FINAL REPORT

2016 Comprehensive Commercial and Industrial Customer Profile Report

Massachusetts Program Administrators and Energy Efficiency Advisory Council

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1 EXECUTIVE SUMMARY

1.1 Background

DNV GL publishes the Commercial and Industrial (C&I) Customer Profile report on an annual basis to present the analysis of Massachusetts Program Administrators’ (PAs’) billing and tracking data. The analysis and reporting of the statewide data allow the PAs and the Energy Efficiency Advisory Council (EEAC) Consultants to:

- Accurately quantify and report on trends and time series evolution in the Massachusetts C&I landscape
- Develop narratives about these trends and their implications for a variety of stakeholder interests
- Help formulate testable hypotheses for future process, market, and impact assessment studies

The C&I Customer Profile report allows the PAs to evaluate how their standardized data compares to other PAs’ standardized data, and compares to the state as a whole, while always maintaining PAs’ customer and IT system confidentiality.

1.2 Project objectives

The overall goals of the C&I Customer Profile project are to integrate the Massachusetts PAs’ billing and tracking data into the MA C&I Evaluation Database, and to analyze this data in order to identify, quantify, and report on the evolving trends in the C&I energy efficiency landscape, which in turn will inform hypotheses for deeper research.

The objectives of the MA C&I Evaluation Database are:

- To provide a standardized, time-series, statewide view of the PAs’ tracking and billing data
- To maintain customer-level data confidentiality
- To support a diverse and robust array of drill-downs and roll-ups of PA data, focusing on various attributes that provide unique insight into PA C&I efficiency accomplishments
- To minimize data requests on the PA teams

The C&I Customer Profile report serves as the vehicle to aggregate and summarize the account- and project-level details contained in the MA C&I Evaluation Database, in accordance with the PAs’ and EEAC Consultants’ goal of:

Generating cross-PA views of the data at as granular a level as feasible without compromising customer or project data confidentiality.¹

1.3 Approach

DNV GL assesses the sources and completeness of data delivered, documents steps taken to extract, transform and load billing and tracking data to ensure consistent and correct standardization, and conducts data maintenance to integrate the most recent data into the MA C&I Evaluation Database. The 2016 project updates and builds on prior C&I Customer Profile Projects to identify new trends or existing patterns over time.

¹ This principle was articulated during the 2012 C&I Customer Profile report and subsequently reaffirmed in the scoping, analysis, and reporting for the 2013 C&I Customer Profile report.
Given the continual updates to the MA C&I Evaluation Database and the efforts made to leverage new information to fill previously unclassified historical fields, the numbers and figures in this current C&I Customer Profile report supersede those of previous year’s reports. Thus, a reader wishing to understand how many accounts of a certain industry sector existed in a 2012 billing population, for instance, should consult the 2012 year in this report’s time series tables, rather than going back to the 2012 Customer Profile report. This will ensure that readers are leveraging the most comprehensive and current data in the MA C&I Evaluation Database.

1.4 Summary of key findings

The section provides a summary of key findings and implications (additional details are provided in section 7.1). Key findings in dark blue boxes indicate new findings specific to the 2016 C&I Comprehensive Customer Profile report, while key findings in light blue boxes represent findings consistent with previous years’ reports. The key findings are presented in descending order of granularity, starting with the broadest, state-wide findings.
**REPORT KEY FINDINGS**

1. **2016 is the first year statewide electric participation and savings rates have decreased.**
   - If electric savings decrease again in future years, it may impact the PAs’ ability to meet annual savings goals.

2. **Across PAs, there are notable differences in the mix of measures installed, representing possible opportunities for statewide energy efficiency gains through more robust segmentation analysis.**
   - It is important to uncover the deeper stories behind key trends. The potential exists to leverage the integrated PA tax data in segmentation analyses to help the PAs fine-tune their marketing outreach efforts.

3. **For both gas and electric PAs, upstream programs have resulted in increased participation of small customers, likely due to the accessible nature of the measures offered.**
   - Additional measures could also be successful via the upstream channel if they are similar in accessibility for customers.

4. **The upstream hot water program experienced a successful first year for the gas market. It delivered 1.4 million therms in gas savings, primarily to small and first-time gas participants.**
   - The first year success with this program could indicate other gas measures with minimal technical barriers may be attractive for small and first-time customers.

5. **Upstream lighting continues to provide substantial savings and participation for the electric market. Shifts in lamp types purchased have caused year-over-year savings fluctuations.**
   - A rapidly shifting lighting market will reflect changes in bulb types purchased through upstream. Continued monitoring of the measure mix and installation rates could help address future upstream challenges.

6. **Custom projects continue to provide substantial savings for both gas and electric accounts. These projects play an important role in meeting PAs’ savings goals.**
   - Custom projects continue to support electric and gas PA savings goals. While high-saving measures like CHP contribute greatly, other custom projects can help meet these goals in the absence of such a large project.

7. **For both electric and gas, savings from HVAC projects continue to decline, even with the inclusion of the electric upstream HVAC offerings.**
   - Electric HVAC savings have been trending down since 2013 (coinciding with the introduction of upstream HVAC). Further analysis into the more successful HVAC electric and gas projects may reveal future opportunities to increase HVAC projects and savings for both fuels.

8. **Control measures provided substantial savings for lighting and HVAC (electric and gas) projects in 2016.**
   - PAs appear to be capturing additional opportunities with controls discussed in previous planning summit meetings.

9. **Aerators and spray valves remain a key driver of gas participation and savings despite the continued statewide decline in these numbers.**
   - Incorporating aerators and spray valves into the upstream hot water program might continue to encourage statewide engagement.
1.5 Recommendations and considerations

1.5.1 Recommendations

The scope of the MA C&I Customer Profile project focuses on the collection of PA data, the construction and maintenance of the MA C&I Evaluation Database, and data analysis and summarization using attribute filters. Additional value and insight can be gained by using this project’s high-level findings to identify critical research questions for deeper analysis or opportunities to improve collected data. For the 2016 C&I Customer Profile report, we present the following recommendations:

1.5.1.1 Increase communication throughout the annual data delivery process to improve the quality of ongoing and future evaluation efforts.

DNV GL recommends that future data intake and updates consist of more frequent communication touchpoints between PAs, evaluators, and EEAC Consultants. As each PA provides its own unique and intricate data, regular communication between all MA C&I Evaluation Database stakeholders would facilitate faster data intake and data authentication processes, and would help prevent future discrepancies during report writing. Increased communication touchpoints would increase the efficiency and improve the quality of all evaluation efforts, including more realistic timelines and better project planning. Specifically, these actions could include:

- An annual kick-off meeting to discuss data intake and management goals for the upcoming year
- Meetings with each PA to determine a feasible level of data quality and realistic timelines for data delivery
- Revising current documentation practices to deliver faster and more impactful information for the PAs
- Exploring the use of web portals and digital dashboards to increase communication and shorten reports

In addition to improving communication between stakeholders, we recommend several changes to the annual data intake process, to help ensure more timely delivery of data:

- Bifurcating billing and tracking data in the annual delivery process:
  - Billing data is generally available before tracking data each year. We recommend sending the billing data as it become available. Earlier access to the billing data will help support ongoing and future projects, and will decrease the interval between the time data is provided and the time it gets included in the MA C&I Evaluation database.

- Assess the feasibility of more regular and standardized data deliveries:
  - Moving from annual to more frequent updates will help support many project efforts. Each PA will need to determine the form of its own data deliveries, to accommodate each PA’s different needs and processes around data security and quality control.

- Modify the annual Summary of Data Completeness process to contain two separate elements.
  - Individual PA reporting to verify PA data as it finishes the data intake process.
  - A statewide summary of the complete data once all PAs are fully processed.
1.5.1.2 Consider leveraging the upstream tracking data to further engage small and mid-size participants that might offer opportunities for increased depth of savings.

The data presented in this report indicates that upstream programs increase participation among small and mid-size customers. By nature, this channel provides efficiency measures to customers without assurance (through comprehensive engineering assessments, etc.) that these measures are being optimally used. Accordingly, upstream customers may be leaving additional savings on the table.

Utilizing the upstream tracking data, PAs could assess whether these customers share commonalities that could be leveraged to increase savings and repeat participation. For instance, identifying similarities in purchasing patterns or geography could help PAs further hone their target marketing to these customers.

Finding small and mid-size customers to begin or continue participating in energy efficiency can be costly. Fortunately, participating in the upstream program demonstrates customers’ willingness improve on energy efficiency, making them valued prospects. The PAs should investigate the feasibility of leveraging the upstream tracking data to help identify customers with a need for deeper energy saving solutions.

1.5.1.3 Investigate the feasibility of a premise-level analysis grain in future Customer Profile reports.

Currently, the C&I Customer Profile report focuses on account-level analysis. This analysis grain provides a clean link to each year’s billing data and is useful in summarizing individual year savings and participation, relative to the customer landscape for each PA. However, account numbers change though time as accounts open and close, and many larger energy efficiency measures, such as some HVAC or building shell installations, have long measure lives that are tied to their installation location. As more years of data are added to the analysis, it becomes increasingly likely that there are locations where an account has closed, but energy efficiency measures remain in place. This may cause an under-representation of the portion of the building population that has already participated in energy efficiency. Moreover, new accounts entering these buildings would not be candidates for new measures, even though they themselves have not participated in energy efficiency.

Beyond the time series challenge, an account-level analysis does not facilitate assessments across fuels for some PAs, or across customers that have different PAs providing each fuel type. This can complicate some analyses, such as the EUI maps, where understanding a building’s overall energy usage may be a more appropriate way of understanding opportunity and participation. The incorporation of premise-level analysis would provide the C&I Customer Profile report with a new analysis grain that could offer more holistic findings, over time and across PAs and fuels. An HVAC building-level analysis, for instance, would identify which buildings have both gas and electric service, and would shed light on cross-fuel participation opportunities.

1.5.2 Considerations and potential future research

The following considerations recognize opportunities of interest that may not have a clear recommendable action or outcome, but nevertheless merit acknowledgment. The considerations also offer up the more speculative findings in this report. These include instances where non-data insights into program design and implementation, customer behaviors, and other non-data elements mean that the PA data in isolation is unlikely to capture the full landscape of underlying drivers. As a result, considerations do not have the same level of certainty or clear actions that recommendations have.
1.5.2.1 Consider additional research into critical items identified in this report’s Key Findings.

Many of the Key Findings identified in the 2016 Comprehensive C&I Customer Profile report present potential topics for future research. Of note are the various differences in outcomes across PAs. For example, Key Finding 2 (section 7.1.2) states, "Across PAs, there are notable differences in the mix of measures installed, representing possible opportunities for statewide energy efficiency gains through more robust segmentation analysis.” Further research, such as a segmentation study, into drivers of project and customer differences could provide valuable knowledge for replicable successful engagement.

Additionally, Key Finding 3 (section 7.1.3) states, "For both gas and electric PAs, upstream programs have resulted in increased participation of small customers, likely due to the accessible nature of the measures offered.” Deeper investigations into these programs and their engagement with small customers may uncover specific measure or program characteristics that encourage engagement from this subset of customers. Research into the upstream hot water market could answer valuable questions regarding the program’s future growth and success.

1.5.2.2 Leverage the combination of location-level analyses, energy use, and American Community Survey block group data to identify and quantify where opportunities for strategic electrification or fuel switching may exist.

The PAs have cultivated geographic data capabilities over the years through the MA C&I Evaluation Database. They could leverage these capabilities to identify areas where, for example, it might be desirable to switch from delivered fuels to a regulated fuel.

For both the electric and gas PAs, the integration of the locational analysis capabilities makes it possible to identify individual buildings where the total energy consumption is substantially different from peer buildings of comparable vintage, size, and industry sector. The American Community Survey data on fuel availability can also be used to understand the likelihood that the customers are using a delivered fuel, and potentially even generate a probability of how much of that delivered fuel they use. With this information, PAs could get an idea of the savings that a delivered customer could obtain by switching to more efficient equipment in regulated fuel.
**1.5.2.3** Create new end use classifications that are more detailed, to support deeper investigations across analysis grains within the C&I Customer Profile report, and to support ongoing and future studies.

PAs provide DNV GL with many different measure end use names and descriptions in their tracking systems. Each year, DNV GL scrutinizes all measure information provided and creates the standardized end use fields found in each fuel’s end use section of the report (Sections 5.2 and 6.2). For end use descriptions such as HVAC or building shell, more detailed measure descriptions would help identify trends that are currently not visible in broader end use classification. Providing BCR measure IDs, if applicable, would also support this effort. Developing end use classifications at this level of detail for strategically important end uses can allow the MA C&I Evaluation Database to further support reporting, customer segmentation, and program planning efforts. The level of classification available in the MA C&I Evaluation Database is highly dependent on the granularity of data provided by each PA. It may be worthwhile for the PAs to consider whether opportunities exist to incorporate additional details into their tracking systems.

**1.5.2.4** PAs should determine whether any measures currently offered through the residential products program may also be appropriate for smaller C&I customers.

Measures like air purifiers, computer and kitchen equipment, and smart strips may represent effective ways to engage smaller customers via a C&I upstream or online products channel. While the combination of these customers and the measures in question are not likely to return large savings, they may provide easy and cost-effective opportunities for introducing and increasing participation among smaller C&I customers.

**1.5.2.5** PAs should consider leveraging updated tax data along with their tracking data to improve customer segmentation and better identify potential future participants.

Through the C&I Enhanced Customer Database project (MA66), DNV GL has appended statewide tax data to the PAs’ billing and tracking data. This newly available information will allow the PAs to use tax parcel characteristics, such as land use, building square footage, vintage, and value to identify similar groups of customers who may share similar needs or have similar barriers to participating in energy efficiency initiatives.

Leveraging this data could provide the PAs with more quantitative analysis on how the demand for different end uses is evolving, in order to offer increasingly attractive programs, further increase participation and savings, and continue to meet annual savings targets.

**1.6 Key findings cut sheets**

The following key finding cut sheets are designed to provide stand-alone, high-level support for each of the key findings. These sections also guide the user to relevant sections of the report where additional details present deeper analysis and support of each finding. These findings are also provided in traditional text format in section 7.1. The key findings are presented in descending order of granularity, starting with the broadest, state-wide findings.

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2 An example of this is the new lighting classification added to section 5 of this report.

3 Throughout this report, the term “upstream hot water” references the C&I Upstream Water Heater Initiative.
**Implications**

- There were more custom projects undertaken in 2016 than in 2015, but these projects provided less in total electric savings than in 2015. (Section 4.3.5.1).

- Participation by customers in electric’s largest consumption bin did not vary substantially from 2015 to 2016. Savings achieved from large customer participation did decrease considerably from 2015 to 2016. (Section 5.1.2).

- In 2015, 3 large CHP and process projects provided substantial electric savings—over twice the savings provided by the 3 largest saving projects in 2016 (upstream lighting, non-upstream lighting, and HVAC). In 2015, the largest CHP projects were in the education and manufacturing sectors; in 2016, the largest CHP projects were in health care. In 2016, 41% of accounts installing CHP measures consume < 0.47 GWh. In 2015, 33% of accounts installing CHP consumed < 0.47 GWh. (Sections 5.1.2 & 5.2).

**Highlights**

2016 is the first year statewide electric participation and savings rates have decreased.

**2011-2016 statewide participation and savings rates, electric**

- Participation Rate
  - 2011: 2.2%
  - 2012: 2.8%
  - 2013: 5.6%
  - 2014: 6.6%
  - 2015: 7.6%
  - 2016: 6.4%

- Population Savings Achieved
  - 2011: 2.0%
  - 2012: 2.3%
  - 2013: 2.6%
  - 2014: 3.2%
  - 2015: 3.2%
  - 2016: 2.9%
Across PAs, there are notable differences in the mix of measures installed, representing possible opportunities for statewide energy efficiency gains through more robust segmentation analysis.

**Implications**

- While the significance of any individual year and measure should not be overestimated, it is important to uncover deeper stories behind key trends.
- The potential exists to leverage the integrated PA tax data in segmentation analyses to determine whether analogous populations exist across PA territories, and at what scale. Such analyses could allow the PAs to fine-tune their marketing outreach efforts.

**Share of 2016 gas savings by end use, by PA**

- For gas, both National Grid and Eversource gas had substantially more programmable thermostat installations than Columbia in 2016. Eversource had a slightly larger number of programmable thermostat installs than National Grid in 2016 despite a substantially smaller gas population (Section 6.2).
- For electric, Eversource had nearly twice as many accounts that installed motors and drives as National Grid. National Grid had twice as many CHP projects as Eversource in 2016, but National Grid’s CHP projects provided only 68% as much savings as the Eversource CHP projects (Section 6.2).
3 For both gas and electric PAs, upstream programs have resulted in increased participation of small customers, likely due to the accessible nature of the measures offered.

Implications

- The data in this report suggests that all upstream programs successfully reach small customers, which are typically more difficult and costlier to engage for both electric and gas PAs. Upstream programs typically use energy efficiency measures that can be self-installed, that are largely interchangeable with the measures they replace, and that have low technical barriers (i.e., they do not require extensive engineering analysis or technical support.)

- The data also shows that a considerable proportion of upstream sales are to end users that also qualify for the direct install program, with annual consumption < 1.5 GWh for electric, and < 40,000 therms for gas. Additional measures could also be successful via the upstream channel if they are similar in accessibility for customers.

Highlights

- Small customers make up a substantial portion of electric and gas upstream accounts. While only 48% of upstream lighting accounts match to billing data, 83% of those consume < 1.5 GWh, and 53% of those consume < 0.11 GWh (Sections 5.2 & 6.2).

- As with lighting, 41% of 2016 upstream HVAC accounts match to billing data, 91% of those consume < 1.5 GWh (Section 5.2).

- For gas, 76% of upstream hot water records and 100% of upstream food service records that match to billing data consume < 40,000 therms (Section 6.2).
The upstream hot water program experienced a successful first year for the gas market. It delivered 1.4 million therms in gas savings, primarily to small and first-time gas participants.

- The combined savings from upstream and non-upstream hot water programs represented a 68% increase in hot water savings from 2015, and an even more substantial increase over historical values. This indicates that the savings from gas upstream hot water provides additional savings that were not previously being captured solely via non-upstream.

- In light of the upstream hot water program’s success, there might be additional measure types that these previously under-participating customers would be willing to install via the upstream program. Measures that can be installed with minimal technical barriers, such as thermostat replacements, may represent an attractive offering for such customers.

- The majority of 2016 upstream hot water participants were small accounts: 78% consume < 40,000 therms, and 42% consume < 8,000 therms (Section 6.2).

- 81% of 2016 upstream hot water participants were first-time gas efficiency program participants (Section 6.2).
Upstream lighting continues to provide substantial savings and participation for the electric market. Shifts in lamp types purchased have caused year-over-year savings fluctuations.

**Highlights**

- The data on individual lighting technologies reinforces the notion of a rapidly shifting lighting market, likely to change bulb types purchased through upstream in the future.
- The upstream lighting program has faced challenges, including the low installation rates discovered through early field evaluation in mid-2016.* Continued monitoring of the upstream measure mix and installation rates will help ensure that the upstream program delivers reliable, cost-effective savings.

**Implications**

- The data shows an increase in upstream lighting sales in 2014 and 2015, with lower sales in 2016. Despite the decline in 2016, upstream lighting still contributed 22% of the electric PA savings (Section 5.2).
- Lamp types purchased through upstream lighting appear to vary from year to year. Screw-based lamps make up the majority of upstream lighting measures sold each year, but have steadily declined since a spike in 2014. All upstream screw-based lamps installed in 2016 were LEDs, almost evenly made up of A-lamps, downlights, and reflectors (Section 5.2.1).
- In 2016, linear and other LEDs increased by 230% over 2015 and 2014 values. This increase was not sufficient to compensate for the decline of screw-based lamps, and overall, upstream lighting savings were lower in 2016 than in 2015 and 2014 (Section 5.2.1).

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* DNV GL. *Impact Evaluation of Massachusetts Commercial and Industrial Upstream Lighting Program*. Massachusetts Energy Efficiency Programs Commercial and Industrial Evaluation Contractor, 2017. These low installation rates may have been at least a partial driver in the overall decline in lighting savings (11.5% lower than in 2015) for the first time since 2013.
Custom projects continue to provide substantial savings for both gas and electric accounts. These projects play an important role in meeting PAs’ savings goals.

Implications

Custom projects continue to support electric and gas PA savings goals. While certain high-saving custom measures, such as CHP, contribute substantially to these goals, other custom projects can help the PAs continue to meet goals, even in the absence of a large project, such as CHP in a given year.

Custom incentive/therm saved and total savings by year, gas

- Custom projects continue to drive savings for the gas PAs. In 2016, savings from custom projects were 16% higher than in 2015. Custom savings made up 76% of total 2016 gas savings (as opposed to prescriptive and upstream). HVAC controls and steam traps made up the most custom gas projects (45%) in 2016; process measures made up 15% (Sections 6.2).

- In 2016, 50% of electric savings came from custom projects, rather than prescriptive or upstream. Most 2016 custom electric projects were retrofit lighting (62%), process (11%), refrigeration (8%), and HVAC (7%) (Section 5.2).

- The highest-saving electric projects in 2016 were custom process projects done in Health Care and Social Assistance and Manufacturing from Eversource and National Grid. Custom electric savings for Eversource were driven largely by retrofit CHP, HVAC, and process projects. In contrast, custom electric savings for National Grid were driven largely by retrofit lighting projects (Section 5.3).
**KEY FINDING**

For both electric and gas, savings from HVAC projects continue to decline, even with the inclusion of the electric upstream HVAC offerings.

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**Implications**

- Savings from HVAC projects (including electric HVAC) have been trending down since the introduction of upstream HVAC measures.
- Statewide, market penetration for HVAC is low for both electric and gas. This provides evidence there are opportunities for future HVAC engagement.
- Further analysis into the more successful HVAC electric and gas projects may reveal future opportunities to increase HVAC projects and savings for both fuels.

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**Summary of HVAC as a share of annual gas and electric savings**

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**Highlights**

- For 2016, electric HVAC measures made up 3% of projects and 13% of total electric savings. Gas HVAC measures made up 28% of 2016 gas projects, and 12% of savings (Sections 5.2 & 6.2).
- Of electric participants who installed either upstream or non-upstream HVAC measures in 2016, 52% were from Eversource, and 42% were from National Grid. These measures were installed primarily in Retail Trade, Professional Services, and Accommodation and Food Services. The highest electric HVAC savings in 2016 were from custom projects done by a few large Manufacturing accounts from Eversource (Section 5.2.2).
- For gas, HVAC projects and savings decreased from 2011 to 2016. Most HVAC participants in 2016 installed controls and boilers. 53% of gas HVAC participants were from National Grid, 23% were from Columbia, and 16% were from Eversource. Most gas HVAC projects in 2016 were in Educational Services, Real Estate, and Professional Services (Section 6.2.2).
Control measures provided substantial savings for lighting and HVAC (electric and gas) projects in 2016.

**KEY FINDING**

- The importance of lighting control technology as the next level of savings beyond energy efficient bulbs and fixtures was discussed by the PAs and EEAC at the 2016 annual C&I planning summit. The substantial increases in lighting controls in 2016 indicates that the PAs have begun capturing these opportunities.

- Savings trends for HVAC controls and all other HVAC measures appear to move in parallel across time for both electric and gas, but this is not always the case, as seen in 2012.

**Implications**

- In 2016, lighting control measures provided 15.8 GWh in gross savings, more than doubling their savings from 2015 and 2014. (Section 5.2).

- Controls account for 27% of electric HVAC measures installed from 2011–2016, and represent 28% of the 6-year electric savings. In 2016, controls provided 21.4 GWh in HVAC savings.

- On the gas side, controls account for 29% of HVAC gas savings over the 6-year period. Educational Services contributed 33% of gas HVAC control savings (Sections 6.2.1 & 6.3).
Aerators and spray valves remain a key driver of gas participation and savings despite the continued statewide decline in these numbers.

- Individual PAs may still have opportunities with these measures, similar to Liberty, which had 80% of its 2016 participants install aerators and spray valves in 2016. This data, coupled with the success of the upstream hot water program seen in Key Finding 3, suggests that aerators and spray valves could be incorporated into the upstream hot water program to continue encouraging statewide engagement in the future.

- While aerators and spray valve installations declined statewide again in 2016, for the 4th year since 2013, they still accounted for 23% of projects installed. This indicates that this offering is still an important way for all PAs to encourage gas participation (Sections 6.2 & 6.4.2).
2 INTRODUCTION

2.1 Project goals and objectives

The overall goals of the C&I Customer Profile project are to integrate the Massachusetts PAs’ billing and tracking data into the MA C&I Evaluation Database, and to analyze this data in order to identify, quantify, and report on the evolving trends in the C&I energy efficiency landscape, which in turn will inform hypotheses for deeper research.

The objectives of the MA C&I Evaluation Database are:

- To maintain customer-level data confidentiality
- To provide a standardized, time-series, statewide view of the PAs’ tracking and billing data
- To support a diverse and robust array of drill-downs and roll-ups of PA data, focusing on various attributes that provide unique insight into PA C&I efficiency accomplishments
- To minimize data requests on the PA teams

The C&I Customer Profile report serves as the vehicle to aggregate and summarize the account- and project-level details contained in the MA C&I Evaluation Database, in accordance with the PAs’ and EEAC Consultants’ goal of:

Generating cross-PA views of the data at as granular a level as feasible without compromising customer or project data confidentiality.  

2.2 Overview of approach

The 2016 C&I Customer Profile project consists of two major tasks, summarized in Figure 2-1:

Figure 2-1. Summary of primary project activities

Task 1: Add 2016 C&I tracking and billing data to the MA C&I Evaluation Database

- Collect PA tracking and billing data for 2016
- Organize and add data to the MA C&I Evaluation Database
- Provide detailed documentation to the PAs on the status of data completeness

Task 2: Analyze and report the 2016 data and historical trends

- 2016 C&I Expedited Customer Profile analysis and report
- 2016 C&I Comprehensive Customer Profile analysis and report

4 This principle was articulated during the 2012 C&I Customer Profile report and subsequently reaffirmed in the scoping, analysis, and reporting for the 2013 C&I Customer Profile report.
2.2.1 Add 2016 C&I tracking and billing data to the MA C&I Evaluation Database

This task consists of the following four steps:

- Assess the sources and the completeness of data delivered, the quality of the variable-level data including logical fit and consistency, and other key considerations needed by project teams
- Document the steps taken to extract, transform, and load the billing and tracking data, to ensure consistent and correct standardization
- Conduct data maintenance to integrate 2016 data fields for use in linking time series and field survey data
- Produce a Summary of Data Completeness memo and apprise the PAs and EEAC Consultants of the final field population and quality in the billing and tracking databases

2.2.2 Analyze PA tracking and billing data

The 2016 Comprehensive C&I Customer Profile analysis consisted of two primary tasks:

1. Create and finalize the Summary of Data Completeness memo – The Summary of Data Completeness memo gives the PAs and EEAC Consultants the opportunity to sign off on the data prior to DNV GL’s analysis. After issuing a draft version of the memo, DNV GL worked with any PAs who found discrepancies in their data to resolve these and make sure the PAs were comfortable with their final numbers before issuing a final version of the memo, and starting the Comprehensive C&I Customer Profile reporting process.

2. Perform the Comprehensive C&I Customer Profile analysis – DNV GL updated and continued to build on the comprehensive analyses performed for previous annual C&I Customer Profile reports. We incorporated the additional guidance received in the comments on the 2015 C&I Customer Profile report, and feedback from the individual PAs and EEAC Consultants. More specifically, our analysis included:

- Updating the base analysis tables and charts from previous C&I Customer Profile reports with 2016 data, focusing on PA-level participation, average savings, participant-weighted savings, and average participant savings
- Updating the detailed PA Summary Tables and the By-PA Breakdown Tables from the 2015 C&I Customer Profile report
- Updating all time-series analyses to include 2016 data and ensure we utilize any new data (e.g., building use) that can fill in missing data from previous years
- Conducting exploratory data analysis on the impact of very large projects in efficiency savings by reporting on means, medians, and other descriptive statistics or text where appropriate
- Investigating categories of measures implemented within end uses to understand the scale and proportional savings contributions of the specific categories
- Updating the geographic information system (GIS) analysis to:
  - Identify and quantify the current year’s town-level savings, consumption, and participation
  - Identify and quantify town-level aggregate participation from 2011 through 2016 by raw and consumption-weighted percentage
  - Identify and quantify differences in dual fuel PA-served towns
  - Identify and assess notable trends from the address-level data
  - Update the Energy Use Intensity (EUI) maps from 2015
DNV GL analyzed the PA data by calculating reporting statistics (account participation, consumption-weighted participation, etc.) for a range of metrics at different levels of granularity. Specific details concerning the metrics used in this report can be found in the Methodology section.

2.3 Organization of report

This report is organized as follows:

- **Methodology (section 3)** provides details about any assumptions, caveats, and items of note used in the analysis approach for the report. These details are important to both the electric and gas market analyses.

- **Electric and gas combined summaries (section 4)** presents details about the electric and gas markets which lay the foundation for each market's detailed analysis section. The charts and tables presented in this section allow for comparisons across the markets.

- **Electric market analysis (section 5) and gas market analysis (section 6)** contain the bulk of the analysis performed for the 2016 C&I Comprehensive Customer Profile report. These sections are organized in a parallel structure to allow for easier movement across sections. The general structure of each section is:
  - Statewide results
  - End use breakdown
  - Industry sector analysis
  - By PA summary

In the 2016 report, certain subsections in the report have been moved to Appendices. These include aspects of the methodology that are repeated from the 2015 report, and the “Within PA summary” subsections that were previously part of the overall electric and gas market sections.

Throughout the report there are many observations and discussions of analysis that relate directly back to the key findings presented in the Executive Summary (section 1) and the Conclusions (section 7). In order to help guide the reader though each section, the following symbol has been added throughout the report:

![Look for this symbol for text that relates directly to key findings.](image)


3 METHODOLOGY

This section details the approach we used for the database development and analysis phases of the C&I Customer Profile project.

3.1 Data acquisition

DNV GL began the project by requesting 2016 tracking and billing data for all C&I customers from the electric and gas PAs. Specifically, DNV GL requested:

- Tracking data pertaining to the customers, projects, equipment, and vendors associated with 2016 energy efficiency measures
- Billing data including customer information and consumption records for each billing period in 2016

The data DNV GL received from the PAs contained a wide variety of file types and formats. We thoroughly reviewed the data and coordinated with the PAs to identify additional files to fill in data gaps. The bulk of the data was received by the third quarter of 2017. Working in conjunction with the PAs, DNV GL continues to refine, update, and load additional data into the MA C&I Evaluation Database to support other Massachusetts C&I evaluation projects as new material becomes available during the project lifecycle.5

For more detail on the data acquisition process and the original data request memo, please see section 8.2 in Appendix B.

3.2 Data collection and database development

This section provides information on the data collection and database extract, transform, and load (ETL) process used to populate the central repository for all PA billing and tracking data. All detailed data is stored in a consistent format at the most granular level possible, in a framework that allows data summarization at whatever level needed by PAs and EEAC Consultants for analytic undertakings. This task consists of the following four steps:

1. Assessing the sources and the completeness of data delivered, the quality of the variable-level data including logical fit and consistency, and other key considerations needed by project teams
2. Documenting the steps taken to extract, transform, and load the billing and tracking data to ensure consistent and correct standardization assignments
3. Conducting data maintenance to ensure that 2016 data fields are integrated for use in linking time series and field survey data
4. Producing iterations of the Summary of Data Completeness memo, consisting of comparison tables between PA’s data in the database and PA’s data in their BCR models. The Final SDC Memo was distributed once all PAs signed off on their data as it stood in the database, and in their BCR models.

3.3 Data analysis

This section details the data analysis that we conducted for this report. Our analysis included:

- All tables and figures presented in the 2015 Comprehensive C&I Customer Profile report

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5 In this regard, each year’s Customer Profile presents a snapshot of the current MA C&I Evaluation Database rather than a fully static picture of data that will not ever be revised. As PAs identify new attributes that yield better insight into the data, DNV GL incorporates them into the MA C&I Evaluation Database and retroactively applies them to the time series data.
• Select tables from the Advanced Lighting Investigation and Exploration of HVAC Trends Deep Dive reports finalized in 2017
• Updates to the base analysis tables and charts from previous C&I Customer Profile reports with 2016 data, focusing on PA-level participation, average savings, participant-weighted savings, and average participant savings
• Updates to the detailed PA Summary Tables and the By-PA Breakdown Tables from the 2015 C&I Customer Profile report
• Updates to all time-series analyses to include 2016 data, along with any new data that can be passed forward from previous years’ data (e.g., building use)
• Updates to all previous years’ data
• Exploratory data analysis on the impact of very large projects in efficiency savings, reporting on means, medians, and other descriptive statistics or text where appropriate
• Investigation into end use measure categories to understand the scale and proportional savings contributions of each category
• Updates to the geographic information system (GIS) analysis to:
  - Identify and quantify the current year’s town-level savings, consumption, and participation for kWh, GWh, 6 therm, and joint MMBTU
  - Identify and quantify town-level aggregate account participation from 2011 through 2016 by raw and consumption-weighted percentage
  - Generate town level kWh, GWh, therms, and MMBTU contribution ratios for the current year and 2011–2016 period
  - Identify and quantify differences in dual fuel PA-served towns
  - Update the location level EUI maps, charts, and supporting tables to reflect the tax data integration successes from the ongoing PA Data Enhancement Project

DNV GL analyzed the PA data by calculating reporting statistics (account participation, consumption-weighted participation, etc. listed below) for a range of metrics at different levels of granularity. 7 Figure 3-1 provides a visual representation of this analysis; calculation details are addressed below.

6 1 GWh = 1 million kWh.
7 For 2016, based on PA and EEAC Consultant feedback, confidence ellipses were removed from the analysis.
Our analysis involved generating the following statistics for the various analysis lenses:

- **Account participation.** This metric identifies the ratio of accounts within the analysis population (e.g., industry sector, PA, etc.) that participated in energy efficiency programs. It can answer questions such as, “What percent of manufacturing accounts participated in an efficiency program for each PA?”

\[
\frac{\text{Number of Participating Accounts within Analysis Population}}{\text{Number of Accounts within Analysis Population}}
\]

- **Consumption-weighted participation.** This metric measures the proportion of all consumption that is derived by participating accounts within a specific analysis population (e.g., industry sector, PA, etc.). It
can answer questions such as, “Accounts who participated in an efficiency program in 2016 represent what percent of total manufacturing consumption?”

\[
\frac{\text{Sum of Consumption for Participating Accounts within Analysis Population}}{\text{Sum of Consumption of all Accounts within Analysis Population}}
\]

- **Population savings achieved.** This metric looks at the energy savings of efficiency participants within a specific analysis population (e.g., industry sector, PA, etc.) relative to the consumption of the total analysis population. It can answer questions such as, “How much energy did the Massachusetts manufacturing sector save relative to its total consumption?”

\[
\frac{\text{Sum of Savings for Participating Accounts within Analysis Population}}{\text{Sum of Consumption of all Accounts within Analysis Population}}
\]

- **Participant savings achieved.** This metric reflects energy savings as a proportion of a participant’s energy consumption. It can answer questions such as, “How much energy did participating manufacturers save relative to their consumption?”

\[
\frac{\text{Sum of Savings for Participating Accounts within Analysis Population}}{\text{Sum of Consumption of Participating Accounts only within Analysis Population}}
\]

- **Penetration rate.** This is an expansion of the “account participation” statistic that is not isolated to a single year. It can answer questions such as, “What percent of the PAs’ accounts participated in an efficiency programs over the past 6 years?”

\[
\frac{\text{Number of Unique Participating Accounts within Analysis Time Horizon}}{\text{Number of Unique Population Accounts within Analysis Time Horizon}}
\]

- **Consumption-weighted penetration rate.** This is an expansion of the “consumption-weighted account participation” metric that is not isolated to a single year. It can answer questions such as, “What percent of total PA consumption has participated in an efficiency program in the past five years?”

\[
\frac{\text{Sum of Consumption for Unique Participating Accounts within Analysis Time Horizon}}{\text{Sum of Consumption of all Unique Population Accounts within Analysis Time Horizon}}
\]

- **Contribution ratio.** This metric measures the proportional savings contribution to total savings for a specific analysis bin relative to the proportional consumption contribution to total consumption. This lens provides a more normalized view of a bin’s savings relative to its consumption by incorporating population-level weights.

\[
\frac{\left(\frac{\text{Savings for analysis bin}}{\text{Total savings for all analysis bins}}\right)}{\left(\frac{\text{Consumption for analysis bin}}{\text{Total Consumption for all analysis bins}}\right)}
\]

- **Time series savings achieved.** This metric reflects the energy savings of efficiency participants of the entire time horizon of the report (2011-2016) relative to the total energy consumption over the same period. This statistic provides insight into the question, ”How much energy has been saved in the electric market over the past 6 years?”

\[
\frac{\text{Sum of Savings for Participating Accounts within Analysis Population for all years, excluding first year}}{\text{Sum of Consumption of all Accounts within Analysis Population for all years, excluding most current year}}
\]
3.4 Data profiling and integration into the MA C&I Evaluation Database

Once DNV GL had received data from the PAs, we standardized the data using the ETL process.

- In the extract phase, we brought the PAs’ raw data into a standard layout to ensure consistent field matches, and assembled any relational files that needed to be constructed from the raw data. We developed a mapping matrix to document:
  - The data elements provided by each PA
  - The final field to which each of the PA attributes was assigned
  - The percentage of the field that was populated with the PAs’ data

- In the transform phase, we cleaned up any non-standard data values and populated missing key data fields by consulting with PAs and technical advisors, and by using new data to fill in missing data from previous years where possible. DNV GL also ensured that the extracted data from each PA conformed to the acceptable field values for the aggregated PA data.

- In the load phase, we loaded the transformed data into the master database.

DNV GL documented all steps taken to extract, transform, and load the billing and tracking data to ensure consistent and correct standardization of data values. Following this, DNV GL submitted multiple iterations of the Summary of Data Completeness memo for PAs to provide a final sign off on their data. All iterations, including the Final memo, are sent to the PAs and EEAC Consultants describing the final loading and percent completion of the requested data attributes, and any limitations identified in the PAs’ billing and tracking data extracts.

3.4.1 Merging billing and tracking data

Merging customer billing and tracking information was a key task in the transform phase of the ETL process. This task combined the consumption and demand information for participants’ accounts, and was completed in three steps as shown in Table 3-1.

<table>
<thead>
<tr>
<th>Step</th>
<th>Allows calculation of:</th>
<th>Match success rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Match 2016 tracking data to 2015 billing data</td>
<td>Consumption-weighted participation, population savings achieved, and participant savings achieved</td>
</tr>
<tr>
<td>2.</td>
<td>Match 2016 tracking data to 2016 billing data</td>
<td>Account participation</td>
</tr>
<tr>
<td>3.</td>
<td>Match 2016 tracking data to 2015 tracking data</td>
<td>Repeat participation</td>
</tr>
</tbody>
</table>
One common cause of unlinked data was missing account numbers in the tracking data. Additional causes of unlinked data included:

- Incomplete billing data or miss-assigned accounts in the PA’s tracking system
- New construction accounts that did not have a record in the previous year’s data
- Accounts that did not contain all necessary IDs for merging and could not be corrected during incorporation into the MA C&I Evaluation Database
- Line item corrections in the underlying data systems
- One-to-many relationships between measures installed and billed accounts
- Missing accounts in the billing data provided by the PAs

The account population is not static over time. The opening and closing of accounts causes year-over-year variation in match rates. The success rate values help determine how much of a given year’s tracking data is used for each PA in the different analyses in this report. Nevertheless, variation from year to year is expected, and a lower number in any given year should not be construed as “worse.”

DNV GL included unlinked accounts in population-level analyses that did not require billing and tracking data to be matched. Including the unlinked accounts in these analyses allows us to demonstrate the magnitude of participation and savings achieved, regardless of whether an account could be linked to billing data in a given year. It is appropriate to include these accounts in the population-level statistics because only active PA customers are allowed to participate in the PAs’ efficiency offerings. Consequently, unlinked accounts listed in the tracking data were active customers in the billing data at the time of their participation. This approach allows for the possibility of two different savings numbers, depending on whether the table is using “all records provided” or “only linked records”; this mostly impacts tables breaking down projects by energy use-related metrics.

3.4.2 Reviewing and reprocessing data

To support consistent year-over-year comparisons, improve quality, and fill in missing values, DNV GL reviewed and updated all historical data to improve quality and fill in missing values. We performed several checks to validate the data after merging the billing and tracking account-level data. As expected, the aggregation methods caused some differences between the raw data and the processed data. As a result of these differences:

- This report uses gross savings rather than net savings for all metrics.
- The “prior year’s consumption” data in the report slightly exceeds the numbers in the raw data due to the extrapolation process that generates a full year’s equivalent consumption.

Starting in the 2013 C&I Customer Profile report, DNV GL continues to use 2011 billing data (instead of 2010 billing data) as the denominator for historical 2011 savings calculations. This approach could potentially overstate the 2011 savings associated with some analysis populations; based on a spot review of the data, it appears that when sizeable variations (e.g., gas population savings) are detected, they are actually the result of trends in the tracking data, rather than an artifact of the billing data denominator.

As in past Customer Profile studies, DNV GL uses a custom-built composite geocoder in ArcGIS to place accounts at the appropriate location in Massachusetts.

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8 This is one of the reasons why the current year’s tracking to current year’s billing will have almost universally higher match ratios, though they will not reach 100%.
In the 2014 study, DNV GL updated the composite locator logic used to generate parcel-level geocodes. This update allowed DNV GL to more accurately place customer data points and in turn gain greater insight into precisely where energy is consumed and saved. This improvement also allowed DNV GL to leverage third-party data—most significantly building use and square footage data—using shared geography relationships.

DNV GL defined minimum match acceptance scores to ensure that the geocoder tool matched the records, and that these matches were correct. DNV GL set a minimum score of 70% for tax-parcel, address, and street-level matches, and 100% for zip codes and towns. The geocoder tool started at the tax-parcel level, and stopped attempting to match address data after the town level.

3.4.3 Industry sector

Industry sector methodological updates did not affect any metric calculations in the report. Because accounts are sometimes updated with new/different industry sectors as the PAs provide new data, these updates did affect which accounts fell into which industry sector for reporting purposes.

Employing the methodology established in the 2015 C&I Customer Profile report, DNV GL uses the 20 unique descriptions of two-digit NAICS codes to assign each account a single unique industry sector that is consistent within each year as well as across all years of billing and tracking data maintained in the MA C&I Evaluation Database. When data was in formats other than a NAICS code (Table 3-2), DNV GL used linking fields to bring the data to a “best” equivalent two-digit NAICS sector.

### Table 3-2. Business classification schemas, differences between schemas, and example classifications of a data center

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Degrees of Detail: Data Center Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAICS Code</td>
<td>Standardized code with increasing levels of detail starting at two digits and increasing to six digits. Periodically updated by the US Office of Management and Budget; last update was in 2012. Intent is to “allow for a high level of comparability in business statistics.”</td>
<td>51-&gt; 510-&gt; 5182-&gt; <strong>518210</strong></td>
</tr>
<tr>
<td>SIC Code</td>
<td>Standardized code with increasing levels of detail starting at two digits and increasing to four digits. Phased out in late 1990s; no longer actively maintained.</td>
<td>73-&gt; 737-&gt; <strong>7374</strong></td>
</tr>
<tr>
<td>Verbal Description or PA Code</td>
<td>PA-supplied names or codes providing a description of the account. Non-standard across PAs.</td>
<td>Data Center, Server Farm, Information Technology</td>
</tr>
</tbody>
</table>

For accounts for which the PA did not supply a business classification code, DNV GL leveraged pilot tax-parcel use codes, as in previous reports. The tax parcel use code consisted of a standard three-digit code for all cities in Massachusetts excluding Boston. DNV GL standardized the PA and tax parcel codes to the most likely NAICS industry sector, and then assigned the standardized code to billing accounts when there was a match. In cases where a tax parcel had several buildings, DNV GL used the tax code associated with the

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9 The geocoder is a tool that takes a description of a physical location (e.g., an address) and converts it into coordinates that can be placed in geographic space relative to one another. DNV GL’s geocoder uses multiple input sources—including the MA Level 3 tax data, the City of Boston’s Parcel and Assessor data, TIGER line files, and Zip Code Tabulation Areas from the US Census—to attempt to standardize and match PA-supplied address information to the most exact corresponding spatial location.

10 Boston has its own separate but similar coding system that we integrated into the analysis.
largest square footage for all buildings included in the parcel.\textsuperscript{11} Table 3-3 provides the list of NAICS code industry sectors, and the brief definitions of the 3 additional classes DNV GL uses along with the rationale behind them.

**Table 3-3. NAICS codes used in the MA C&I Evaluation Database**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Agriculture, Forestry, Fishing and Hunting</td>
</tr>
<tr>
<td>21</td>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
</tr>
<tr>
<td>22</td>
<td>Utilities</td>
</tr>
<tr>
<td>23</td>
<td>Construction</td>
</tr>
<tr>
<td>31-33</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>42</td>
<td>Wholesale Trade</td>
</tr>
<tr>
<td>44-45</td>
<td>Retail Trade</td>
</tr>
<tr>
<td>48-49</td>
<td>Transportation and Warehousing</td>
</tr>
<tr>
<td>51</td>
<td>Information</td>
</tr>
<tr>
<td>52</td>
<td>Finance and Insurance</td>
</tr>
<tr>
<td>53</td>
<td>Real Estate and Rental and Leasing</td>
</tr>
<tr>
<td>54</td>
<td>Professional, Scientific, and Technical Services</td>
</tr>
<tr>
<td>55</td>
<td>Management of Companies and Enterprises</td>
</tr>
<tr>
<td>56</td>
<td>Administrative and Support and Waste Management and Remediation Services</td>
</tr>
<tr>
<td>61</td>
<td>Educational Services</td>
</tr>
<tr>
<td>62</td>
<td>Health Care and Social Assistance</td>
</tr>
<tr>
<td>71</td>
<td>Arts, Entertainment, and Recreation</td>
</tr>
<tr>
<td>72</td>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>81</td>
<td>Other Services (except Public Administration)</td>
</tr>
<tr>
<td>82</td>
<td>Public Administration</td>
</tr>
</tbody>
</table>

Source: [http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012](http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012)

In addition to the NAICS codes, DNV GL has one additional industry sector code, “Unknown,” which contains accounts for which either no sector data is available or the data provided is not classifiable into a sector (such as a NAICS code of “999999”). This is an update from the 2014 C&I Customer Profile report, in which there were three additional industry sector classifications: “No Data,” “N/A,” and “Unknown.” In the 2014 C&I Customer Profile report, “No Data” consisted of records for which the PA did not provide any information, and for which tax data was unable to match with the record. “N/A” was a code coming exclusively from the MA Level 3 tax database, indicating that the record matched successfully to the tax data, but the tax code was unable to provide it with a NAICS match. In the 2016 report, all three variations of absent industry sector data are binned into the single code “Unknown.”

Starting in the 2016 Comprehensive C&I Customer Profile analysis, DNV GL utilized the efforts of Project 66, “Enhanced Database,” to fill any industry sector fields that were still missing in the data (marked as “Unknown”). Specifically, DNV GL utilized Massachusetts’ tax data and data from InfoUSA®, attempted to link them to accounts within the MA C&I Evaluation Database, and where successful, utilized their 2-digit NAICS code information to provide industry sector information where it was previously missing. This process did not fill in missing industry sector information for all accounts, but for some of the PAs, it provided a much higher presence of industry sector information that was previously “Unknown.”

\textsuperscript{11} This introduces the opportunity of misclassified records, though it is mitigated to some extent because the tax codes have built in a level of hierarchy similar to NAICS and SIC codes. For example, code 102 and 105 are both “Lodging,” so the final building type assignment will be accurate.
3.4.4 End use

Within the tracking data there are varying degrees of detail concerning what was specifically installed for each project. All end use information stems from PA’s provided measure codes and/or descriptions. In incorporating the 2016 tracking data into the MA C&I Evaluation Database, each unique end use description provided by the PAs is cross-walked to a standardized set of values within either electric or gas data. The 2016 C&I Comprehensive Customer Profile reports on classifications of the tracking data using the fields “end use impacted” (broad) and “sub-end use impacted” (specific). These categories are similar to the MA Technical Research Library (TRL).12

3.4.5 Usage size bins

In 2016, in consultation with the PAs, DNV GL added new consumption GWh size bins; these new bins replace the demand size bins used in previous iterations of the report. Previously, the C&I Customer Profile presented electric customer sizes by demand (kW) and consumption (kWh).13 We are now presenting two different representations of consumption: broad consumption bins and narrow consumption bins. Broad consumption bins consist of fewer GWh categories, with more accounts falling in each bin; narrow consumption bins consist of more GWh categories, with fewer accounts falling in each bin.

PA feedback suggests that this change to fewer size categories benefits smaller PAs, who have fewer customers than the larger PAs in each size bin. This change also aligns the number of size bins in the electric market with the number of size bins in the gas market. Previously, there were 6 electric demand bins and 5 gas therm bins; now there are 5 usage bins for both electric and gas. Our team used the analyses from the Mid-size Customer Assessment project14 to help design the new GWh broad bins. Table 3-4 and Table 3-5 show the electric bin changes and the explicit consumption breakpoint values for electric and gas. These will be reiterated throughout the report where necessary.

Table 3-4. 2011–2015 C&I Profile gas consumption (therms) and electric demand (kW) bins

<table>
<thead>
<tr>
<th>Usage Size Category</th>
<th>Therm Bin</th>
<th>kW Demand Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>&lt; 8,000</td>
<td>&lt; 75</td>
</tr>
<tr>
<td>Medium - Small</td>
<td>8,000 – 40,000</td>
<td>75 – 300</td>
</tr>
<tr>
<td>Medium</td>
<td>300 – 750</td>
<td></td>
</tr>
<tr>
<td>Medium - Large</td>
<td>40,000 – 80,000</td>
<td>750 – 1,000</td>
</tr>
<tr>
<td>Large</td>
<td>80,000 – 1,000,000</td>
<td>1,000 – 5,000</td>
</tr>
<tr>
<td>Very Large</td>
<td>&gt; 1,000,000</td>
<td>&gt; 5,000</td>
</tr>
</tbody>
</table>

---

12 Preliminary data mining by the ongoing PA Differences study suggests that some PA tracking systems accurately capture custom measures at the end use level. For some subset of these custom measures, the detailed project description may be at too high a summary level. One example is the occurrence of custom HVAC chillers within the gas tracking data where the actual project is insulating a chilled water loop rather than the chiller unit itself. This could not be verified from the data available for the C&I Customer Profile. The resulting implication is that for a small subset of custom projects, the individual project detail may be misaligned at the granular technology level.

13 For brevity’s sake, bins are presented in GWh rather than kWh. 1 GWh = 1 million kWh.

Table 3-5. 2016 C&I Profile gas consumption (therms) and electric consumption (GWh\textsuperscript{15}) bins

<table>
<thead>
<tr>
<th>Usage Size Category</th>
<th>Therm Bin</th>
<th>GWh Broad Consumption bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>&lt; 8,000</td>
<td>&lt; 0.11</td>
</tr>
<tr>
<td>Medium - Small</td>
<td>8,000 – 40,000</td>
<td>0.11 – 0.47</td>
</tr>
<tr>
<td>Medium - Large</td>
<td>40,000 – 80,000</td>
<td>0.47 – 1.5</td>
</tr>
<tr>
<td>Large</td>
<td>80,000 – 1,000,000</td>
<td>1.5 – 4.5</td>
</tr>
<tr>
<td>Very Large</td>
<td>&gt; 1,000,000</td>
<td>&gt; 4.5</td>
</tr>
</tbody>
</table>

3.4.6 EUI analysis

The industry sector sections of this report present maps, tables and charts on EUI at the building level by industry sector. These EUI analyses have been present in previous years’ Customer Profile reports. The 2016 Customer Profile leverages tax data linked to PA billing data. It also leverages CIS data integration improvements made under the PAs’ ongoing Data Enhancement Project.

Previous analyses involving the tax data relied on locational matching only; the current analysis uses spatial proximity (the geographic closeness of similar addresses), algorithmic text matching (similarities between business name, contact name, etc. and nearby tax information), and direct string matches (matches involving the phone number or building number). Once we have matched tax data with the PA billing data to obtain building square footage information, we calculate EUIs.

We then assign each building to the most appropriate industry sector, even when a building contains multiple accounts assigned to different industry sectors. We make this assignment using the same methodology as the U.S. Energy Information Administration’s Commercial Building Energy Consumption Survey (CBECS), which is to assign industry sector based on the business activity that uses the most square footage in the building. If there is a tie, or square footage is only available at the location level, rather than for each account within a building, we assign a building’s industry sector based on the business activity with the greatest energy consumption. These refinements to tax data matching have yielded highest-coverage EUI maps to date.\textsuperscript{16}

3.4.7 Upstream data

In 2016, program tracking data from upstream programs includes lighting and HVAC for electric, and hot water and food service for gas. The integration of upstream data impacts all calculation metrics and sections of the report, as it represents such a large proportion of the number of measures in the electric PAs’ tracking data; since 2016, upstream is also impacting gas PAs’ tracking data. Since this report is designed to provide as much data as possible while remaining succinct, we break out upstream data in all tables and figures where it is present.

Each year, DNV GL also attempts to fill in missing account numbers for the upstream data. This is done by matching upstream addresses with addresses in the current year’s billing data. Anywhere there is only a single known account for an address, DNV GL can fill in the upstream lighting data with an account number; this fill results in a ~30% assignment rate of account IDs to the upstream data. If an account cannot be identified using customer information, a temporary account ID is assigned using the raw address as the data

\textsuperscript{15} 1 GWh = 1 million kWh.

\textsuperscript{16} EUI analysis was first introduced as a pilot effort within the 2013 C&I Customer Profile report.
grain. Notably, there can be more than one customer at each raw address (e.g., an office building with several customers). The process of assigning temporary IDs can only represent each address as a single account. As a result, it cannot accurately identify all upstream data participants. For more information on this, see Appendix A section 8.1.7.

New to 2016, DNV GL applied a more extensive matching algorithm to account numbers that were still missing. This new matching algorithm uses customer names, addresses, and phone numbers provided in the tracking data to attempt to locate account IDs in the corresponding billing data. With 2016 data, this process resulted in a 49% average fill rate for all accounts that originally had no ID information available between electric and gas. The more accurate and consistent the data, the more likely this process can improve our further analyses by offering the ability to fill IDs and better link accounts—particularly for upstream projects.

### 3.4.7.1 Upstream lighting data

Since 2014, the PAs have been able to provide DNV GL a single upstream lighting dataset containing measure-level records across all four electric PAs. This final Excel file presents a consistent data grain across each PA, and fields that enhance DNV GL’s ability to analyze the data, consistent with guidance from the PAs and EEAC Consultants. Key fields include installation address, customer name, measure description, quantity installed, and line item savings.

Two key data manipulation steps were leveraged, per PA guidance, to ensure that the upstream sales data was consistent with the rolled-up monthly totals it replaced:

- Savings for the PAs’ measure-level data were estimated using PA-provided assumptions received by the Impact Evaluation for Upstream Lighting Program.
- The measure-level data did not always match perfectly with the PA-provided data. DNV GL addressed this with a line item adjustment reconciling differences between PA-provided savings and incentive totals, and the measure-level file’s totals. This adjustment enables the MA C&I Evaluation Database to reflect the total upstream lighting savings and incentives that the PAs provided, while still keeping all of the measure-level file’s fields.

Upstream lighting data continues to present a challenge and a risk of overstating unique participation, particularly for smaller towns. Because account IDs are not collected during the course of the program, and still missing after any matching processes, DNV GL must assign unique temporary IDs to upstream data every year. To do this we leverage unique addresses that were able to link to billing data via our custom geocoding tool, where there is a 1-to-1 match between the standardized address and accounts in the billing data. Below are issues to keep in mind whenever the analysis includes upstream data with these unique temporary ID assignments:

- Because new temporary account IDs get assigned every year, it is possible for the same account, participating in multiple years, to appear as a unique participant each year, causing the overestimation of participation over time.

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17 This advanced matching logic has been applied retroactively in the MA C&I Evaluation Database and has increased some account ID assignments in previous years where they were previously missing.

18 For a more complete walkthrough of these points, see Appendix A in section 8.1.
• It is possible that unidentified accounts are participating in both upstream and non-upstream programs, both within a single year and over multiple years. This would also cause the overestimation of participation rates.
• Lastly, although on a smaller scale, if multiple accounts at a single location participate in the upstream program they are counted as a single participant, which can result in underestimating single-year participation.

3.4.7.2 Upstream non-lighting data
Upstream non-lighting data has become more prevalent since the upstream program’s inception in 2013. In addition, the quality of upstream data has improved, and data has become more comparable across PAs. For 2016, upstream non-lighting data now consists of HVAC (electric), hot water (gas)\(^{19}\), and food service (gas) measures. Note that PAs also offer non-upstream measures in these end uses. This data provided across the PAs is of similar data grains and contains measure-level savings, allowing it to be loaded directly into the database, similar to non-upstream data. The limiting factor of the data, as with upstream lighting data, is that the majority of records do not contain account numbers. DNV GL uses the same methodology as with upstream lighting, and when account numbers cannot be determined, uses the customer information matching algorithm introduced in 2016.

3.4.8 Billing extrapolation
Although no methodological updates were made to the billing extrapolation, DNV GL has included the methodology for transparency, given the importance of consumption in the metrics. The billing extrapolation impacts:

• Consumption-weighted participation
• Population savings achieved
• Participant savings achieved
• Proportional consumption ratio
• Contribution ratio
• EUI

When calculating savings metrics in this report, DNV GL uses the prior year’s consumption data and the current year’s savings data.\(^{20}\) The prior year’s consumption is used as the baseline to reflect consumption prior to any savings derived from the measure’s installation. The rationale behind this decision is:

• If the savings were divided by the current year’s consumption (i.e., 2016 tracking / 2016 billing), the resulting ratio would overstate the savings for accounts that did not have a full year’s worth of consumption. For example, an account opened in October would only have three months of consumption data, but if it installed LEDs during those three months, the tracking data would show a full year of savings for LEDs. This would result in an inflated savings ratio.
• Even if the account were open the full year, or modeled out for the full year (i.e., 2016 tracking / 2016 billing extrapolated), the consumption once the measure was installed would decrease as a result of the measure. This would cause an overstatement of the measure’s impact.

\(^{19}\) In this report, the term “upstream hot water” references the C&I Upstream Water Heater Initiative.
\(^{20}\) E.g. 2015 savings divided by 2014 consumption.
As a result, this report uses the billing data for the year prior to the measure being installed to get an unaffected baseline for the account (e.g., 2016 tracking / 2015 billing). Since not all accounts have a full year’s worth of consumption for the year prior to the measure being installed, the report extrapolates the consumption, taking weather conditions into account, to fill in the blank consumption intervals with a representative consumption level that is then used as the numerator in the division to calculate savings ratios (i.e., 2016 tracking / 2015 extrapolated billing).

Since savings are reported as an annual number, DNV GL needs a full year’s worth of consumption to accurately calculate the ratio; not all accounts have a full year of data. DNV GL extrapolates the full year’s consumption using the available data for each account. We use a modified extrapolation approach for natural gas accounts to capture seasonality of gas usage. The effect of this change is that the extrapolated gas consumption for missing days is a few percentage points lower than it would be if a straight-line extrapolation were used. For both electric and gas accounts, the extrapolation is applied only to missing interval days using the following equation:

\[
\left( \frac{\text{Actual Consumption}}{\# \text{ Days Consumption Reported}} \right) + \left( \frac{\text{Actual Consumption}}{\# \text{ Days Consumption Reported}} \right) \times (365 - \# \text{Days Consumption Reported})
\]

The majority of accounts included a full year or near full year of data. Accounts that were missing consumption data on average required 20 days of extrapolated consumption number to fill in the missing intervals and generate a full year’s representative consumption. The need to fill occurs across the PAs and can increase up or down on an account-by-account basis. To ensure that year-over-year comparisons are appropriate, DNV GL applies the 2013 extrapolation approach to all data from 2011 through 2016.

### 3.4.9 Calculating incentives issued

Incentives feature in the Sections 4, 5, and 6. Although DNV GL has made no methodological updates to how we report incentives, we include the methodology for transparency. Depending on the PA data source, the incentives in the raw data may be reported at the measure level or the project level (with multiple measures). The following example highlights the differences between project and measure level:

- **PA 1** has a project with 5 measures, and a total incentive of $100. The incentive data is only collected at the project level (e.g., project received a $100 incentive for the 5 measures), so the raw data shows the $100 repeating for each measure in the project.
- **PA 2** has undertaken the same project, but records the data at the measure level (e.g., each of the 5 measures received a $20 incentive), for a total project cost of $100.
- Although the projects had the same cost, if the raw data are summed without taking into account the different levels of data capture, then the incentive dollars are overstated. PA 1 would have an apparent cost of $500 (this would be incorrect; the project cost was $100) while PA 2 would have a cost of $100 (correct). To accommodate the different grains of data, DNV GL uses a logic rule to assign a project or measure cost flag to the individual lines of data.

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21 This situation can occur when a new account is opened in the middle of the year, or when PA systems provide incomplete data.
22 The detailed methodology for how this normalization occurs is addressed in the Commercial and Industrial section of the Massachusetts Top-Down Modeling Methods Study.
4 ELECTRIC AND GAS COMBINED SUMMARIES

This section provides high level summaries of the population, consumption, program participation, and savings of electric and gas accounts for 2011-2016. The section presents these summaries by year, PA, geography, customer size, and program type.

The section is organized as follows:

- Section 4.1 – Presents the overall number of accounts and consumption history
- Section 4.2 – Summarizes project savings and usage in common units (MMBTU) for electric and gas
- Section 4.3 – Provides a deeper dive into overall program participation and savings

4.1 Population of accounts and consumption 2011 – 2016

This section provides an overview of the population of accounts and consumption based on the 2011 to 2016 consumption (billing data). DNV GL conducted a time series analysis examining the universe of updated billing and tracking accounts from 2011-2016. Such analysis provides a more complete view of participation by the total population (as opposed to a single year’s data), and includes elements like consumption-weighted participation ratios. In this section, we discuss findings related to billing data and to tracking data.

Since DNV GL actively manages the data contained in the MA C&I Evaluation Database, the values provided in this report supersede the values provided in previous C&I Customer Profile reports, and should be used in their place.

Unlinked upstream data is likely to have the following effects on the results presented in this section:

- The market penetration rates since 2011 are likely to be slightly overstated.
- The total number of unique accounts since 2011 is liable to be slightly overestimated, since the upstream lighting data cannot be matched year over year due to missing account numbers.
- The consumption-weighted market penetration rate may be slightly underestimated, since much of the upstream lighting data cannot be matched to billing accounts.
Table 4-1 shows the number of accounts for each PA in each year. Table 4-2 provides total consumption for each PA in each year. Some PAs saw more unique accounts in 2016. This is partially due to strategic accounts existing for the first time in 2016. These tables are intended to provide a baseline for the remainder of the tables in this report.

For the purposes of this report, an account is the unique combination of a business entity at a unique address.

### Table 4-1. 2011–2016 number of unique accounts, electric and gas

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>25,099</td>
<td>25,507</td>
<td>25,661</td>
<td>25,909</td>
<td>26,069</td>
<td>25,842</td>
<td>36,569</td>
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<tr>
<td></td>
<td>Eversource</td>
<td>144,832</td>
<td>149,574</td>
<td>162,664</td>
<td>117,411</td>
<td>145,909</td>
<td>170,795</td>
<td>224,293</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>172,883</td>
<td>155,605</td>
<td>158,306</td>
<td>168,548</td>
<td>159,993</td>
<td>181,869</td>
<td>255,397</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>3,537</td>
<td>3,620</td>
<td>4,007</td>
<td>3,746</td>
<td>3,984</td>
<td>3,810</td>
<td>5,376</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>346,351</td>
<td>334,306</td>
<td>350,638</td>
<td>315,614</td>
<td>335,955</td>
<td>382,316</td>
<td>521,635</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>40,141</td>
<td>40,767</td>
<td>39,397</td>
<td>34,137</td>
<td>23,917</td>
<td>34,332</td>
<td>69,872</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>26,114</td>
<td>26,513</td>
<td>28,365</td>
<td>27,009</td>
<td>26,108</td>
<td>30,246</td>
<td>39,452</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>55,163</td>
<td>70,474</td>
<td>71,142</td>
<td>73,395</td>
<td>74,117</td>
<td>84,087</td>
<td>107,362</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>10,082</td>
<td>10,531</td>
<td>10,238</td>
<td>11,059</td>
<td>11,220</td>
<td>11,331</td>
<td>15,008</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>4,646</td>
<td>4,983</td>
<td>4,661</td>
<td>5,277</td>
<td>5,307</td>
<td>5,328</td>
<td>6,958</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>3,900</td>
<td>3,955</td>
<td>4,186</td>
<td>3,993</td>
<td>4,128</td>
<td>4,216</td>
<td>5,620</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>1,536</td>
<td>1,593</td>
<td>1,391</td>
<td>1,789</td>
<td>1,785</td>
<td>1,787</td>
<td>2,430</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>131,500</td>
<td>148,285</td>
<td>149,142</td>
<td>145,600</td>
<td>135,362</td>
<td>159,996</td>
<td>231,694</td>
</tr>
</tbody>
</table>

### Table 4-2. 2011–2016 annual consumption, electric and gas

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Total consumption 2011 kWh</th>
<th>Total consumption 2012 kWh</th>
<th>Total consumption 2013 kWh</th>
<th>Total consumption 2014 kWh</th>
<th>Total consumption 2015 kWh</th>
<th>Total consumption 2016 kWh</th>
<th>Total consumption 2011–2016 kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>848,976,320</td>
<td>850,560,039</td>
<td>889,012,611</td>
<td>870,579,757</td>
<td>775,972,136</td>
<td>824,213,789</td>
<td>5,059,314,652</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>15,866,037,784</td>
<td>15,421,849,083</td>
<td>15,871,597,089</td>
<td>14,601,182,621</td>
<td>14,391,731,622</td>
<td>15,845,571,474</td>
<td>91,997,969,674</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>13,164,380,313</td>
<td>12,346,215,367</td>
<td>12,286,990,118</td>
<td>12,191,981,540</td>
<td>11,816,120,800</td>
<td>12,556,626,533</td>
<td>74,362,314,670</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>221,554,768</td>
<td>221,792,807</td>
<td>277,749,412</td>
<td>252,622,853</td>
<td>314,624,410</td>
<td>247,631,181</td>
<td>1,535,975,431</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30,100,949,185</td>
<td>28,840,417,296</td>
<td>29,325,349,230</td>
<td>27,916,366,771</td>
<td>27,298,448,968</td>
<td>29,474,042,977</td>
<td>172,955,574,427</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>253,761,384</td>
<td>231,230,555</td>
<td>259,012,313</td>
<td>234,991,618</td>
<td>197,155,365</td>
<td>300,364,524</td>
<td>1,476,515,760</td>
</tr>
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<td></td>
<td>Eversource</td>
<td>250,041,116</td>
<td>265,630,117</td>
<td>353,720,960</td>
<td>476,902,302</td>
<td>455,405,360</td>
<td>446,357,448</td>
<td>2,246,057,303</td>
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<td></td>
<td>National Grid</td>
<td>443,155,147</td>
<td>526,037,511</td>
<td>533,141,114</td>
<td>676,622,163</td>
<td>664,990,123</td>
<td>706,006,692</td>
<td>3,546,552,750</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>78,577,426</td>
<td>74,433,071</td>
<td>83,324,304</td>
<td>87,170,300</td>
<td>101,178,355</td>
<td>81,793,058</td>
<td>506,476,514</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>39,662,396</td>
<td>35,572,679</td>
<td>39,551,812</td>
<td>40,226,407</td>
<td>42,688,969</td>
<td>37,714,021</td>
<td>235,416,284</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>24,749,384</td>
<td>23,832,304</td>
<td>27,899,251</td>
<td>31,073,574</td>
<td>41,503,792</td>
<td>29,216,190</td>
<td>178,274,495</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,025,535,073</td>
<td>1,095,331,255</td>
<td>1,229,196,691</td>
<td>1,477,868,383</td>
<td>1,418,729,203</td>
<td>1,529,121,721</td>
<td>7,775,602,326</td>
</tr>
</tbody>
</table>
4.2 Statewide MMBTU summaries

Figure 4-1 presents the unique number of 2016 billing accounts by town in the MA C&I Evaluation Database. This view of the data illustrates the preponderance of accounts in eastern Massachusetts, particularly in Boston and the surrounding towns. The number of accounts in western Massachusetts is lower than in the eastern portion of the state, though there are individual towns with higher concentrations of accounts. Worcester in central Massachusetts presents an interesting dynamic, with several municipal-served towns located close to the large PA-served town. These municipal towns’ electric accounts are not captured in the MA C&I Evaluation Database. In towns served by a gas PA, it is possible for some accounts’ electric measures to be reflected in the gas data as non-energy impacts.

Figure 4-1. 2016 statewide distribution of electric accounts
Figure 4-2 presents the unique number of 2016 gas accounts by town in the MA C&I Evaluation Database. This data view shows the prevalence of accounts in eastern Massachusetts, particularly in Boston and the surrounding towns, although the scale of accounts is smaller than electric.

Figure 4-2. 2016 statewide distribution of gas accounts
Figure 4-3 presents the town-level MMBTU PA consumption. It is important to note that this map does not reflect the gas consumption for municipal gas towns, or the electric consumption for municipal electric towns. To generate these maps, DNV GL converted the town-level electric and therm data into MMBTU and then summed the two numbers for each town. The rationale behind including MMBTU data is that they could contribute to a more cohesive picture of town savings in particular, by aggregating the consumption and savings for accounts across fuels and PAs. A small number of towns (identified in white) do not include any consumption data because they do not have any gas or electric PA service.

**Figure 4-3. 2016 statewide electric and gas consumption by town (MMBTU)**

Figure 4-4 illustrates that with the 2016 data, the number of accounts present in all 6 years is lower than 2015. There are more accounts in the 2- and 3-year categories. There were also more electric and gas accounts in 2016 than in 2015.

- It appears that there are more gas and electric customers than before. This increase alone lowers population participation and savings rates, even if participation and savings values remain consistent.

4.3 Overview of program participation and savings

This section begins with an overview of the process and outcomes of appending 2016 participant data to the MA C&I Evaluation Database. Next, we provide a time series analysis of program participants and savings over the 6-year period (2011–2016).

4.3.1 Appending 2016 program participants to the MA C&I Evaluation Database

Comparing annual savings data to annual consumption data requires consideration of temporal effects. When measures are installed at any time during a program year, they are likely to impact that year’s consumption. This means that comparing program year savings to program year consumption would likely overstate the impact of the savings. To resolve this, we compare the current year’s savings to the previous year’s consumption.

Table 4-3 shows the match success rates of the 2016 tracking and the 2015 billing data without the upstream data; this match impacts most of the analysis where the metric “participant savings achieved” is presented, as this metric can only be measured for accounts that have matched successfully.

Table 4-4 shows the match success rates of the 2016 tracking and 2015 billing data including the upstream data.

Table 4-5 shows the match success rates of the 2016 tracking and 2015 billing data without the upstream data.

Table 4-6 shows the match success rates of the 2016 tracking and 2015 tracking data without the upstream data, and provides a basic view into year-over-year participation in 2015 and 2016. We have found that match success rates across tracking data are always lower than match rates from tracking data to billing.
data. We speculate that this is because most non-upstream accounts do not participate in energy efficiency programs two years in a row.\textsuperscript{23}

Notably, while removing upstream data allows for a greater match success rate, it also results in a lower number of accounts for electric and gas PAs. PAs with small populations can show large variations in match success rates even though most accounts match. For example, if a PA only has 10 participants each year, a match of 8 in year 1 would show a success rate of 80% but a match of 9 in year 2 would be 90%.

As in the past, where possible, DNV GL assigned account numbers to upstream data that included addresses and other customer information. Where account IDs were still unobtainable we assigned temporary proxy IDs to the upstream data. This process is detailed further in the Methodology section.

**Table 4-3. 2016 tracking to 2015 billing data match success rates (excludes upstream data)**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Number of Accounts in 2016 Tracking</th>
<th>Number of Unique Accounts Successfully Merged to 2015 Billing</th>
<th>Merge Success Rate 2016</th>
<th>Merge Success Rate 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cape Light Compact</td>
<td>609</td>
<td>537</td>
<td>88%</td>
<td>87%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>4,231</td>
<td>3,619</td>
<td>86%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>4,213</td>
<td>3,851</td>
<td>91%</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>127</td>
<td>112</td>
<td>88%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td><strong>Electric Total</strong></td>
<td><strong>9,180</strong></td>
<td><strong>8,119</strong></td>
<td><strong>88%</strong></td>
<td><strong>86%</strong></td>
</tr>
<tr>
<td></td>
<td>Columbia</td>
<td>635</td>
<td>401</td>
<td>63%</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>521</td>
<td>426</td>
<td>82%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,200</td>
<td>1,082</td>
<td>90%</td>
<td>86%</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td><strong>Small Gas PAs</strong></td>
<td><strong>412</strong></td>
<td><strong>386</strong></td>
<td><strong>94%</strong></td>
<td><strong>84%</strong></td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>88</td>
<td>80</td>
<td>91%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>303</td>
<td>288</td>
<td>95%</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>21</td>
<td>18</td>
<td>86%</td>
<td>78%</td>
</tr>
<tr>
<td></td>
<td><strong>Gas Total</strong></td>
<td><strong>2,768</strong></td>
<td><strong>2,295</strong></td>
<td><strong>83%</strong></td>
<td><strong>86%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>11,948</strong></td>
<td><strong>10,414</strong></td>
<td><strong>87%</strong></td>
<td><strong>86%</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{23} Upstream data is not a factor in these match success rates, as we remove it prior to merging. In linking tracking data across consecutive years, only accounts that participated in both years show up as successfully matched.
<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Number of Accounts in 2016 Tracking</th>
<th>Number of Unique Accounts Successfully Merged to 2015 Billing</th>
<th>Merge Success Rate 2016</th>
<th>Merge Success Rate 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>1,310</td>
<td>798</td>
<td>61%</td>
<td>63%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>11,636</td>
<td>5,836</td>
<td>50%</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>11,143</td>
<td>6,162</td>
<td>55%</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>210</td>
<td>147</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>Electric Total</td>
<td>24,299</td>
<td>12,943</td>
<td>53%</td>
<td>50%</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>763</td>
<td>461</td>
<td>60%</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>663</td>
<td>522</td>
<td>79%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,666</td>
<td>1,386</td>
<td>83%</td>
<td>86%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>Columbia</td>
<td>763</td>
<td>461</td>
<td>60%</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>Columbia</td>
<td>441</td>
<td>406</td>
<td>92%</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>521</td>
<td>484</td>
<td>93%</td>
<td>85%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,200</td>
<td>1,142</td>
<td>95%</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>412</td>
<td>367</td>
<td>89%</td>
<td>87%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>88</td>
<td>79</td>
<td>90%</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>303</td>
<td>269</td>
<td>89%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>21</td>
<td>19</td>
<td>90%</td>
<td>83%</td>
</tr>
<tr>
<td>Gas Total</td>
<td></td>
<td>2,768</td>
<td>2,598</td>
<td>94%</td>
<td>81%</td>
</tr>
<tr>
<td>Electric Total</td>
<td></td>
<td>9,180</td>
<td>8,698</td>
<td>95%</td>
<td>91%</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>11,948</td>
<td>11,296</td>
<td>95%</td>
<td>88%</td>
</tr>
</tbody>
</table>
Table 4-6. 2016 tracking to 2015 tracking data match success rates (excludes upstream data)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Number of Accounts in 2016 Tracking</th>
<th>Number of Unique Accounts Successfully Merged to 2015 Tracking</th>
<th>Merge Success Rate 2016</th>
<th>Merge Success Rate 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>609</td>
<td>122</td>
<td>20%</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>4,213</td>
<td>1,042</td>
<td>25%</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>4,231</td>
<td>909</td>
<td>21%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>127</td>
<td>21</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>Electric Total</td>
<td>9,180</td>
<td>2,094</td>
<td>23%</td>
<td>21%</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>635</td>
<td>73</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>521</td>
<td>57</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,200</td>
<td>151</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>412</td>
<td>17</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>88</td>
<td>9</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>303</td>
<td>7</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>21</td>
<td>1</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Gas Total</td>
<td>2,768</td>
<td>298</td>
<td>11%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>11,948</td>
<td>2,392</td>
<td>20%</td>
<td>18%</td>
</tr>
</tbody>
</table>
Figure 4-5 presents the gross town-level MMBTU savings, and shows that overall, the majority of statewide savings come from towns surrounding large cities. Since large cities also have large consumption, it is important to not discount the impact of smaller savings in more rural areas.

Figure 4-5. 2016 statewide electric and gas savings by town (MMBTU)

Several towns reported negative electric consumption at the town level; a review of the data and aerial images suggest this is driven by the presence of large solar farms in these towns.
4.3.2 Six-year overall program participation and savings trends

Table 4-7 shows the number of participants for each PA in each year. Table 4-8 shows the participant savings for each PA in each year. In 2016, electric PAs had fewer unique participants in 2016 than in 2015. The 2016 participation and savings values are still higher than values from 2011 to 2014. Most gas PAs had more unique participants in 2016, possibly due to the new upstream hot water program in 2016.

2016 is the first year that statewide electric participation and savings have decreased. These values are still quite high in comparison to 2014 and earlier values, but close attention should be taken to ensure this does not reflect a new declining trend.

### Table 4-7. 2011–2016 number of participants in the tracking data (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Unique participants 2011</th>
<th>Unique participants 2012</th>
<th>Unique participants 2013</th>
<th>Unique participants 2014</th>
<th>Unique participants 2015</th>
<th>Unique participants 2016</th>
<th>Total number of unique participants 2011-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>487</td>
<td>565</td>
<td>1,219</td>
<td>1,387</td>
<td>1,521</td>
<td>1,310</td>
<td>5,465</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>4,293</td>
<td>4,775</td>
<td>9,375</td>
<td>9,679</td>
<td>12,006</td>
<td>11,616</td>
<td>43,984</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>2,735</td>
<td>3,813</td>
<td>6,285</td>
<td>6,690</td>
<td>11,654</td>
<td>11,143</td>
<td>39,942</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>46</td>
<td>83</td>
<td>159</td>
<td>160</td>
<td>230</td>
<td>210</td>
<td>738</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7,561</td>
<td>9,336</td>
<td>19,953</td>
<td>20,916</td>
<td>25,451</td>
<td>24,299</td>
<td>90,129</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>316</td>
<td>592</td>
<td>1,007</td>
<td>722</td>
<td>1,131</td>
<td>763</td>
<td>4,136</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>656</td>
<td>424</td>
<td>1,036</td>
<td>559</td>
<td>673</td>
<td>663</td>
<td>3,546</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>2,270</td>
<td>2,989</td>
<td>2,676</td>
<td>1,619</td>
<td>1,291</td>
<td>1,666</td>
<td>10,930</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>143</td>
<td>215</td>
<td>328</td>
<td>231</td>
<td>167</td>
<td>441</td>
<td>1,387</td>
<td></td>
</tr>
<tr>
<td>Berkshire</td>
<td>88</td>
<td>128</td>
<td>155</td>
<td>104</td>
<td>104</td>
<td>106</td>
<td>704</td>
<td></td>
</tr>
<tr>
<td>Liberty</td>
<td>28</td>
<td>60</td>
<td>93</td>
<td>93</td>
<td>45</td>
<td>304</td>
<td>533</td>
<td></td>
</tr>
<tr>
<td>Unitil</td>
<td>27</td>
<td>27</td>
<td>29</td>
<td>34</td>
<td>18</td>
<td>31</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3,385</td>
<td>4,220</td>
<td>5,046</td>
<td>3,181</td>
<td>3,262</td>
<td>3,833</td>
<td>19,999</td>
</tr>
</tbody>
</table>

### Table 4-8. 2011–2016 electric and gas savings (includes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>10,220,418</td>
<td>11,747,761</td>
<td>13,411,098</td>
<td>31,274,386</td>
<td>25,754,821</td>
<td>19,153,339</td>
<td>111,561,822</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>289,142,681</td>
<td>388,234,049</td>
<td>395,485,163</td>
<td>423,537,383</td>
<td>480,262,201</td>
<td>425,683,296</td>
<td>2,405,384,773</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>225,619,350</td>
<td>206,032,380</td>
<td>247,301,642</td>
<td>290,399,109</td>
<td>394,660,041</td>
<td>351,007,227</td>
<td>1,715,915,750</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>17,831,022</td>
<td>4,384,776</td>
<td>6,395,332</td>
<td>6,689,292</td>
<td>6,136,766</td>
<td>5,221,182</td>
<td>46,622,369</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>542,809,471</td>
<td>611,338,866</td>
<td>665,577,235</td>
<td>751,900,170</td>
<td>906,813,829</td>
<td>801,065,043</td>
<td>4,279,484,715</td>
</tr>
<tr>
<td>Gas (therms)</td>
<td>Columbia</td>
<td>1,499,421</td>
<td>1,509,114</td>
<td>2,168,697</td>
<td>2,731,129</td>
<td>1,681,791</td>
<td>1,885,149</td>
<td>11,835,609</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>2,396,784</td>
<td>3,702,554</td>
<td>4,837,319</td>
<td>4,826,340</td>
<td>4,349,978</td>
<td>4,361,188</td>
<td>24,074,163</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>5,548,131</td>
<td>7,969,003</td>
<td>4,592,806</td>
<td>6,718,060</td>
<td>5,682,453</td>
<td>7,636,117</td>
<td>38,146,671</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>339,064</td>
<td>745,851</td>
<td>566,325</td>
<td>1,025,195</td>
<td>411,388</td>
<td>523,536</td>
<td>3,613,359</td>
<td></td>
</tr>
<tr>
<td>Berkshire</td>
<td>141,136</td>
<td>152,380</td>
<td>256,914</td>
<td>383,010</td>
<td>113,487</td>
<td>240,996</td>
<td>1,207,922</td>
<td></td>
</tr>
<tr>
<td>Liberty</td>
<td>118,245</td>
<td>97,583</td>
<td>233,839</td>
<td>183,543</td>
<td>61,534</td>
<td>198,480</td>
<td>893,224</td>
<td></td>
</tr>
<tr>
<td>Unitil</td>
<td>79,683</td>
<td>485,889</td>
<td>77,572</td>
<td>458,641</td>
<td>236,368</td>
<td>84,060</td>
<td>1,422,212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9,783,407</td>
<td>13,926,522</td>
<td>12,167,447</td>
<td>15,300,725</td>
<td>12,125,611</td>
<td>14,385,990</td>
<td>77,689,702</td>
</tr>
</tbody>
</table>
Table 4-9 and Table 4-10 show multi-year participation for electric and gas accounts for their respective PAs. DNV GL combined the separate one-year rows to illustrate participation in any one of the past 6 years.

- Notably, over the past 6 years, for all PAs, almost all participants have participated for only one year. For a majority of the PAs, 2-year participation has also increased. This is evident in Figure 4-6, which shows multi-year participation for electric and gas accounts.
- In particular, the measure makeup of the gas market makes it more difficult to participate in multiple years for gas. There are proportionally more 2-year participants in 2016 for all of the gas PAs.

Nearly all gas PAs saw more participant savings in 2016 than in 2015. As this increase is much larger than the small increase in 2016 participation seen in Table 4-7, it could be the result of the upstream gas program, introduced in 2016.

**Table 4-9. 2016 multi-year participation by PA (electric)**

<table>
<thead>
<tr>
<th>Years Participated</th>
<th>Cape Light Compact</th>
<th>Eversource</th>
<th>National Grid</th>
<th>Unil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>86.6%</td>
<td>87.5%</td>
<td>86.2%</td>
<td>84.1%</td>
<td>86.9%</td>
</tr>
<tr>
<td>2 years</td>
<td>9.7%</td>
<td>9.0%</td>
<td>9.6%</td>
<td>12.9%</td>
<td>9.4%</td>
</tr>
<tr>
<td>3 years</td>
<td>2.5%</td>
<td>2.3%</td>
<td>2.8%</td>
<td>1.9%</td>
<td>2.5%</td>
</tr>
<tr>
<td>4 years</td>
<td>0.9%</td>
<td>0.8%</td>
<td>0.9%</td>
<td>0.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>5 years</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.3%</td>
</tr>
<tr>
<td>All 6 years</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 4-10. 2016 multi-year participation by PA (gas)**

<table>
<thead>
<tr>
<th>Years Participated</th>
<th>Columbia</th>
<th>Eversource</th>
<th>National Grid</th>
<th>Berkshire</th>
<th>Liberty</th>
<th>Unil</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>90.7%</td>
<td>88.9%</td>
<td>87.9%</td>
<td>90.1%</td>
<td>93.8%</td>
<td>90.7%</td>
<td>88.9%</td>
</tr>
<tr>
<td>2 years</td>
<td>8.1%</td>
<td>9.6%</td>
<td>10.4%</td>
<td>8.7%</td>
<td>5.0%</td>
<td>8.0%</td>
<td>9.6%</td>
</tr>
<tr>
<td>3 years</td>
<td>1.0%</td>
<td>1.0%</td>
<td>1.3%</td>
<td>1.0%</td>
<td>0.9%</td>
<td>1.3%</td>
<td>1.2%</td>
</tr>
<tr>
<td>4 years</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>5 years</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>All 6 years</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure 4-7 presents the distribution of savings across the 6 years. This figure illustrates that a large proportion of savings comes from multi-year participants. While this initially appears to contradict the findings in Figure 4-6, it in fact does not. While multi-year participation represents a small proportion of overall participation, multi-year participants contribute a disproportionately large proportion of overall savings.

Table 4-8 provides the savings values for each year. The majority of the largest electric accounts are multi-year participants; this helps explain the disproportionately high savings from the multi-year participant group seen in Figure 4-7.

In contrast, due to gas’ narrow measure opportunities in a facility, the largest participating gas accounts across the 6-year span are typically single-year participants, undertaking one large end use with an extended measure life. Regardless of their differences in multi-year participation, both fuel types had a larger proportion of savings from multi-year participants in 2016. The new upstream gas program could also lead to increased multi-year participation for gas customers of a variety of sizes.
### 4.3.3 Overall participation in electric and gas programs by measure

The following tables focus on projects that installed multiple measure types. Table 4-11 illustrates the total number of multiple-measure end-use-type combinations that participants installed in 2016 for electric and gas accounts. As in 2015, most multiple-measure type accounts installed 2 unique types of measures. In addition, in 2016 there were more electric and gas participants who installed 2 unique measure types.

**Table 4-11. 2016 number of participants that installed multiple measure types by number of measure types installed and savings (includes unlinked data)**

<table>
<thead>
<tr>
<th># of Different Measure Types Installed</th>
<th>2016 Electric Participants</th>
<th>2016 Gas Participants</th>
<th>2016 kWh Savings for Bin</th>
<th>2016 Therm Savings for Bin</th>
<th>Total Annual kWh Savings for Bin</th>
<th>Total Annual Therm Savings for Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>977</td>
<td>111</td>
<td>5.0%</td>
<td>3.1%</td>
<td>39,274,799</td>
<td>445,461</td>
</tr>
<tr>
<td>3</td>
<td>443</td>
<td>48</td>
<td>2.9%</td>
<td>2.3%</td>
<td>22,962,299</td>
<td>330,002</td>
</tr>
<tr>
<td>4</td>
<td>112</td>
<td>15</td>
<td>1.7%</td>
<td>0.5%</td>
<td>13,507,811</td>
<td>71,100</td>
</tr>
<tr>
<td>5</td>
<td>31</td>
<td>4</td>
<td>0.8%</td>
<td>0.4%</td>
<td>6,162,049</td>
<td>60,565</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>-</td>
<td>0.2%</td>
<td>0.0%</td>
<td>1,656,333</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>-</td>
<td>0.0%</td>
<td>0.0%</td>
<td>345,205</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>-</td>
<td>0.0%</td>
<td>0.0%</td>
<td>153,610</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,574</strong></td>
<td><strong>178</strong></td>
<td><strong>10.6%</strong></td>
<td><strong>6.3%</strong></td>
<td><strong>84,062,105</strong></td>
<td><strong>907,129</strong></td>
</tr>
</tbody>
</table>

We present the different measure type combinations below using the broad end-use measure category. At a high level, this provides details about the different types of measures installed by accounts and how prevalent these combinations are in the data. In this summary view, it is possible for accounts to install different measure types that fall under a single broad end use. For example, an account could install both faucet aerators and low-flow showerheads, both of which fall under the end use “hot water”; in the following tables, this account would fall entirely into the “hot water–hot water” category.
Table 4-12 shows the unique combinations of electric measure categories encountered in the 2016 tracking data (regardless of the order in which they appeared in the data). As in 2015, accounts that first performed lighting end uses (bulbs, controls, etc.) were the leaders in electric multi-measure participation. New in 2016, HVAC measures as a first end use trailed closely behind lighting to contribute a large proportion of savings as well.

Across the various combinations of different end uses installed, when lighting is present, it makes up the larger proportion of total savings for that group of participants. This is consistent with 2015. This trend could reflect lighting as a successful “foot in the door” measure for multi-end-use participation in the future. A first or second end use proportional savings value of 0% shows that while all savings went to the opposite end use, a project was still undertaken.
Table 4-12. 2016 electric end use combinations for accounts that installed 2 measure types and savings (includes unlinked data)

<table>
<thead>
<tr>
<th>First End Use</th>
<th>Second End Use</th>
<th>2016 Number of Participants</th>
<th>2016 Savings for Bin (kWh)</th>
<th>2016 % of total annual electric savings</th>
<th>2016 First End Use Proportional Savings</th>
<th>2016 Second End Use Proportional Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressed Air Process</td>
<td></td>
<td>1</td>
<td>365,876</td>
<td>0.05%</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td></td>
<td>1</td>
<td>153,610</td>
<td>0.02%</td>
<td>1%</td>
<td>13%</td>
</tr>
<tr>
<td>Food Service Lighting</td>
<td></td>
<td>1</td>
<td>27,863</td>
<td>0.00%</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>Hot Water</td>
<td></td>
<td>14</td>
<td>204,291</td>
<td>0.03%</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td>1</td>
<td>-</td>
<td>0.00%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>2</td>
<td>7,037</td>
<td>0.00%</td>
<td>21%</td>
<td>79%</td>
</tr>
<tr>
<td>HVAC Lighting</td>
<td></td>
<td>57</td>
<td>2,807,643</td>
<td>0.35%</td>
<td>32%</td>
<td>69%</td>
</tr>
<tr>
<td>HVAC Motors/Drives</td>
<td></td>
<td>14</td>
<td>2,039,149</td>
<td>0.26%</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>HVAC Refrigeration</td>
<td></td>
<td>4</td>
<td>367,707</td>
<td>0.05%</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td>7</td>
<td>1,604,979</td>
<td>0.20%</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>2</td>
<td>19,159</td>
<td>0.00%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>HVAC Upstream HVAC</td>
<td></td>
<td>1</td>
<td>16,277</td>
<td>0.00%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td>9</td>
<td>271,767</td>
<td>0.03%</td>
<td>45%</td>
<td>55%</td>
</tr>
<tr>
<td>Lighting Motors/Drives</td>
<td></td>
<td>94</td>
<td>2,080,902</td>
<td>0.26%</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Lighting Refrigeration</td>
<td></td>
<td>20</td>
<td>5,516,309</td>
<td>0.70%</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td>667</td>
<td>18,958,255</td>
<td>2.35%</td>
<td>92%</td>
<td>9%</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>12</td>
<td>481,683</td>
<td>0.06%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>HVAC Lighting</td>
<td></td>
<td>9</td>
<td>2,063,687</td>
<td>0.26%</td>
<td>44%</td>
<td>56%</td>
</tr>
<tr>
<td>HVAC Process</td>
<td></td>
<td>2</td>
<td>456,148</td>
<td>0.06%</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td>Building Shell HVAC</td>
<td></td>
<td>1</td>
<td>6,293</td>
<td>0.00%</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Motors/Drives Refrigeration</td>
<td></td>
<td>1</td>
<td>7,106</td>
<td>0.00%</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td>1</td>
<td>26,923</td>
<td>0.00%</td>
<td>71%</td>
<td>29%</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>1</td>
<td>-</td>
<td>0.00%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Refrigeration Upstream Lighting</td>
<td></td>
<td>1</td>
<td>13,903</td>
<td>0.00%</td>
<td>66%</td>
<td>34%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td></td>
<td>1</td>
<td>9,450</td>
<td>0.00%</td>
<td>78%</td>
<td>22%</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td></td>
<td>54</td>
<td>2,282,392</td>
<td>0.29%</td>
<td>44%</td>
<td>57%</td>
</tr>
</tbody>
</table>
Table 4-13 presents the gas measure combinations for participants who installed 2 different measure types in 2016. In 2016, the end use combination with the largest savings is building shell and HVAC, followed by HVAC and process measure. In 2016, it is interesting to see upstream HVAC appearing as a multi-end-use measure, but only as a second end use installed.

<table>
<thead>
<tr>
<th>First End Use</th>
<th>Second End Use</th>
<th>2016 Number of Participants</th>
<th>2016 Savings for Bin (therms)</th>
<th>2016 % of total annual gas savings</th>
<th>2016 First End Use Proportional Savings</th>
<th>2016 Second End Use Proportional Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Service</td>
<td>Hot Water</td>
<td>1</td>
<td>362</td>
<td>0.00%</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>HVAC</td>
<td>3</td>
<td>766</td>
<td>0.01%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>HVAC</td>
<td>32</td>
<td>57,841</td>
<td>0.40%</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>26</td>
<td>95,261</td>
<td>0.66%</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>Upstream Hot Water</td>
<td>14</td>
<td>11,923</td>
<td>0.08%</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>HVAC</td>
<td>Process</td>
<td>7</td>
<td>30,898</td>
<td>0.21%</td>
<td>54%</td>
<td>46%</td>
</tr>
<tr>
<td></td>
<td>Upstream Hot Water</td>
<td>1</td>
<td>1,218</td>
<td>0.01%</td>
<td>84%</td>
<td>16%</td>
</tr>
<tr>
<td>Building shell</td>
<td>Hot Water</td>
<td>6</td>
<td>16,990</td>
<td>0.12%</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>HVAC</td>
<td>18</td>
<td>203,805</td>
<td>1.42%</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>2</td>
<td>7,978</td>
<td>0.06%</td>
<td>39%</td>
<td>61%</td>
</tr>
<tr>
<td>Building Systems</td>
<td>HVAC</td>
<td>1</td>
<td>18,420</td>
<td>0.13%</td>
<td>97%</td>
<td>3%</td>
</tr>
</tbody>
</table>
4.3.4 Program participation and savings by project size bin

Table 4-14 presents the electric and gas savings by saving size category. This is interchangeable with our definition of a project’s size. For both electric and gas, DNV GL separated projects and savings into non-upstream and upstream-only programs. We also added a separate metric to the end of the table to calculate how much upstream contributes to savings. As in prior years, the smaller prescriptive offerings make up the bulk of electric and gas projects. Though the total number of projects decreased for both electric and gas, almost all PAs saw more medium and large projects in 2016, contributing more to overall savings. Separating upstream projects and savings sheds light on how the upstream program makes up savings for both fuels in 2016. The smallest electric project category acquires most of its savings through upstream. By contrast, the gas upstream program, consisting of hot water and food service measure offerings, contributes equally large savings across all project sizes.

Table 4-14. 2016 number of electric and gas projects and project savings (upstream and non-upstream)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Saving Size Category</th>
<th>Savings Range</th>
<th>2016 Projects</th>
<th>2016 Savings</th>
<th>% of Projects</th>
<th>% of Savings</th>
<th>Upstream % of Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non-upstream Projects</td>
<td>Upstream Only Projects</td>
<td>Total Projects</td>
<td>Non-upstream Savings</td>
<td>Upstream Only Savings</td>
</tr>
<tr>
<td>Electric</td>
<td>Small</td>
<td>&lt;4,000 KWh</td>
<td>4,168</td>
<td>11,285</td>
<td>15,453</td>
<td>4,391,414</td>
<td>12,833,109</td>
</tr>
<tr>
<td></td>
<td>Medium 1</td>
<td>4,000 - 11,000 KWh</td>
<td>2,600</td>
<td>3,273</td>
<td>5,873</td>
<td>18,399,545</td>
<td>21,692,330</td>
</tr>
<tr>
<td></td>
<td>Medium 2</td>
<td>11,000 - 34,000 KWh</td>
<td>2,942</td>
<td>2,111</td>
<td>5,053</td>
<td>57,920,874</td>
<td>39,707,465</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>34,000 - 92,000 KWh</td>
<td>1,643</td>
<td>732</td>
<td>2,375</td>
<td>92,109,358</td>
<td>39,257,964</td>
</tr>
<tr>
<td></td>
<td>Very Large</td>
<td>&gt;92,000 KWh</td>
<td>1,311</td>
<td>314</td>
<td>1,625</td>
<td>514,068,110</td>
<td>63,184,874</td>
</tr>
<tr>
<td>Total</td>
<td>12,664</td>
<td>17,715</td>
<td>30,379</td>
<td>4,391,414</td>
<td>12,833,109</td>
<td>17,224,523</td>
<td>50.9%</td>
</tr>
<tr>
<td>Gas</td>
<td>Small</td>
<td>&lt;800 Therms</td>
<td>3,892</td>
<td>1,326</td>
<td>3,892</td>
<td>819,699</td>
<td>321,784</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>800 - 3,700 Therms</td>
<td>844</td>
<td>198</td>
<td>844</td>
<td>1,515,848</td>
<td>337,718</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>3,700 - 63,000 Therms</td>
<td>580</td>
<td>104</td>
<td>580</td>
<td>7,116,919</td>
<td>755,001</td>
</tr>
<tr>
<td></td>
<td>Very Large</td>
<td>&gt;63,000 Therms</td>
<td>31</td>
<td></td>
<td>31</td>
<td>4,933,524</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5,347</td>
<td>1,628</td>
<td>5,347</td>
<td>4,933,524</td>
<td>755,001</td>
<td>5,688,525</td>
<td>755,001</td>
</tr>
</tbody>
</table>

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects.
** Savings are in kWh for Electric and therms for Gas

The next two figures provide a year-over-year comparison showing the percentage of projects (Figure 4-8) and savings (Figure 4-9) for electric. Similar to 2015, these charts differentiate between upstream and non-upstream projects of various sizes. The proportion of projects across all sizes remained consistent with 2015’s values. There also appeared to more non-upstream projects for all sizes than 2015.
The impact of the upstream lighting program is substantial on project proportions, both currently and historically. As seen in Figure 4-9, upstream projects continue to make up more of total savings when the project size decreases. Savings from the largest project size were lower than 2015. All medium-sized projects saw more savings in 2016. Savings trends from upstream participation continue to mirror the trends of downstream: the most savings within upstream come from the few largest projects, and savings steadily fall as project sizes decrease, such that small projects yield relatively small savings. Thus, disproportionately high participation in small projects is necessary to achieve comparable savings from this project size segment.

**Figure 4-8. 2011–2016 percentage of projects (includes upstream data)**

![Figure 4-8. 2011–2016 percentage of projects (includes upstream data)](image)
Figure 4-9. 2011–2016 percentage of savings (includes upstream data)

Figure 4-10 and Figure 4-11 provide a year-over-year comparison showing the percentage of projects and savings for gas by project size. Project size bins are determined by amount of savings. These are interchangeable with saving size presented in Table 4-14.

- The 2016 gas trends across all project sizes are very similar to 2015. 2016 introduces the split of upstream from projects, as in electric. It is evident that the upstream program mainly penetrated the small project (savings) size category, and that upstream projects consisted mainly of upstream hot water measures. Similar to electric, most of the 2016 gas projects were of the smallest saving size.
In 2016, historical project proportions were similar to 2015 values for all project sizes. Though the upstream program did not provide savings to the largest gas saving size bin, this bin is still a strong contributor to overall savings, and its proportion of savings increased slightly from 2015.

It will be interesting to track the gas upstream program in the coming years to see whether it shares the electric upstream program’s relationship between project size and proportion of total savings.

Figure 4-10. 2011–2016 gas project proportions (%) (includes upstream data)
Figure 4-11. 2011–2016 proportional distribution of gas savings by savings bin (%) (includes upstream data)
Table 4-15 presents the percentage of savings by usage category for electric and gas. New in 2016, electric's size bin is based on consumption (GWh), instead of demand (kW), as it was previously. DNV GL made this change for two reasons:

1. Nearly all PAs did not provide sufficient demand data in 2016 to extrapolate (fill in) missing data.
2. Recent PA discussion revealed that there is still much ambiguity in demand information across PAs, and that electric accounts may have inconsistent size bin assignments.

The new consumption-based binning process has the added benefit of creating an equal number of usage bins for electric and gas; before, electric had an extra “medium” category.

Similar to 2015, the smallest usage size category generates the most savings of all usage sizes. This is particularly notable for gas. One should keep in mind that savings percentages are not absolutely comparable, as size ranges are defined differently based on fuel type.

Table 4-15. 2016 participant average percent electric and gas savings (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Therm Bin</th>
<th>GWh Broad Consumption Bin</th>
<th>Participant Average Percent Savings (kWh)</th>
<th>Participant Average Percent Savings (Therms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8,000</td>
<td>&lt;0.11</td>
<td>38.9%</td>
<td>26.0%</td>
</tr>
<tr>
<td>8,000 – 40,000</td>
<td>0.11 – 0.47</td>
<td>13.2%</td>
<td>9.4%</td>
</tr>
<tr>
<td>40,000 – 80,000</td>
<td>0.47 – 1.5</td>
<td>9.3%</td>
<td>7.0%</td>
</tr>
<tr>
<td>80,000 – 1,000,000</td>
<td>1.5 – 4.5</td>
<td>6.4%</td>
<td>7.0%</td>
</tr>
<tr>
<td>&gt; 1,000,000</td>
<td>&gt; 4.5</td>
<td>3.4%</td>
<td>4.7%</td>
</tr>
</tbody>
</table>

4.3.5 Overall participation and savings by program

This section presents high-level program details for the electric and gas energy efficiency activities in 2016. The section begins by breaking savings into custom, prescriptive, and upstream project tracks, moves on to new construction and retrofit summaries, provides a cross-tab analysis showing the interaction of the previous classification bins, and concludes with details about the end uses installed under custom programs.

4.3.5.1 Project tracks: custom vs. prescriptive vs. upstream

Table 4-16, Table 4-17, and Table 4-18 show the 2016 project and savings statistics for electric and gas PAs by installation track (custom vs. prescriptive vs. upstream). The separation of upstream as its own track is consistent with 2015’s analysis, with the inclusion of new, gas upstream data provided in 2016.

Separating these tracks allows us to thoroughly analyze each track’s contribution to projects and savings each year. In 2016, the custom track provides the majority of savings for both electric and gas at the statewide level. The upstream program contributed more than half of total projects for both fuel types in 2016. Additional points of interest for specific PAs include:
• Upstream had a lower proportion of projects in 2016 than in 2015 for all electric PAs. Prior to 2016, the electric upstream track had increased in number of projects and proportion of savings every consecutive year. The upstream track as a proportion of savings remained consistent with 2015 at 22%.

  Custom projects continue to provide the most savings statewide for both electric and gas. Although savings from custom projects decreased in 2016 compared to 2015 and 2014, custom electric projects increased in 2016. In 2016, 50% of kWh savings came from custom projects, rather than prescriptive or upstream. Most 2016 custom electric projects consisted of retrofit lighting (62%), process (11%), refrigeration (8%), and HVAC (7%).

• Custom electric savings for Eversource were driven largely by retrofit CHP, HVAC and process projects. In contrast, custom savings for National Grid are mainly driven by accounts installing retrofit lighting measures.

• Eversource and National Grid’s proportions of savings from prescriptive and upstream projects are quite different between one another. National Grid’s electric savings came from a larger proportion of prescriptive projects, and Eversource’s upstream projects were higher in their proportion to savings.

• Prescriptive electric projects as a proportion of savings increased as a whole in 2016. The proportion of prescriptive projects and savings for gas decreased. This is likely the result of the gas upstream program’s introduction in 2016.

• Most of the small gas PAs undertook more custom projects in 2016. For Berkshire, custom projects were driven largely by accounts installing HVAC control measures. For Unitil gas, custom project savings were driven largely by accounts installing new construction HVAC and hot water measures.

• The upstream gas program made up a fair number of projects across all gas PAs. However, most gas savings were realized in the custom and prescriptive tracks.

  The upstream program continues to occupy an important role as its own project track for C&I energy efficiency. It has consistently made up more than half of projects for electric PAs. For gas, the upstream track also made up more than half of projects even in the program’s first year.

25 Some portion of the custom lighting data may be due to artifacts of the PAs’ tracking systems, since new lamps and fixtures are sometimes classified as “custom” in their first year.
Table 4-16. 2016 custom projects and savings, summary statistics by PA and fuel

<table>
<thead>
<tr>
<th>Fuel (kWh)</th>
<th>PA</th>
<th>Projects*</th>
<th>Savings</th>
<th>Percent Projects</th>
<th>Percent Savings</th>
<th>Mean Savings</th>
<th>Median Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>199</td>
<td>5,744,121</td>
<td>11%</td>
<td>30%</td>
<td>55,232</td>
<td>12,405</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>2,664</td>
<td>241,805,686</td>
<td>19%</td>
<td>57%</td>
<td>90,768</td>
<td>9,741</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,208</td>
<td>149,738,961</td>
<td>10%</td>
<td>44%</td>
<td>123,956</td>
<td>27,612</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>7</td>
<td>840,781</td>
<td>3%</td>
<td>16%</td>
<td>120,112</td>
<td>62,122</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4,078</td>
<td>398,129,549</td>
<td>14%</td>
<td>50%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gas (therms)</td>
<td>Columbia</td>
<td>166</td>
<td>1,295,544</td>
<td>20%</td>
<td>69%</td>
<td>7,804</td>
<td>1,396</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>158</td>
<td>3,887,390</td>
<td>20%</td>
<td>89%</td>
<td>24,604</td>
<td>5,214</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>448</td>
<td>5,860,508</td>
<td>24%</td>
<td>77%</td>
<td>13,081</td>
<td>3,853</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>64</td>
<td>367,997</td>
<td>7%</td>
<td>70%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>42</td>
<td>199,626</td>
<td>35%</td>
<td>83%</td>
<td>4,753</td>
<td>2,007</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>15</td>
<td>94,106</td>
<td>4%</td>
<td>47%</td>
<td>6,274</td>
<td>621</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>7</td>
<td>74,265</td>
<td>21%</td>
<td>88%</td>
<td>10,609</td>
<td>1,062</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>836</td>
<td>11,411,438</td>
<td>12%</td>
<td>79%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.

Table 4-17. 2016 prescriptive projects and savings, summary statistics by PA and fuel

<table>
<thead>
<tr>
<th>Fuel (kWh)</th>
<th>PA</th>
<th>Projects*</th>
<th>Savings</th>
<th>Percent Projects</th>
<th>Percent Savings</th>
<th>Mean Savings</th>
<th>Median Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>784</td>
<td>4,379,322</td>
<td>44%</td>
<td>23%</td>
<td>12,918</td>
<td>6,007</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>3,138</td>
<td>81,732,510</td>
<td>22%</td>
<td>19%</td>
<td>26,046</td>
<td>7,669</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>3,116</td>
<td>126,786,592</td>
<td>25%</td>
<td>37%</td>
<td>40,689</td>
<td>13,276</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>111</td>
<td>3,565,833</td>
<td>49%</td>
<td>68%</td>
<td>32,125</td>
<td>12,037</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7,149</td>
<td>216,464,257</td>
<td>25%</td>
<td>27%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gas (therms)</td>
<td>Columbia</td>
<td>498</td>
<td>402,414</td>
<td>59%</td>
<td>22%</td>
<td>808</td>
<td>177</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>430</td>
<td>222,261</td>
<td>55%</td>
<td>5%</td>
<td>521</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>816</td>
<td>806,589</td>
<td>44%</td>
<td>11%</td>
<td>988</td>
<td>228</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>372</td>
<td>128,785</td>
<td>40%</td>
<td>25%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>57</td>
<td>26,369</td>
<td>48%</td>
<td>11%</td>
<td>463</td>
<td>246</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>302</td>
<td>95,887</td>
<td>90%</td>
<td>48%</td>
<td>319</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>13</td>
<td>6,529</td>
<td>38%</td>
<td>8%</td>
<td>502</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,116</td>
<td>1,560,049</td>
<td>31%</td>
<td>11%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
Table 4-18. Upstream projects and savings, summary statistics by PA and fuel

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Projects*</th>
<th>Savings</th>
<th>Percent Projects</th>
<th>Percent Savings</th>
<th>Mean Savings</th>
<th>Median Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric (kWh)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape Light Compact</td>
<td>787</td>
<td>9,029,895</td>
<td>44%</td>
<td>47%</td>
<td>11,474</td>
<td>2,670</td>
<td></td>
</tr>
<tr>
<td>Eversource</td>
<td>8,581</td>
<td>102,145,101</td>
<td>60%</td>
<td>24%</td>
<td>11,920</td>
<td>2,522</td>
<td></td>
</tr>
<tr>
<td>National Grid</td>
<td>8,147</td>
<td>65,186,179</td>
<td>65%</td>
<td>19%</td>
<td>8,001</td>
<td>1,962</td>
<td></td>
</tr>
<tr>
<td>Unitil</td>
<td>108</td>
<td>814,568</td>
<td>48%</td>
<td>16%</td>
<td>7,542</td>
<td>1,473</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17,623</td>
<td>177,175,742</td>
<td>61%</td>
<td>22%</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Gas (therms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>184</td>
<td>167,191</td>
<td>22%</td>
<td>9%</td>
<td>909</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>Eversource</td>
<td>193</td>
<td>251,537</td>
<td>25%</td>
<td>6%</td>
<td>1,324</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>National Grid</td>
<td>596</td>
<td>969,020</td>
<td>32%</td>
<td>13%</td>
<td>1,626</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>54</td>
<td>26,754</td>
<td></td>
<td></td>
<td>53%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Berkshire</td>
<td>20</td>
<td>15,000</td>
<td>17%</td>
<td>6%</td>
<td>750</td>
<td>462</td>
<td></td>
</tr>
<tr>
<td>Liberty</td>
<td>20</td>
<td>8,487</td>
<td>6%</td>
<td>4%</td>
<td>424</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>Unitil</td>
<td>14</td>
<td>3,267</td>
<td>41%</td>
<td>4%</td>
<td>233</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,027</td>
<td>1,414,503</td>
<td>57%</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
Table 4-19 and Table 4-20 provide project and savings information for all end uses installed in 2016 under the custom project track for electric and gas.

- For electric, lighting increased to more than half of custom projects in 2016. The corresponding savings achieved are also quite large for custom lighting.
- Electric HVAC measures increased from 11.5% to 15.2% of custom savings in 2016, to achieve the second highest proportional savings after lighting.
- Although the proportion of savings from electric CHP projects decreased in 2016 by over 15%, the CHP project contribution ratio increased by nearly 25%. This means that the accounts that installed CHP measures in 2016 were smaller customers, contributing less to overall usage compared to savings provided by the CHP measure.
- In 2016, statewide gas custom projects decreased for hot water and HVAC, the leading contributors to gas custom savings.
- Out of all end uses, custom gas HVAC measures continue to contribute the most savings. (This broad end use category notably encompasses many HVAC sub-uses, such as boilers, controls, steam traps, and chillers, which when grouped together are likely to yield a large proportion of savings.). Similar to previous years, the highest-saving custom gas HVAC measure in 2016 was boilers.
### Table 4-19. Custom electric projects, savings, and incentives paid by end-use

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>2016 projects</th>
<th>2016 population savings (kWh)</th>
<th>2016 total incentives paid</th>
<th>% of 2016 custom projects</th>
<th>% of 2016 custom savings</th>
<th>Incentive ($) per kWh</th>
<th>Contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>22</td>
<td>77,916,841</td>
<td>$11,199,544</td>
<td>0.5%</td>
<td>19.6%</td>
<td>$0.14</td>
<td>36.28</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>84</td>
<td>12,627,727</td>
<td>$3,757,340</td>
<td>2.1%</td>
<td>3.2%</td>
<td>$0.30</td>
<td>1.54</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>61</td>
<td>7,700,365</td>
<td>$1,581,718</td>
<td>1.5%</td>
<td>1.9%</td>
<td>$0.21</td>
<td>1.29</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>40</td>
<td>101,575</td>
<td>$36,285</td>
<td>1.0%</td>
<td>0.0%</td>
<td>$0.36</td>
<td>0.03</td>
</tr>
<tr>
<td>HVAC</td>
<td>302</td>
<td>63,636,564</td>
<td>$12,506,320</td>
<td>7.4%</td>
<td>16.0%</td>
<td>$0.20</td>
<td>2.16</td>
</tr>
<tr>
<td>Lighting</td>
<td>2,274</td>
<td>164,012,176</td>
<td>$59,022,599</td>
<td>55.8%</td>
<td>41.2%</td>
<td>$0.36</td>
<td>0.74</td>
</tr>
<tr>
<td>Motors/Drives</td>
<td>34</td>
<td>2,401,956</td>
<td>$629,180</td>
<td>0.8%</td>
<td>0.6%</td>
<td>$0.26</td>
<td>0.72</td>
</tr>
<tr>
<td>N/A</td>
<td>621</td>
<td>3,281,021</td>
<td>$2,518,687</td>
<td>15.2%</td>
<td>0.8%</td>
<td>$0.77</td>
<td>0.05</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>315</td>
<td>54,078,031</td>
<td>$13,348,895</td>
<td>7.7%</td>
<td>13.6%</td>
<td>$0.25</td>
<td>1.76</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>302</td>
<td>12,051,662</td>
<td>$2,886,225</td>
<td>7.4%</td>
<td>3.0%</td>
<td>$0.24</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,055</td>
<td>397,807,919</td>
<td><strong>$107,486,792</strong></td>
<td><strong>$0.27</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A project is the unique combination of fuel, PA, account ID, and project ID

**Total rows will decrease slightly due to suppression rules

### Table 4-20. Custom gas projects, savings, and incentives paid by end-use

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>2016 projects</th>
<th>2016 population savings (therms)</th>
<th>2016 total incentives paid</th>
<th>% of 2016 custom projects</th>
<th>% of 2016 custom savings</th>
<th>Incentive ($) per therm</th>
<th>Contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>131</td>
<td>1,071,112</td>
<td>$2,106,482</td>
<td>15.7%</td>
<td>9.4%</td>
<td>$1.97</td>
<td>0.60</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>56</td>
<td>1,899,765</td>
<td>$3,261,806</td>
<td>6.7%</td>
<td>16.6%</td>
<td>$1.72</td>
<td>2.49</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>164</td>
<td>1,065,641</td>
<td>$1,731,360</td>
<td>19.6%</td>
<td>9.3%</td>
<td>$1.62</td>
<td>0.48</td>
</tr>
<tr>
<td>HVAC</td>
<td>371</td>
<td>3,958,028</td>
<td>$6,044,891</td>
<td>44.4%</td>
<td>34.7%</td>
<td>$1.53</td>
<td>0.78</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>104</td>
<td>3,009,784</td>
<td>$4,581,790</td>
<td>12.4%</td>
<td>26.4%</td>
<td>$1.52</td>
<td>2.12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>826</td>
<td>11,004,330</td>
<td><strong>$17,726,329</strong></td>
<td><strong>$1.61</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A project is the unique combination of fuel, PA, account ID, and project ID

**Total rows will decrease slightly due to suppression rules
Figure 4-12 and Figure 4-13 illustrate time series trends in projects and savings for electric project tracks from 2011 to 2016 for all of the electric PAs. These charts also break out upstream for each year.

There was an increase in custom project count as a proportion of project tracks for all PAs in 2016. The upstream program continues to make up a large proportion of project tracks for all electric PAs. Additional findings include:

- Prescriptive and upstream projects make up equal proportions of projects for both Cape Light Compact and Unitil.
- In 2016, National Grid’s upstream project track had the highest proportion of projects among the electric PAs.
- The overall decrease in the upstream track’s proportion of savings is a new statewide trend. Statewide, electric PAs typically acquired most projects through the upstream track. This could indicate that although the upstream project track is an important way to encourage participation, programs should continue offering a variety of track options to optimize savings each year.

As in previous years, Figure 4-12 illustrates the proportion of 2016 projects undertaken by custom, prescriptive, and upstream project tracks. Figure 4-13 provides their corresponding proportions to overall savings.

- Although the proportion of custom projects has increased in 2016, the proportion of custom savings decreased for some PAs from 2015.
- For Eversource, custom projects still make up more than half of electric savings. This has been a consistent trend for Eversource over the past 6 years.
- Cape Light Compact’s savings are largely attributable to the upstream project track in 2016. In 2015, each of its project tracks contributed an equal proportion of savings.
- Unitil’s electric savings proportions have varied over time. In 2016, the custom and prescriptive tracks contributed most of Unitil’s savings.
Figure 4-12. 2011–2016 percent of custom, prescriptive, and upstream electric projects

"Project" refers to the combination of account, end use, and track. This means an account that undertook an HVAC project with a custom furnace, and then also installed programmable thermostats, would have a record in both the custom and prescriptive portions of this graph even though the measures were part of the same overall installation. This is done to account for the fact that there is not always a hard distinction between measures installed by accounts. More details on this topic are included in the methodology section.
Figure 4-13. 2011–2016 percent of custom, prescriptive, and upstream electric project savings
The next two figures provide year-over-year comparisons showing the percent of projects (Figure 4-14) and the percent of savings (Figure 4-15) for each gas PA that came from custom versus prescriptive projects.

Historically, prescriptive projects made up most of the gas projects year over year. In 2016, while the prescriptive track continued to substantially support the gas PAs’ energy efficiency efforts, the upstream program quickly became prominent, making up a fair proportion of the gas projects even in its first year.

Figure 4-15 illustrates the strong relationship between project track and savings. As expected, year over year custom projects yield the vast majority of savings.

- Columbia’s custom projects decreased back to their historic proportions, following their spike in 2015.
- Unitil gas’s savings are almost solely made up of the prescriptive program track in 2016.
- Berkshire’s proportion of savings returned back to its historic values, with the custom project track contributing over 80% of Berkshire’s gas savings in 2016.
- The custom project track continues to contribute the majority of savings for Eversource and National Grid. The upstream track’s proportion of savings is larger than that of the prescriptive track in 2016. This could indicate a high value for the upstream program in the gas market, as a critical means of acquiring prescriptive measure savings.

Custom projects continue to drive savings for the gas PAs. In 2016, savings from custom projects were 16% higher than in 2015, and close to the peak seen in 2014 (> 11 million therms). Savings from 2016 custom gas projects made up 76% of total 2016 gas savings (as opposed to prescriptive and upstream). HVAC controls and steam traps made up the most custom gas projects (45%) in 2016; process measures made up 15%. Many of these process measure projects provided among the highest gas savings of all custom projects. Accounts that installed these measures were mostly in Educational Services and Manufacturing from Eversource and National Grid.
Figure 4-14. 2011–2016 percent of custom, prescriptive, and upstream gas projects
Figure 4-15. 2011–2016 percent of custom, prescriptive, and upstream gas project savings
4.3.5.2  Project classes: New construction vs. retrofit vs. upstream projects

Table 4-21 shows the 2016 project and savings statistics for electric and gas PAs by installation class (new construction vs. retrofit vs. upstream). Per PA definitions, the “new construction” track includes major renovation projects, some end-of-life replacements, and the non-lighting upstream programs; in this regard the track is broader than just “a new building.” Similar to 2015 the 2015 report, DNV GL teased out upstream data from new construction and created a separate project class for this data, as we did above with project track.

New to the 2016 report is the extraction of upstream gas as its own project class. Teasing out upstream as a separate project class allows for deeper insight into its role in the energy efficiency market as it relates to new construction and retrofit initiatives.

- Similar to 2015 the 2015 report, electric accounts tend to have more projects in the upstream program (64%), but more savings in the retrofit programs (62%).
- For gas accounts, retrofit projects continue to provide the bulk of the projects (72%) as well as the bulk of the savings (75%). This is an increase from the 64% of savings seen in 2015.
- For Eversource electric, CHP and HVAC end uses contributed the most savings in 2016 for new construction. In 2016, retrofit projects yield substantial savings for electric and gas projects with both of these end uses.
- For National Grid, the primary source of electric savings in 2016 for new construction projects is the result of numerous accounts installing process measures. These accounts appear to be primarily manufacturing.
- Overall, upstream is Unitil’s primary installation class in 2016 for both electric (48%) and gas (43%). This is also true for Cape Light Compact, whose upstream lighting projects made up 48% of its electric projects in 2016.
- Seventy five percent of project savings for the small gas PAs came from retrofit installations in 2016. Overall, savings from retrofit classes provides over half of all statewide savings for both electric and gas.

For the first time since 2013, statewide there is a decrease in the proportion of upstream electric projects. Notably, upstream savings also decreased by 16% from 2015.

- National Grid and Eversource’s gas retrofit savings are attributed to a variety of measures including HVAC, process equipment, and building shell.
- Nearly all of Columbia’s largest saving measures in 2016 are custom retrofit HVAC measures. These include building shell, steam trap, and control measures for most of its accounts. One of Columbia’s accounts installed a retrofit HVAC measure that provided 16% of Columbia’s overall therm savings for 2016.
- Unitil’s largest-saving gas project was a custom hot water retrofit, which accounted for nearly 80% of 2016 savings. Other high saving projects were new construction HVAC measures; the most prevalent projects were in new construction and upstream.
### Table 4-21. 2016 projects and savings summary by fuel, PA, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>New Construction</th>
<th>Retrofit</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Projects¹</td>
<td>Savings</td>
<td>% Projects</td>
</tr>
<tr>
<td>Electric (kWh)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape Light Compact</td>
<td>103</td>
<td>1,871,135</td>
<td>6%</td>
</tr>
<tr>
<td>Eversource</td>
<td>615</td>
<td>84,229,278</td>
<td>5%</td>
</tr>
<tr>
<td>National Grid</td>
<td>568</td>
<td>43,289,865</td>
<td>5%</td>
</tr>
<tr>
<td>Unitil *</td>
<td>* 1,284,878</td>
<td>* 25%</td>
<td>105</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,286</td>
<td>130,675,155</td>
<td>5%</td>
</tr>
<tr>
<td>Gas (therms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>203</td>
<td>231,672</td>
<td>24%</td>
</tr>
<tr>
<td>Eversource</td>
<td>173</td>
<td>1,930,031</td>
<td>22%</td>
</tr>
<tr>
<td>National Grid</td>
<td>441</td>
<td>2,578,138</td>
<td>23%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>92</td>
<td>112,265</td>
<td>19%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>49</td>
<td>85,574</td>
<td>39%</td>
</tr>
<tr>
<td>Liberty</td>
<td>28</td>
<td>13,837</td>
<td>8%</td>
</tr>
<tr>
<td>Unitil</td>
<td>15</td>
<td>12,854</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>909</td>
<td>4,852,106</td>
<td>23%</td>
</tr>
</tbody>
</table>

¹ Counts represent unique combinations of account, class, and end use. May exceed the number of projects, and may not equal number of projects from project track table.

### Table 4-22. 2011–2016 percent of projects by project type, PA, fuel, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>New Construction</th>
<th>Retrofit</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cape Light Compact</td>
<td>5.4%</td>
<td>12.1%</td>
<td>4.1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Eversource</td>
<td>8.2%</td>
<td>8.8%</td>
<td>5.2%</td>
<td>5.9%</td>
</tr>
<tr>
<td>National Grid</td>
<td>13.5%</td>
<td>10.6%</td>
<td>4.7%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Unitil</td>
<td>0.0%</td>
<td>7.9%</td>
<td>1.7%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>60.9%</td>
<td>27.7%</td>
<td>22.6%</td>
<td>22.3%</td>
</tr>
<tr>
<td>Eversource</td>
<td>5.7%</td>
<td>5.3%</td>
<td>14.4%</td>
<td>6.7%</td>
</tr>
<tr>
<td>National Grid</td>
<td>25.2%</td>
<td>20.0%</td>
<td>20.1%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>3.1%</td>
<td>57.8%</td>
<td>41.0%</td>
<td>48.3%</td>
</tr>
<tr>
<td>Liberty</td>
<td>38.7%</td>
<td>71.2%</td>
<td>65.2%</td>
<td>80.1%</td>
</tr>
<tr>
<td>Unitil Gas</td>
<td>32.4%</td>
<td>60.6%</td>
<td>58.6%</td>
<td>57.5%</td>
</tr>
</tbody>
</table>
### Table 4-23. 2011–2016 percent of project savings by project type, PA, fuel, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>New Construction</th>
<th></th>
<th>Retrofit</th>
<th></th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>8.4%</td>
<td>22.4%</td>
<td>8.6%</td>
<td>3.4%</td>
<td>16.8%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>18.6%</td>
<td>15.5%</td>
<td>16.2%</td>
<td>14.3%</td>
<td>15.9%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>17.3%</td>
<td>20.9%</td>
<td>15.6%</td>
<td>16.4%</td>
<td>12.3%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>0.0%</td>
<td>21.2%</td>
<td>2.8%</td>
<td>26.6%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>35.2%</td>
<td>21.5%</td>
<td>17.1%</td>
<td>15.6%</td>
<td>25.2%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>32.2%</td>
<td>22.7%</td>
<td>37.8%</td>
<td>21.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>33.5%</td>
<td>19.7%</td>
<td>30.7%</td>
<td>23.5%</td>
<td>47.3%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>5.3%</td>
<td>48.0%</td>
<td>40.7%</td>
<td>34.6%</td>
<td>57.2%</td>
</tr>
<tr>
<td></td>
<td>Liberty Utilities</td>
<td>15.6%</td>
<td>96.3%</td>
<td>94.8%</td>
<td>65.6%</td>
<td>97.9%</td>
</tr>
<tr>
<td></td>
<td>Unitil Gas</td>
<td>17.2%</td>
<td>4.1%</td>
<td>28.9%</td>
<td>12.5%</td>
<td>67.1%</td>
</tr>
</tbody>
</table>
4.3.5.3 Project track and class advanced crosstab analysis

The 2016 report continues to include project class within tracks. This extrapolation offers deeper insight into the types of projects that provide certain PAs and fuel types with unique savings opportunities. Table 4-24, Table 4-25, and Table 4-26 show tracking statistics by PA, fuel, track, and class (custom vs. prescriptive vs. upstream). These tables reveal the following:

- For most PAs, particularly the large gas PAs, custom retrofit projects yield the majority of savings. In 2016, the largest savings projects in this category were process and HVAC measure installations, primarily from Columbia, Eversource, and National Grid.
- In 2016, Nearly half of Cape Light Compact’s 2016 savings came from the upstream project track and class.
- There is an even split between the proportion of total electric savings from prescriptive retrofit projects and upstream in 2016 (22%).
- Consistent with prior years, the upstream track and class continue to make up a large amount of overall electric projects (60%). Most savings are derived from custom retrofit projects (40%).

In 2016, the upstream gas program made up a third of projects for the small gas PAs. This is a large proportion of projects for the program’s inaugural year.

Table 4-24. 2016 custom project and savings summary by PA, fuel, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Electric (kWh)</th>
<th>Gas (therms)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Projects¹</td>
<td>Savings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cape Light Compact</td>
<td>32</td>
<td>1,173,147</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>311</td>
<td>67,609,267</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>145</td>
<td>25,699,123</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>*</td>
<td>590,946</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>493</td>
<td>95,172,483</td>
</tr>
<tr>
<td></td>
<td>Columbia</td>
<td>27</td>
<td>66,425</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>54</td>
<td>1,853,760</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>105</td>
<td>2,332,330</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>15</td>
<td>72,876</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>*</td>
<td>66,520</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>*</td>
<td>6,357</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>201</td>
<td>4,325,392</td>
</tr>
</tbody>
</table>

¹ Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
### Table 4-25. 2016 prescriptive project and savings summary by PA, fuel, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>New Construction</th>
<th>Prescriptive</th>
<th>Retrofit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric (kWh)</td>
<td></td>
<td>Projects¹</td>
<td>Savings</td>
<td>% Projects</td>
</tr>
<tr>
<td>Cape Light Compact</td>
<td>74</td>
<td>697,988</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Eversource</td>
<td>399</td>
<td>16,620,011</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>National Grid</td>
<td>439</td>
<td>17,590,742</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>593,931</td>
<td>4%</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>920</strong></td>
<td><strong>35,502,672</strong></td>
<td><strong>3%</strong></td>
<td><strong>4%</strong></td>
</tr>
<tr>
<td>Gas (therms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia</td>
<td>177</td>
<td>165,247</td>
<td>21%</td>
<td>9%</td>
</tr>
<tr>
<td>Eversource</td>
<td>119</td>
<td>76,271</td>
<td>15%</td>
<td>2%</td>
</tr>
<tr>
<td>National Grid</td>
<td>341</td>
<td>245,808</td>
<td>18%</td>
<td>3%</td>
</tr>
<tr>
<td><strong>Small Gas PAs</strong></td>
<td><strong>79</strong></td>
<td><strong>39,388</strong></td>
<td><strong>48%</strong></td>
<td><strong>8%</strong></td>
</tr>
<tr>
<td>Berkshire</td>
<td>39</td>
<td>19,054</td>
<td>31%</td>
<td>72%</td>
</tr>
<tr>
<td>Liberty</td>
<td>28</td>
<td>13,837</td>
<td>8%</td>
<td>14%</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>6,497</td>
<td>35%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>716</strong></td>
<td><strong>526,714</strong></td>
<td><strong>19%</strong></td>
<td><strong>4%</strong></td>
</tr>
</tbody>
</table>

¹ Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
### Table 4-26. 2016 upstream project and savings summary by PA, fuel, and class

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Projects¹</th>
<th>Upstream Fuel</th>
<th>Projects</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Electric (kWh)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cape Light Compact</td>
<td>787</td>
<td>9,029,895</td>
<td>44%</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>8,581</td>
<td>102,145,101</td>
<td>59%</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>8,147</td>
<td>65,186,179</td>
<td>65%</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>108</td>
<td>814,568</td>
<td>48%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17,623</td>
<td>177,175,742</td>
<td>61%</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td>Electric (kWh)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Columbia</td>
<td>184</td>
<td>167,191</td>
<td>21%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>193</td>
<td>251,537</td>
<td>25%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>596</td>
<td>969,020</td>
<td>32%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>54</td>
<td>26,754</td>
<td>33%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>20</td>
<td>15,000</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>20</td>
<td>8,487</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>*</td>
<td>3,267</td>
<td>41%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,027</td>
<td>1,414,503</td>
<td>28%</td>
<td>10%</td>
</tr>
</tbody>
</table>

¹ Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
4.3.6 Overall performance metrics

Figure 4-16 shows the 2016 C&I participation and population savings ratios for each PA. These ratios are explored in more depth by fuel type later in the report. With the exception of Liberty, the electric PAs show higher participation rates than the gas PAs. Liberty’s spike in percent participation is a direct result of its large increase in participants in 2016, while its number of billed accounts remained consistent. In 2016, the electric PAs maintained similar ratios of savings to participation, while overall savings and participation rates went down.

For gas PAs, ratios of savings to participation vary from PA to PA. The majority of gas PAs show lower participation than 2015. Across all electric and gas PAs, population savings achieved is impacted by the increase in billed accounts shown in Table 4-1.

Figure 4-16. 2016 account participation and population savings achieved (includes upstream data)
Figure 4-17 illustrates time series participant savings achieved for electric and gas by account size. For electric, participant savings achieved increased from 2015 in all size bins. Gas’s smallest size bin decreased in 2016, returning to its historic average. In contrast, participant savings increased in 2016 for gas’s very large size bin. Notably, gas participant savings achieved tend to fluctuate based on the makeup of gas participants and measures undertaken within a given year.

**Figure 4-17. 2011–2016 summary of participant savings achieved, electric and gas (excludes unlinked tracking data)**
Figure 4-18 presents the town-level savings ratios in MMBTU. Consistent with the electric and gas maps, towns with fewer accounts tend to have more variability in the savings.

**Figure 4-18. 2016 statewide electric and gas savings ratio by town (MMBTU)**

The town-level contribution ratio maps yield insight into how different areas of the state are contributing to the share of savings relative to their share of consumption. In the simplest terms, contributions ratios can be used as follows:

- \( <1 \), the town contributes less towards total statewide savings than it does towards statewide consumption
- \( \approx 1 \), the town contributes equally or almost equally towards total statewide savings and statewide consumption
- \( >1 \), the town contributes more towards total statewide savings than it does towards statewide consumption

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27 Savings ratios for municipal towns are impacted due to a lack of consumption and savings information.
Figure 4-19 shows the MMBTU contribution ratio for all towns with at least one electric or gas PA provider. The MMBTU map suggests that, when the MA landscape is considered at the statewide level for all PAs irrespective of fuels, some of the more rural towns actually have the higher contribution ratios and could be characterized as contributing more towards the overall share of energy savings than they do towards the overall share of consumption, despite having fewer and generally smaller accounts. Several towns reported negative consumption in the billing data, but received savings from measures in the tracking data. This resulted in a negative contribution ratio. For these towns, the negative is not indicative of under-contribution. Rather, with a negative consumption number it is not mathematically possible to achieve a positive contribution ratio given how the equation is calculated. On deeper review of the data, applying the absolute value to these towns makes 2 towns have contribution ratios in excess of 10, and the other 3 have contribution ratios less than 0.5.
5 ELECTRIC MARKET ANALYSIS

This section presents notable findings and details about the C&I energy efficiency landscape for the electric market in Massachusetts.

For analyses presenting data that required tracking accounts to be linked to billing accounts, only tracking data that could be linked to the billing population is included. Analyses presenting population-level metrics that did not require linking specific accounts include all tracking and billing records. The match rates and supporting detail for the billing and tracking data for each PA are presented in section 3.4.1, earlier in this report.

This section describes the electric market in Massachusetts, broken up by PA service territory, as shown in Figure 5-1. For towns where service territories overlap, participants and savings are split into each PA’s specific customers. This is not the case only where results are presented at the town level; in these cases, each PA’s customers are used to compute any town-specific analysis.

Figure 5-1. MA electric PA service territories

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28 Specifically, these are the consumption-weighted participation and participant savings achieved metrics, as well as any industry sector or consumption sections.
5.1 Participation and savings

5.1.1 Statewide participation and savings

This section contains detailed kWh breakdowns for all PAs in aggregate, and for individual PAs. As seen in the 2015 report, Table 5-1 summarizes electric key metrics for 2016. This includes unlinked tracking data. In addition, Figure 5-2 illustrates overall participation and population savings achieved across all years. In 2016 the electric market’s billed accounts and usage increased from 2015.

In 2016, for the first time, there was a decrease in overall electric participation and population savings achieved compared to prior years. This section delves into the primary drivers of these trends.

Table 5-1. 2016 key electric metrics (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Key Metrics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Billing Accounts</td>
<td>382,316</td>
</tr>
<tr>
<td>Population kWh Usage (2015)</td>
<td>27,298,448,968</td>
</tr>
<tr>
<td>Total Participating Accounts*</td>
<td>24,290</td>
</tr>
<tr>
<td>Gross Participant kWh Savings</td>
<td>791,769,548</td>
</tr>
<tr>
<td>2016 Incentives Paid</td>
<td>$198,388,959</td>
</tr>
<tr>
<td>2016 Account Participation Rate</td>
<td>6.4%</td>
</tr>
<tr>
<td>2016 Population Savings Achieved</td>
<td>2.9%</td>
</tr>
<tr>
<td>2016 Percent of Total Savings from Upstream</td>
<td>22.4%</td>
</tr>
</tbody>
</table>

Figure 5-2. 2011–2016 statewide electric program participation rates and population savings achieved
Figure 5-3 summarizes the participation, savings, consumption, and population distribution for the population and participants by consumption bin. In previous years, these bins were made by demand breakouts. In the 2016 report, we replaced these with new, broad GWh (consumption) bins. Further information on this change can be found in Section 3.4.5.

Figure 5-3 also shows the total GWh saved by the matched participants. Consistent with previous years, the larger the bin, the higher the participation rate, and the lower the participant savings achieved. The following definitions help clarify the chart below:

- **% Population** = The percentage of the overall population that exists in each consumption bin
- **Population Savings Achieved** = The proportion of savings by this consumption bin among the overall population
- **% of Consumption** = The percentage of consumption generated by the population in each consumption bin
- **Participant Savings Achieved** = The proportion of savings by this consumption bin among only the participating population
- **Account Participation** = The proportion of participation by this consumption bin among the overall population
- **GWh Electricity Saved** = Total savings associated with the consumption bin

The number of GWh saved for every broad consumption bin continues to increase every year. Account participation decreased in 2016 for every broad consumption bin. In addition, all except the smallest broad bin (<0.11 GWh) saw decreases from 2015 in participant savings achieved. Participant savings achieved increased in 2016 for the smallest broad bin (<0.11 GWh), from 27% to nearly 40%.29 The results for individual PAs are presented in section 8.3.

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29 Keep in mind that comparisons made to the 2015 report should take into account the size bin changes from demand (kW) to consumption (GWh). This particular chart looks different from 2015's year's, for instance, in the gray area representing percent of consumption.
Figure 5-3. 2016 electric consumption and savings summary by broad consumption bin (excludes unlinked tracking data)
Introduced in the 2015 report, Figure 5-4 also summarizes the participation, savings, consumption, and population distribution for the population and participants by broad consumption bin—but illustrates these metrics across all 6 years. It also reports the total GWh saved by the matched participants for all years. Similar to Figure 5-3 above, the larger the bin, the higher the participation rate, and the lower the participant savings achieved. Figure 5-4 reflects the decrease in participation that occurred in 2016 as well.

Note that while the 2015 report broke out this figure by demand, rather than GWh consumption, the overall shapes and trends within the 2015 and 2016 figures are similar. Overall, this new chart illustrates that 6-year metrics appear to average out across time and reflect the same trends in participation, savings, consumption, and population distribution by broad consumption bin that are seen in any particular year alone. However, it is important to note that many accounts can move between bins from year to year due to even subtle variations in total consumption. The total consumption depicted between these two figures may change due to this fact.

Figure 5-4. 2011 – 2016 electric consumption and savings summary by broad consumption bin (excludes unlinked tracking data)

30 The only difference seen in 2016’s year’s figure is the steady increase of consumption percent (gray area), which steepens when you get to the largest bins. In 2015’s year’s figure this area represented demand, and was more variable between bins.
Figure 5-5 shows the town-level participation for electric accounts. Consistent with previous years, participation as a percentage of unique accounts in the town is generally higher, though more variable, in western Massachusetts. This is influenced by the smaller total number of accounts in these towns: small changes in the number of participating accounts can have larger impacts in the participation ratio. As in past years, several towns also did not have any identified participation in 2016. Given the small population, these towns are unlikely to represent a substantial level of consumption as a group; some individual accounts may represent one-off opportunities.

Figure 5-5. 2016 town level electric account participation ratio (includes upstream data)
Figure 5-6 shows the town-level electric population savings achieved relative to the towns’ prior year’s full consumption. As with participation, towns in the western portion of the state had greater variability in town-level savings, since individual accounts can have greater impact when they participate. As noted in past years, higher participation does not always translate to larger savings ratios, due in part to the impact of smaller prescriptive-type measures. As a percentage, these measures can have a large impact on town-level participation while having a more muted impact on savings.

Individual towns were also affected by very large accounts, which tend to result in one-off instances of higher town-level savings relative to consumption. One such example is Cambridge, adjacent to Boston, where a custom electric project substantially increased the savings in 2016 relative to the prior year’s consumption.

**Figure 5-6. 2016 electric population savings achieved as a percent of town consumption (includes upstream data)**
Figure 5-7 presents the town-level electric contribution ratios. These maps provide an idea of how, geographically, towns are contributing to the share of savings relative to their share of consumption. In the simplest terms, contributions ratios can be used as follows:

- \(<1\), the town contributes less towards total statewide savings than it does towards statewide consumption
- \(\sim 1\), the town contributes equally or almost equally towards total statewide savings and statewide consumption
- \(>1\), the town contributes more towards total statewide savings than it does towards statewide consumption

Variability in the contribution ratio is much more distributed across the state than it is concentrated in the western portion, as occurs with town level percent savings. There are several visual clusters (reds and oranges) across the state. The geographic proximity of these clusters may indicate certain vendors or channel offerings focusing on a discrete area; additional data on vendor service territories and network service territories of these vendors may yield greater insight into the validity of this hypothesis. Boston’s contribution ratio increased to above 1.25 in 2016, while the surrounding metros continued to have contribution ratios slightly lower than 1. Ten of the top 20 electric saving projects for 2016 were located in Boston; in 2015 only 2 such projects were located in Boston.

Figure 5-7. 2016 electric contribution ratio by town (includes unlinked tracking data)
5.1.2 Participation and savings by consumption size bins

This section presents participation and savings information for the overall statewide electric market by consumption bin. Each analysis presents size bins in broad categories and narrow categories, allowing the reader to view the same information at both a high level and a more granular level. The broad consumption tables and figures replace the demand ones seen in previous reports. This method change is discussed in more detail in section 3.4.5.

Table 5-2 shows the participation and savings statistics by broad consumption bins for electric accounts in 2016. Table 5-3 illustrates the same savings statistics but by narrow consumption bin categories, to provide the same information on more detailed customer sizes. While reviewing these tables, it is important to keep in mind that the largest consumption bins also have smaller populations, which means that each individual participant represents a larger percentage of the population count. (While this circumstance is important to note, it should not be interpreted as an explanatory driver.)

In 2016, the data show an increase in participating accounts for nearly all narrow consumption bins, consistent with the general pattern over the past three years. Also consistent with the 2015 report, the 2016 analysis showed that participation rates increase as the consumption bin size increases. This trend holds across all consumption bins in both broad and narrow categories. 2016 also saw an overall decrease in participant savings and the percent of savings achieved. This could be a direct result of the increase in billed customers for all accounts, as discussed in Section 4.1.

- For the first time, in 2016 the smallest narrow consumption bin (<0.01 GWh) achieved a contribution ratio greater than 1. This means that the proportion of savings is greater than the proportion of usage for this bin of accounts. Within this bin, 50% of savings came from non-upstream lighting measures, and 41% from upstream lighting measures.

  Despite the overall decrease in savings, most of the small and medium narrow bins had an increase in population savings achieved. This indicates that PAs continue to be successful engaging these more difficult to reach customers. The evidence in section 5.2 suggests the upstream program continues to support participation for these customers.

It should also be noted that these savings statistics, in conjunction with the electric savings statistics presented above, include upstream data for accounts for which DNV GL could assign account IDs to the more granular data.
Table 5-2. 2016 participation and savings by broad electric consumption bin (includes unlinked tracking data)\(^{31}\)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>7,849</td>
<td>298,347</td>
<td>104,976,226</td>
<td>4,514,967,103</td>
<td>$34,703,646</td>
<td>2.6%</td>
<td>2.3%</td>
<td>0.80</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>2,682</td>
<td>20,230</td>
<td>82,838,524</td>
<td>4,487,900,211</td>
<td>$28,775,702</td>
<td>13.3%</td>
<td>1.8%</td>
<td>0.64</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>1,250</td>
<td>5,179</td>
<td>98,624,318</td>
<td>4,324,476,635</td>
<td>$29,857,288</td>
<td>24.1%</td>
<td>2.3%</td>
<td>0.79</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>705</td>
<td>2,086</td>
<td>115,856,958</td>
<td>5,293,075,897</td>
<td>$26,682,746</td>
<td>33.8%</td>
<td>2.2%</td>
<td>0.75</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>429</td>
<td>739</td>
<td>204,262,349</td>
<td>9,270,054,628</td>
<td>$40,759,183</td>
<td>58.1%</td>
<td>2.2%</td>
<td>0.76</td>
</tr>
<tr>
<td>Less than 0 GWh or missing</td>
<td>11,384</td>
<td>55,735</td>
<td>185,211,174</td>
<td>(592,025,505)</td>
<td>$37,610,393</td>
<td>see footnote</td>
<td>see footnote</td>
<td>see footnote</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24,299</td>
<td>382,316</td>
<td>791,769,548</td>
<td>27,298,448,968</td>
<td>$198,388,959</td>
<td>6.4%</td>
<td>2.9%</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 5-3. 2016 population participation and savings achieved by narrow electric consumption bin (includes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.01 GWh</td>
<td>1,934</td>
<td>181,784</td>
<td>22,186,100</td>
<td>592,162,802</td>
<td>$6,259,397</td>
<td>1.1%</td>
<td>3.7%</td>
<td>1.29</td>
</tr>
<tr>
<td>0.01 – 0.025 GWh</td>
<td>1,936</td>
<td>53,093</td>
<td>18,973,181</td>
<td>873,982,783</td>
<td>$6,008,948</td>
<td>3.6%</td>
<td>2.2%</td>
<td>0.75</td>
</tr>
<tr>
<td>0.025 – 0.05 GWh</td>
<td>1,801</td>
<td>30,934</td>
<td>25,037,799</td>
<td>1,125,896,464</td>
<td>$9,046,720</td>
<td>5.8%</td>
<td>2.2%</td>
<td>0.77</td>
</tr>
<tr>
<td>0.05 – 0.1 GWh</td>
<td>1,886</td>
<td>23,324</td>
<td>32,986,649</td>
<td>1,670,088,300</td>
<td>$11,578,149</td>
<td>8.1%</td>
<td>2.0%</td>
<td>0.68</td>
</tr>
<tr>
<td>0.1 – 0.25 GWh</td>
<td>1,872</td>
<td>16,470</td>
<td>48,279,210</td>
<td>2,607,003,140</td>
<td>$17,206,062</td>
<td>11.4%</td>
<td>1.9%</td>
<td>0.64</td>
</tr>
<tr>
<td>0.25 – 0.5 GWh</td>
<td>1,115</td>
<td>6,583</td>
<td>41,006,370</td>
<td>2,352,617,956</td>
<td>$13,751,050</td>
<td>16.9%</td>
<td>1.7%</td>
<td>0.60</td>
</tr>
<tr>
<td>0.5 – 1 GWh</td>
<td>781</td>
<td>3,470</td>
<td>52,991,610</td>
<td>2,502,738,799</td>
<td>$17,136,617</td>
<td>22.5%</td>
<td>2.1%</td>
<td>0.73</td>
</tr>
<tr>
<td>1 – 2.5 GWh</td>
<td>750</td>
<td>2,500</td>
<td>93,310,217</td>
<td>4,026,847,895</td>
<td>$24,563,177</td>
<td>30.0%</td>
<td>2.3%</td>
<td>0.80</td>
</tr>
<tr>
<td>2.5 – 5 GWh</td>
<td>376</td>
<td>948</td>
<td>74,518,345</td>
<td>3,310,270,080</td>
<td>$15,703,781</td>
<td>39.7%</td>
<td>2.3%</td>
<td>0.78</td>
</tr>
<tr>
<td>5 – 10 GWh</td>
<td>191</td>
<td>366</td>
<td>38,198,038</td>
<td>2,605,911,260</td>
<td>$9,630,307</td>
<td>52.2%</td>
<td>1.5%</td>
<td>0.51</td>
</tr>
<tr>
<td>10 – 25 GWh</td>
<td>146</td>
<td>213</td>
<td>99,304,014</td>
<td>3,236,646,311</td>
<td>$17,540,847</td>
<td>68.5%</td>
<td>3.1%</td>
<td>1.06</td>
</tr>
<tr>
<td>25 – 50 GWh</td>
<td>39</td>
<td>53</td>
<td>33,904,659</td>
<td>1,779,028,540</td>
<td>$7,072,594</td>
<td>73.6%</td>
<td>1.9%</td>
<td>0.66</td>
</tr>
<tr>
<td>&gt; 50 GWh</td>
<td>14</td>
<td>16</td>
<td>23,961,030</td>
<td>1,207,280,143</td>
<td>$4,795,234</td>
<td>87.5%</td>
<td>2.0%</td>
<td>0.68</td>
</tr>
<tr>
<td>Less than 0 GWh or missing</td>
<td>11,458</td>
<td>62,562</td>
<td>187,112,325</td>
<td>(592,025,505)</td>
<td>$38,096,077</td>
<td>see footnote</td>
<td>see footnote</td>
<td>see footnote</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24,299</td>
<td>382,316</td>
<td>791,769,548</td>
<td>27,298,448,968</td>
<td>$198,388,959</td>
<td>6.4%</td>
<td>2.9%</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^{31}\) Accounts with zero or negative consumption may be net metered accounts. Unlinked tracking accounts by definition have no associated consumption bin, and are therefore included in the “Less than 0 GWh or missing” bins in these tables.
Figure 5-8 and Figure 5-9 provide a year-over-year comparison of electric population participation by broad consumption bin for 2011 to 2016. Notable observations include the following:

- Account participation decreased for nearly every narrow consumption bin for the first time in 6 years. Interestingly, nearly every narrow consumption bin also saw an increase in savings for 2016. This reinforces the idea that participation and savings trends do not always tell the same story. Evidence throughout section 5 suggests this shift is largely driven by increased participation in the upstream program.

- The third largest narrow bin (10-25 GWh) experienced a drop in account participation back to its 2013 value. Nearly all of the 39 accounts in this bin have participated consecutively over the past 5 or 6 years.

- As discussed above, accounts in the third and fourth largest narrow consumption bins (5-25 GWh) did experience increased participation for the sixth year in a row. Eighty-five percent of these accounts installed lighting measures from either upstream or non-upstream programs. Fifty-five percent of these accounts are multi-year participants who have participated in at least 3 of the last 6 years.

- The majority of accounts have decreased in participation since 2015; for nearly all bins this decrease is slight.
  - This decrease is likely a direct result of the increases in billed accounts seen in 2016 across all PAs. This is explored in greater detail in section 4.1.
Figure 5-8. 2011–2016 electric account participation rate by broad consumption bin (excludes unlinked tracking data)
Figure 5-9. 2011–2016 electric account participation rate by narrow consumption bin (excludes unlinked tracking data)

Figure 5-10 and Figure 5-11 provide year-over-year comparisons of the electric population savings achieved by consumption bin for 2011 to 2016. Notable observations include the following:

- The spike seen in 2015 in the second largest narrow consumption bin (25-50 GWh) dropped back to its 2013 value in 2016. This spike was primarily due to a few large accounts from National Grid and Eversource installing large retrofit projects (primarily CHPs). These large accounts, all in the manufacturing sector, provide this bin with disproportionately large savings.

- Accounts in the second largest broad consumption bin (1.5 – 4.5 GWh) also saw increases in population savings achieved. The projects leading these savings involved upstream lighting measures installed by accounts in accommodation and food services, healthcare, and real estate.

- Accounts in the smallest narrow consumption bin (<0.01 GWh) also experienced an increase in electric population savings achieved, as seen in Figure 5-11. Seventy-three percent of these accounts installed lighting; two thirds of the lighting was from the upstream program. There were also a number of accounts (17%) that installed process and HVAC measures in 2016 as well.

- A continuing trend is the increase in mid-sized participant savings in 2016, coming from a variety of end uses, primarily including lighting (non-upstream), as well as number of process, HVAC and refrigeration measures.
Figure 5-10. 2011–2016 population savings achieved by broad consumption bin (excludes unlinked tracking data)
Table 5-4 presents the electric industry sector account population savings by aggregated consumption bin. Notable findings include the following:

- Upstream lighting projects contributed to 50% of savings for all sectors in the largest electric consumption bin (> 50 GWh).
- The Health Care sector provided the highest savings this year by engaging two very large customers in upstream and new construction non-upstream lighting projects.
  - A consistent trend for the Health Care and Social Assistance sector is that it displays proportionally larger savings as the consumption classes get larger; this is likely explained by inpatient health care facilities. The scale and variety of equipment in the small versus large health care sectors offer very different sources of savings.
- The Manufacturing sector’s total population savings increased to 4.7%; in 2014 this total was 1.8%. These savings rates are not correlated with consumption bins for this sector, as both large and small consumption bins provided representative savings amounts.
  - Most of the population savings in manufacturing from the largest consumption bins are the result of a large Manufacturing account from National Grid that installed custom CHP in 2016.
- For small- and medium-sized accounts, the largest saving end uses were non-upstream lighting measures, with a few exceptions for compressed air. Non-upstream lighting makes up 45% of Manufacturing savings for accounts with less than 0.5 GWh.

- Educational Services also contributed notable savings in 2016 from very large accounts installing custom process measures and upstream lighting measures, particularly linear LEDs and high performance fluorescents.

- The Professional, Scientific, and Technical Services and the Retail Trade sectors saw notable increases in savings from their smallest bins. These are primarily the result of small accounts in these sectors installing upstream lighting measures.
Table 5-4. 2016 industry sector account population savings achieved by broad consumption bin (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>&lt;.05 GWh</th>
<th>.05 - .5 GWh</th>
<th>.5 - 5 GWh</th>
<th>5 - 50 GWh</th>
<th>&gt; 50 GWh</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>2.2%</td>
<td>1.2%</td>
<td>1.7%</td>
<td>1.8%</td>
<td>0.0%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>1.0%</td>
<td>2.2%</td>
<td>1.5%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>3.7%</td>
<td>2.0%</td>
<td>7.9%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>3.3%</td>
<td>2.6%</td>
<td>2.5%</td>
<td>0.9%</td>
<td>0.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Construction</td>
<td>5.6%</td>
<td>2.4%</td>
<td>1.7%</td>
<td>1.5%</td>
<td>0.0%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>7.6%</td>
<td>2.6%</td>
<td>2.6%</td>
<td>2.4%</td>
<td>1.5%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1.3%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>1.2%</td>
<td>0.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>1.7%</td>
<td>1.4%</td>
<td>2.2%</td>
<td>5.1%</td>
<td>3.4%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Information</td>
<td>1.3%</td>
<td>0.8%</td>
<td>1.0%</td>
<td>0.6%</td>
<td>0.0%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>1.5%</td>
<td>1.2%</td>
<td>0.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3.8%</td>
<td>3.0%</td>
<td>3.3%</td>
<td>2.9%</td>
<td>1.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.4%</td>
<td>1.7%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>4.6%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>2.4%</td>
<td>2.1%</td>
<td>2.8%</td>
<td>4.4%</td>
<td>0.0%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2.3%</td>
<td>1.6%</td>
<td>3.1%</td>
<td>1.0%</td>
<td>0.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>2.2%</td>
<td>1.6%</td>
<td>1.5%</td>
<td>0.3%</td>
<td>0.0%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>3.6%</td>
<td>2.5%</td>
<td>1.6%</td>
<td>1.9%</td>
<td>0.0%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>2.4%</td>
<td>2.2%</td>
<td>2.4%</td>
<td>1.5%</td>
<td>4.4%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>2.8%</td>
<td>1.9%</td>
<td>10.2%</td>
<td>1.3%</td>
<td>4.0%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Utilities</td>
<td>2.5%</td>
<td>1.0%</td>
<td>1.8%</td>
<td>0.2%</td>
<td>5.3%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>2.8%</td>
<td>3.8%</td>
<td>2.1%</td>
<td>0.8%</td>
<td>0.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.0%</td>
<td>0.9%</td>
<td>2.0%</td>
<td>0.2%</td>
<td>0.0%</td>
<td>32.1%</td>
</tr>
<tr>
<td>Statewide</td>
<td>2.6%</td>
<td>1.8%</td>
<td>2.3%</td>
<td>2.0%</td>
<td>2.2%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>
Table 5-5 presents the savings and consumption of participating accounts, by broad consumption bin, for 2016 only. Total 2016 participant kWh savings decreased in 2016 from 2015. As seen in prior years, the participants in the smallest consumption bins had the largest savings relative to their consumption.

Although total 2016 participant kWh savings decreased from 2015 to 2016, participant savings in every consumption bin increased in 2016, with the exception of the > 4.5 GWh bin. The decrease in savings for > 4.5 GWh customers was substantial enough to decrease the total participant savings for 2016.

Table 5-5. 2016 participant savings achieved summary statistics by broad consumption bin (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Broad Consumption Bin (GWh)</th>
<th>2016 Participant Savings (kWh)</th>
<th>2016 Mean Participant Savings (kWh)</th>
<th>2016 Median Participant Savings (kWh)</th>
<th>2015 Participant Usage (kWh)</th>
<th>2016 Incentives Paid</th>
<th>2016 Participant % Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>103,075,075</td>
<td>13,442</td>
<td>5,076</td>
<td>265,118,053</td>
<td>$34,217,963</td>
<td>38.9%</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>82,838,524</td>
<td>31,213</td>
<td>12,040</td>
<td>626,320,497</td>
<td>$28,775,702</td>
<td>13.2%</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>98,624,318</td>
<td>79,793</td>
<td>23,761</td>
<td>1,064,660,249</td>
<td>$29,857,288</td>
<td>9.3%</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>115,856,958</td>
<td>165,747</td>
<td>58,954</td>
<td>1,813,937,600</td>
<td>$26,682,746</td>
<td>6.4%</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>204,262,349</td>
<td>477,248</td>
<td>106,973</td>
<td>6,070,876,358</td>
<td>$40,759,183</td>
<td>3.4%</td>
</tr>
<tr>
<td></td>
<td><strong>604,657,223</strong></td>
<td><strong>9,840,912,757</strong></td>
<td><strong>$160,292,882</strong></td>
<td></td>
<td></td>
<td><strong>6.1%</strong></td>
</tr>
</tbody>
</table>
Table 5-6 shows the median and mean participant savings contributed by each consumption bin, as a lens to explore a "typical account." The impact of mean 2016 participant savings is calculated by dividing total 2016 savings in a given bin by that bin’s average savings for 2016. Similar to 2015, incorporating this lens reveals the expected trends in savings ratios for most consumption bins: The larger consumption bins and larger individual accounts typically contribute more to overall savings. As a result of PAs' efforts, the engagement of large accounts continues to contribute significantly towards savings goals.

Table 5-6. 2016 participant savings and mean and median impacts by broad consumption bin (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Broad Consumption Bin (GWh)</th>
<th>2016 Participant Savings (kWh)</th>
<th>Impact of Mean 2016 Participant</th>
<th>Impact of Median 2016 Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>103,075,075</td>
<td>0.01%</td>
<td>0.00%</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>82,838,524</td>
<td>0.04%</td>
<td>0.01%</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>98,624,318</td>
<td>0.08%</td>
<td>0.02%</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>115,856,958</td>
<td>0.14%</td>
<td>0.05%</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>204,262,349</td>
<td>0.23%</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

Figure 5-12 provides a year-over-year comparison showing the participant savings achieved by broad consumption bin for 2011 to 2016. This figure contains only tracking accounts that successfully match in the billing data. As a result, some of the upstream data are not present in the figure.

Opposite to 2015, the smallest consumption bins saw increases in participant savings achieved. All bins, except very large, saw increases in participant savings achieved in 2016. This is interesting in that participation decreased for most bins, as shown in Figure 4-17 in section 4. More than half of participants in the smallest consumption bin installed upstream lighting measures, but the largest saving accounts in this bin installed a variety of custom lighting, HVAC motors, and process equipment measures.
5.2 End uses

This section breaks PA savings into two different end use classifications which are based on, but not identical to, the Massachusetts Technical Resource Library (TRL). The two fields are:

- **Broad**, which provides a high-level classification for end uses. End uses that would appear as "custom" under the MA TRL have been re-classed into more specific end uses, such as process or CHP.
- **Specific**, which provides a more granular look at the broad measures installed. This report also refers to specific end uses as "sub uses." Measures in this classification bin can appear in multiple "broad" end use bins. An example of this would be "controls," which can appear under the broad end uses of HVAC and hot water.

For additional details about end uses, see section 3.4.4.

In order to provide details into the types of energy efficiency measures being installed in the MA electric market, this section presents analyses in a few different views:

- Tables summarizing the 2016 results
- Time series tables and figures showing key metrics from 2011–2016
• Cross-tab tables showing the relationship between the broad and specific end use classifications. Table 5-7 shows the project and savings statistics by end use for electric accounts in 2016. Similar to the 2015 report, this table shows upstream lighting and upstream HVAC as their own separate end uses, to help differentiate and better understand the savings associated with each end use. In prior years, “upstream other” refers to upstream HVAC only. Contribution ratio in this table is defined as the percentage of total savings from a particular end use divided by the percentage of total projects for that end use.

New in 2016 is the inclusion of incentives, incentive per kWh saved, and contribution ratios for each end use. The contribution ratio in this table represents proportional savings relative to number of projects. As seen in the table:

• Lighting measures (non-upstream and upstream) continue their strong historical trend as the leading end use, providing the largest number of projects, the most gross savings, and the highest percentage of savings for another year.

Although upstream lighting projects made up over half of all electric projects in 2016, it has decreased from 2015 in number of projects and in overall population savings. This is likely due to the change in lamps being purchased year over year. Screw-based lamps make up most upstream lighting measures sold each year, but have been steadily declining since a spike in 2014. In 2016, linear and other LEDs increased by 230% over 2015 and 2014 values. However, this increase was not sufficient to compensate for the decline of screw-based lamps, and overall, upstream lighting savings decreased to pre-2014 levels.

• There was a substantial increase in upstream HVAC projects and a slight decrease in non-upstream HVAC projects in 2016. Despite this decrease, there was a lift in savings contributions from non-upstream HVAC projects (from 9.7% in 2015 to 13.1% in 2016).

• In 2016, process as a broad end use had almost double the number of projects of 2015. The makeup of sub end uses within process changed in 2016, and reflects lower population savings than 2015. In 2016, within process the sub-use of motors increased and the sub-use of custom process measures decreased.
Table 5-7. Population summary – electric end uses, including upstream lighting and upstream HVAC

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>2016 projects</th>
<th>2016 population savings (kWh)</th>
<th>2016 total incentives</th>
<th>% of 2016 projects</th>
<th>% of 2016 savings</th>
<th>Incentive per kWh saved</th>
<th>2016 contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>15</td>
<td>168,033</td>
<td>$142,961</td>
<td>0.1%</td>
<td>0.0%</td>
<td>$0.85</td>
<td>0.40</td>
</tr>
<tr>
<td>CHP</td>
<td>22</td>
<td>77,916,841</td>
<td>$11,199,544</td>
<td>0.1%</td>
<td>9.8%</td>
<td>$0.14</td>
<td>126.46</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>97</td>
<td>12,651,536</td>
<td>$3,771,418</td>
<td>0.3%</td>
<td>16.6%</td>
<td>$0.30</td>
<td>4.66</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>198</td>
<td>12,429,261</td>
<td>$2,410,032</td>
<td>0.7%</td>
<td>16.6%</td>
<td>$0.19</td>
<td>2.24</td>
</tr>
<tr>
<td>Food Service</td>
<td>44</td>
<td>30,331</td>
<td>$34,827</td>
<td>0.2%</td>
<td>0.0%</td>
<td>$1.15</td>
<td>0.02</td>
</tr>
<tr>
<td>Hot Water</td>
<td>137</td>
<td>214,389</td>
<td>$43,757</td>
<td>0.5%</td>
<td>0.0%</td>
<td>$0.20</td>
<td>0.06</td>
</tr>
<tr>
<td>HVAC</td>
<td>797</td>
<td>103,493,631</td>
<td>$19,343,132</td>
<td>2.8%</td>
<td>13.1%</td>
<td>$0.19</td>
<td>4.64</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>1,066</td>
<td>9,366,940</td>
<td>$3,433,413</td>
<td>3.8%</td>
<td>1.2%</td>
<td>$0.37</td>
<td>1.71</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>16,558</td>
<td>167,808,802</td>
<td>$21,832,722</td>
<td>58.6%</td>
<td>21.2%</td>
<td>$0.13</td>
<td>2.43</td>
</tr>
<tr>
<td>Lighting</td>
<td>6,846</td>
<td>327,655,722</td>
<td>$114,111,867</td>
<td>24.2%</td>
<td>41.4%</td>
<td>$0.35</td>
<td>5.72</td>
</tr>
<tr>
<td>Motors/Drives</td>
<td>82</td>
<td>5,585,424</td>
<td>$1,205,539</td>
<td>0.3%</td>
<td>0.7%</td>
<td>$0.22</td>
<td>0.78</td>
</tr>
<tr>
<td>Process</td>
<td>347</td>
<td>55,603,659</td>
<td>$13,625,727</td>
<td>1.2%</td>
<td>7.0%</td>
<td>$0.25</td>
<td>0.09</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>682</td>
<td>14,893,322</td>
<td>$3,985,844</td>
<td>2.4%</td>
<td>1.9%</td>
<td>$0.27</td>
<td>1.26</td>
</tr>
<tr>
<td>N/A</td>
<td>1,371</td>
<td>3,634,731</td>
<td>$3,197,683</td>
<td>4.8%</td>
<td>0.5%</td>
<td>$0.88</td>
<td>0.36</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28,262</strong></td>
<td><strong>791,452,621</strong></td>
<td><strong>$198,338,466</strong></td>
<td></td>
<td></td>
<td><strong>$0.25</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Lines have been suppressed and removed from Total

Figure 5-13 facilitates snapshot comparisons of the percent of projects and percent of savings by end use. For the reader’s benefit, in 2016 we have changed this chart from a pie chart to a bar chart. In the legend, we have also labeled the percent of total projects and the percent of total savings. As this figure shows:

- The proportion of upstream savings provided in 2016 is the same as seen in 2015 at 21%, however their proportion of projects decreased from 63% to 57% of electric projects.
- The proportion of savings from CHP projects declined substantially in 2016 at 9.8%, compared to 20% in 2015.
- HVAC measures appear to hold high-savings opportunities for electric PAs as seen in Figure 5-13 with a proportion of 2016 projects of 3%, but a 13% proportion of savings. This was an increase in 2015’s proportion of savings at 10%.
Figure 5-13. Electric end use project count and savings proportions, including upstream
Table 5-8 summarizes historical kWh savings for the standardized end uses from 2011 to 2016. Similar to 2015, DNV GL extracted upstream lighting and upstream HVAC (upstream other), as their own separate end uses. Although overall savings decreased in 2016, the differences between 2016 and 2015 vary widely for each end use. In particular:

- Savings from non-upstream lighting are at the highest level of the past 6 years. In 2016, the largest drivers of non-upstream lighting savings were National Grid and Eversource accounts who installed custom retrofits for lighting systems, controls, and fixtures. The largest of these projects were for accounts in the Mining, Quarrying, and Oil and Gas Extraction; Retail Trade; Manufacturing; and Transportation and Warehousing industry sectors.
- In 2016, non-upstream HVAC savings increased after a large drop in 2015. Savings from upstream HVAC decreased quite substantially in 2016.
- In 2016, the upstream program did not yield as much savings as the last 2 years. The program's total contribution (combining lighting and HVAC) to 2016 savings remained consistent with 2015 at 22%.
- Savings from building shell, process, and refrigeration measures are the highest level of the past 6 years. In 2016 there were significant decreases in savings from CHP measures, comprehensive design measures, and motors/drives.

Table 5-8. 2011–2016 gross savings by end use, electric

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>131,662,267</td>
<td>34,810,302</td>
<td>62,144,927</td>
<td>7,231,697</td>
<td>181,157,750</td>
<td>77,916,841</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>19,248,747</td>
<td>18,964,286</td>
<td>33,143,077</td>
<td>27,691,534</td>
<td>31,233,345</td>
<td>12,651,536</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>3,688,088</td>
<td>16,949,587</td>
<td>17,900,734</td>
<td>19,750,855</td>
<td>17,118,365</td>
<td>12,429,261</td>
</tr>
<tr>
<td>Food Service</td>
<td>-</td>
<td>60,168</td>
<td>884,626</td>
<td>575,431</td>
<td>325,212</td>
<td>30,331</td>
</tr>
<tr>
<td>Hot Water</td>
<td>3,574,899</td>
<td>4,460,999</td>
<td>2,440,099</td>
<td>885,864</td>
<td>232,981</td>
<td>214,389</td>
</tr>
<tr>
<td>HVAC</td>
<td>94,514,022</td>
<td>137,519,282</td>
<td>122,849,389</td>
<td>128,133,546</td>
<td>88,674,130</td>
<td>103,493,631</td>
</tr>
<tr>
<td>Lighting</td>
<td>204,777,829</td>
<td>244,350,585</td>
<td>226,810,143</td>
<td>252,125,120</td>
<td>263,907,465</td>
<td>327,655,722</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>9,569,706</td>
<td>20,886,346</td>
<td>38,069,737</td>
<td>26,322,042</td>
<td>11,881,697</td>
<td>5,585,424</td>
</tr>
<tr>
<td>N/A</td>
<td>-</td>
<td>-</td>
<td>1,052,292</td>
<td>3,561,171</td>
<td>11,690,052</td>
<td>3,634,731</td>
</tr>
<tr>
<td>Other</td>
<td>1,122,890</td>
<td>5,231,062</td>
<td>486,117</td>
<td>900,129</td>
<td>1,256,619</td>
<td>316,927</td>
</tr>
<tr>
<td>Process</td>
<td>26,996,577</td>
<td>28,054,513</td>
<td>23,145,439</td>
<td>27,263,235</td>
<td>31,594,577</td>
<td>55,603,659</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>447,229</td>
<td>525,072</td>
<td>1,987,558</td>
<td>270,588</td>
<td>6,330,022</td>
<td>14,893,322</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>-</td>
<td>-</td>
<td>1,052,292</td>
<td>3,561,171</td>
<td>11,690,052</td>
<td>9,366,940</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>-</td>
<td>59,895,345</td>
<td>105,699,091</td>
<td>182,449,405</td>
<td>189,689,492</td>
<td>167,808,802</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>542,809,471</strong></td>
<td><strong>611,338,966</strong></td>
<td><strong>665,557,235</strong></td>
<td><strong>751,900,170</strong></td>
<td><strong>906,813,829</strong></td>
<td><strong>791,769,548</strong></td>
</tr>
</tbody>
</table>
Figure 5-14 provides a year-over-year comparison showing the percent of projects by end use from 2011 to 2016. This figure also presents the trends seen in the table above: decreases in 2016 in upstream lighting projects and increases in non-upstream lighting projects. Though there were more upstream than non-upstream HVAC projects undertaken, non-upstream projects achieved more HVAC savings.

**Figure 5-14. 2011–2016 project count proportion by electric end use impacted**
Figure 5-15 provides a year-over-year comparison showing the percent of savings by end use from 2011 to 2016. Key points of interest include the following:

- CHP’s contribution to savings in 2016 decreased substantially from 2015, back to its 2013 value of 10%. As outlined in the 2015 C&I Comprehensive Customer Profile report, this spike in proportional savings was driven by a few large accounts from National Grid and Eversource.
- As discussed in Table 5-8, non-upstream lighting made up the largest proportion of savings in 2016. Overall, lighting continues to contribute the majority of electric savings.

Figure 5-15. 2011–2016 savings proportion by electric end use impacted

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Table 5-9 presents lifetime savings for electric end uses in 2016. Measures are listed in the table only if their lifetime savings were provided by the PAs or could be calculated using the PAs’ data. CHP and lighting are the two leading end use savers for electric. HVAC’s lifetime savings has increased and HVAC is now a substantial contributor to overall electric lifetime savings. Lighting’s large savings rate is a consistent historical trend.

Table 5-9. Lifetime savings by end use 2016, electric (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>Proportion of lifetime savings</th>
<th>Lifetime savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>0.0%</td>
<td>1,265,348</td>
</tr>
<tr>
<td>CHP</td>
<td>19.0%</td>
<td>1,557,720,317</td>
</tr>
<tr>
<td>Comprehensive</td>
<td>2.7%</td>
<td>219,275,217</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>1.9%</td>
<td>151,808,988</td>
</tr>
<tr>
<td>Food Service</td>
<td>0.0%</td>
<td>1,915,363</td>
</tr>
<tr>
<td>Hot Water</td>
<td>0.0%</td>
<td>1,753,258</td>
</tr>
<tr>
<td>HVAC</td>
<td>15.3%</td>
<td>1,256,372,170</td>
</tr>
<tr>
<td>Lighting</td>
<td>48.7%</td>
<td>3,990,957,205</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>0.8%</td>
<td>69,287,890</td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>3,703,386</td>
</tr>
<tr>
<td>Process</td>
<td>8.7%</td>
<td>710,576,903</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>2.0%</td>
<td>167,107,334</td>
</tr>
<tr>
<td>N/A</td>
<td>0.6%</td>
<td>53,127,999</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>0.2%</td>
<td>15,623,526</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>8,200,494,903</strong></td>
</tr>
</tbody>
</table>

Table 5-10 presents measure categories associated with projects and energy savings in 2016. This table is an extension of the broad end use categories presented in Table 5-8. Totals may differ between these two tables, as we removed some specific end uses due to project suppression rules (<15 projects are not included). The Equipment sub use is primarily associated with process measures for which there is limited additional detail (see Table 5-28). Among statewide electric projects:

- This more granular view of end uses installed in 2016 supports non-upstream lighting as the leader in proportion of savings. This is consistent year over year.
- As seen previously, there were more upstream than non-upstream lighting projects. However, non-upstream measures provided more savings. Furthermore, non-upstream’s contribution to savings is larger than 2015. Both of these classes include T8s, T5s, high-intensity fluorescents, LEDs, and other higher efficiency lighting.
- Although there were not as many CHP projects in 2016 as 2015, CHP continues to provide the third largest proportion of savings.
- Table 5-10 also illustrates that a bulk of the process end use savings comes from controls and motor savings.

In 2016, lighting control measures provided 15.8 million kWh in gross savings, more than doubling their savings from 2015 and 2014 (7.8 million kWh in savings each year).
Table 5-10. Population summary – electric measure categories, including upstream lighting and upstream HVAC

<table>
<thead>
<tr>
<th>Specific end use</th>
<th>2016 projects</th>
<th>2016 population savings (kWh)</th>
<th>2016 total incentives paid</th>
<th>% of 2016 projects</th>
<th>% of 2016 savings</th>
<th>Incentive per kWh saved</th>
<th>Contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>131</td>
<td>260,406</td>
<td>$39,803</td>
<td>0.4%</td>
<td>0.0%</td>
<td>$0.15</td>
<td>0.07</td>
</tr>
<tr>
<td>Building Shell</td>
<td>16</td>
<td>168,541</td>
<td>$143,059</td>
<td>0.1%</td>
<td>0.0%</td>
<td>$0.85</td>
<td>0.40</td>
</tr>
<tr>
<td>CDA</td>
<td>97</td>
<td>12,651,536</td>
<td>$3,771,418</td>
<td>0.3%</td>
<td>1.6%</td>
<td>$0.30</td>
<td>4.91</td>
</tr>
<tr>
<td>Chillers</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>22</td>
<td>77,916,841</td>
<td>$11,199,544</td>
<td>0.1%</td>
<td>9.8%</td>
<td>$0.14</td>
<td>133.25</td>
</tr>
<tr>
<td>Compressed Air- Other</td>
<td>41</td>
<td>570,416</td>
<td>$9,685</td>
<td>0.1%</td>
<td>0.1%</td>
<td>$0.02</td>
<td>0.52</td>
</tr>
<tr>
<td>Compressor</td>
<td>67</td>
<td>2,265,629</td>
<td>$304,654</td>
<td>0.2%</td>
<td>0.3%</td>
<td>$0.13</td>
<td>1.27</td>
</tr>
<tr>
<td>Cooking</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>DEEC</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Dryer</td>
<td>69</td>
<td>709,039</td>
<td>$166,094</td>
<td>0.2%</td>
<td>0.1%</td>
<td>$0.23</td>
<td>0.39</td>
</tr>
<tr>
<td>Equipment</td>
<td>123</td>
<td>12,779,277</td>
<td>$3,732,199</td>
<td>0.4%</td>
<td>1.6%</td>
<td>$0.29</td>
<td>3.91</td>
</tr>
<tr>
<td>Food Service-Controls</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Heat Pump</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>18</td>
<td>899,185</td>
<td>$528,428</td>
<td>0.1%</td>
<td>0.1%</td>
<td>$0.59</td>
<td>1.88</td>
</tr>
<tr>
<td>HVAC-Chiller</td>
<td>196</td>
<td>34,993,557</td>
<td>$7,325,505</td>
<td>0.7%</td>
<td>4.4%</td>
<td>$0.21</td>
<td>6.72</td>
</tr>
<tr>
<td>HVAC-Controls</td>
<td>273</td>
<td>21,425,800</td>
<td>$4,875,760</td>
<td>0.9%</td>
<td>2.7%</td>
<td>$0.23</td>
<td>2.95</td>
</tr>
<tr>
<td>Lighting</td>
<td>6,752</td>
<td>311,877,709</td>
<td>$107,795,981</td>
<td>22.7%</td>
<td>39.4%</td>
<td>$0.35</td>
<td>1.74</td>
</tr>
<tr>
<td>Lighting-Controls</td>
<td>1,264</td>
<td>15,747,368</td>
<td>$6,229,866</td>
<td>4.2%</td>
<td>2.0%</td>
<td>$0.40</td>
<td>0.47</td>
</tr>
<tr>
<td>Low-flow Showerhead</td>
<td>21</td>
<td>21,739</td>
<td>$11,917</td>
<td>0.1%</td>
<td>0.0%</td>
<td>$0.55</td>
<td>0.04</td>
</tr>
<tr>
<td>Motors</td>
<td>670</td>
<td>56,448,633</td>
<td>$10,952,488</td>
<td>2.2%</td>
<td>7.1%</td>
<td>$0.19</td>
<td>3.17</td>
</tr>
<tr>
<td>Motors-Controls</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>1,584</td>
<td>28,044,440</td>
<td>$7,331,877</td>
<td>5.3%</td>
<td>3.5%</td>
<td>$0.26</td>
<td>0.67</td>
</tr>
<tr>
<td>Process</td>
<td>130</td>
<td>25,922,172</td>
<td>$5,538,763</td>
<td>0.4%</td>
<td>3.3%</td>
<td>$0.21</td>
<td>7.50</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>42</td>
<td>2,935,422</td>
<td>$1,002,505</td>
<td>0.1%</td>
<td>0.4%</td>
<td>$0.34</td>
<td>2.63</td>
</tr>
<tr>
<td>Refrigeration-Controls</td>
<td>401</td>
<td>6,916,591</td>
<td>$1,421,826</td>
<td>1.3%</td>
<td>0.9%</td>
<td>$0.21</td>
<td>0.65</td>
</tr>
<tr>
<td>Refrigeration-Lighting</td>
<td>167</td>
<td>1,195,427</td>
<td>$493,032</td>
<td>0.6%</td>
<td>0.2%</td>
<td>$0.41</td>
<td>0.27</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unitary</td>
<td>29</td>
<td>152,703</td>
<td>$57,973</td>
<td>0.1%</td>
<td>0.0%</td>
<td>$0.38</td>
<td>0.20</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>1,066</td>
<td>9,366,940</td>
<td>$3,433,412</td>
<td>3.6%</td>
<td>1.2%</td>
<td>$0.37</td>
<td>0.33</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>16,558</td>
<td>167,808,802</td>
<td>$21,832,722</td>
<td>55.6%</td>
<td>21.2%</td>
<td>$0.13</td>
<td>0.38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>29,737</td>
<td>791,078,174</td>
<td>$198,198,509</td>
<td></td>
<td></td>
<td>$0.25</td>
<td></td>
</tr>
</tbody>
</table>

* A project is the unique combination of fuel, PA, account ID, and project ID

** Total rows will decrease slightly due to suppression rules

33 DEEC stands for dual enthalpy economizer.
Table 5-11 provides a summary of historical savings for the standardized specific measure types from 2011 to 2016. Noteworthy findings include the following:

- Most end uses decreased in savings from 2015. There were a few measure types that increased substantially compared to 2015.
- Savings from building shell increased substantially in 2016.
- Measure savings from process, low-flow showerheads, and HVAC chillers also show large increases from 2015. Specific process end use savings were strongly influenced by National Grid’s large manufacturing, retail trade, and transportation accounts installing custom process equipment measures. Most of these accounts are 5- and 6-year participants.
- HVAC chiller savings were driven primarily by Eversource accounts installing custom retrofit and new construction HVAC chiller equipment. The majority of these accounts were real estate and rental and leasing customers.

  Controls also continue to be an important part of electric HVAC solutions. Controls account for 27% of electric HVAC measures installed from 2011–2016, and represent 28% of the 6-year kWh savings. In 2016, controls provided 21.4 million kWh in savings. Savings from electric HVAC control measures have been steadily decreasing over time, but this is likely the result of overall HVAC savings decreasing each year. Over half of the electric HVAC control measures installed in 2016 were from Eversource, with a few large accounts in Manufacturing and Educational Services installing the highest-savings electric HVAC control measures. Accommodation and Food Services installed more of the 2016 electric HVAC control measures than all the other sectors (22%).

- Lighting continues to increase in gross savings every year since 2013. Both National Grid and Eversource engaged many accounts installing custom lighting measures, increasing overall savings for lighting more than seen previously.
- Savings from hot water measures decreased substantially compared to 2015. This measure end use appears to have high variability in electric savings from year to year.
- CHP and comprehensive design (CDA) savings also decreased sharply from their 2015 values. Savings from CHP spiked in 2015 due to numerous large custom retrofit CHP projects completed by National Grid and Eversource that year.
- Savings from non-upstream HVAC and unitary HVAC appear to be in a decreasing trend; upstream HVAC also ticked down in 2016.

  National Grid installed over half of the 2016 lighting control measures (56%). Eversource provided the highest-saving lighting controls projects, which made up 6% of total kWh savings for lighting control measures. Most 2016 lighting control projects were seen in the Professional Services and Retail Trade industry sectors, (15% and 14%, respectively).
Table 5-11. 2011–2016 gross savings by measure category, electric – including unlinked data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>165,335</td>
<td>40,445</td>
<td>42,135</td>
<td>115,204</td>
<td>280,675</td>
<td>260,406</td>
</tr>
<tr>
<td>Boilers</td>
<td></td>
<td>1,800</td>
<td>355,703</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Shell</td>
<td>254,023</td>
<td>474,365</td>
<td>107,739</td>
<td>225,677</td>
<td>70,758</td>
<td>168,541</td>
</tr>
<tr>
<td>CDA</td>
<td>19,248,747</td>
<td>18,964,286</td>
<td>33,128,221</td>
<td>27,691,534</td>
<td>31,233,345</td>
<td>12,651,536</td>
</tr>
<tr>
<td>Chiller</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36,541</td>
<td>264,253</td>
</tr>
<tr>
<td>CHP</td>
<td>145,389,797</td>
<td>35,941,509</td>
<td>62,144,927</td>
<td>7,231,697</td>
<td>181,157,750</td>
<td>77,916,841</td>
</tr>
<tr>
<td>Compressed air-controls</td>
<td>487,417</td>
<td>442,197</td>
<td>1,641,308</td>
<td></td>
<td>259,232</td>
<td></td>
</tr>
<tr>
<td>Compressed air-other</td>
<td>152,661</td>
<td>274,245</td>
<td>401,664</td>
<td>759,287</td>
<td>973,543</td>
<td>570,416</td>
</tr>
<tr>
<td>Compressor</td>
<td>12,214,451</td>
<td>14,294,037</td>
<td>13,854,070</td>
<td>17,151,516</td>
<td>2,265,629</td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td></td>
<td></td>
<td></td>
<td>60,168</td>
<td>246,492</td>
<td>54,140</td>
</tr>
<tr>
<td>DEEC</td>
<td>1,948,569</td>
<td>788,395</td>
<td>1,585,762</td>
<td>1,503,926</td>
<td>236,111</td>
<td></td>
</tr>
<tr>
<td>Dishwasher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15,747,368</td>
<td></td>
</tr>
<tr>
<td>Dryer</td>
<td>284,632</td>
<td>494,696</td>
<td>252,528</td>
<td>617,404</td>
<td>4,040,411</td>
<td>709,039</td>
</tr>
<tr>
<td>Equipment</td>
<td>14,604,261</td>
<td>14,099,571</td>
<td>5,352,598</td>
<td>65,952,515</td>
<td>59,345,471</td>
<td>12,779,277</td>
</tr>
<tr>
<td>Food service-controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>116,489</td>
<td>446,477</td>
</tr>
<tr>
<td>Furnace</td>
<td></td>
<td></td>
<td></td>
<td>60,168</td>
<td>246,492</td>
<td>54,140</td>
</tr>
<tr>
<td>Heat Pump</td>
<td>521,742</td>
<td>945,104</td>
<td>1,512,068</td>
<td>872,855</td>
<td>575,752</td>
<td>285,179</td>
</tr>
<tr>
<td>Hot Water</td>
<td>28,468</td>
<td>17,054</td>
<td>357,323</td>
<td>111,561</td>
<td>571,059</td>
<td>3,865</td>
</tr>
<tr>
<td>HVAC</td>
<td>4,229</td>
<td>223,221</td>
<td>11,795,304</td>
<td>3,991,792</td>
<td>899,185</td>
<td></td>
</tr>
<tr>
<td>HVAC-Chiller</td>
<td>24,946,722</td>
<td>8,405,201</td>
<td>47,210,254</td>
<td>34,608,458</td>
<td>14,263,097</td>
<td>34,993,557</td>
</tr>
<tr>
<td>HVAC-controls</td>
<td>30,828,477</td>
<td>58,350,298</td>
<td>34,869,488</td>
<td>31,623,466</td>
<td>21,605,110</td>
<td>21,425,800</td>
</tr>
<tr>
<td>Lighting</td>
<td>192,237,356</td>
<td>229,039,997</td>
<td>158,105,166</td>
<td>244,337,636</td>
<td>256,079,693</td>
<td>311,877,709</td>
</tr>
<tr>
<td>Lighting-controls</td>
<td>12,541,894</td>
<td>15,310,589</td>
<td>10,579,432</td>
<td>7,878,484</td>
<td>15,747,368</td>
<td></td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>4,204,388</td>
<td>6,180,140</td>
<td>3,750,579</td>
<td>40,807</td>
<td>9,940</td>
<td>21,739</td>
</tr>
<tr>
<td>Motors</td>
<td>47,632,474</td>
<td>87,330,445</td>
<td>81,733,639</td>
<td>78,236,230</td>
<td>69,924,653</td>
<td>56,484,633</td>
</tr>
<tr>
<td>Motors-controls</td>
<td></td>
<td></td>
<td></td>
<td>1,095</td>
<td>273,431</td>
<td>17,936</td>
</tr>
<tr>
<td>Other</td>
<td>17,528,172</td>
<td>46,484,286</td>
<td>88,633,005</td>
<td>10,823,931</td>
<td>23,154,640</td>
<td>28,044,440</td>
</tr>
<tr>
<td>Other-controls</td>
<td>3,361</td>
<td>2,571,154</td>
<td>358,474</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>2,928,189</td>
<td>164,410</td>
<td>5,310,197</td>
<td></td>
<td>4,247,876</td>
<td>25,922,172</td>
</tr>
<tr>
<td>Process-controls</td>
<td>98,592</td>
<td>148,001</td>
<td>(208,315)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td>726,138</td>
<td>664,954</td>
<td>1,331,723</td>
<td>1,535,183</td>
<td>2,854,372</td>
<td>2,935,422</td>
</tr>
<tr>
<td>Refrigeration-controls</td>
<td>6,035,269</td>
<td>7,866,256</td>
<td>3,843,074</td>
<td>13,222,879</td>
<td>8,549,020</td>
<td>6,916,591</td>
</tr>
<tr>
<td>Refrigeration-lighting</td>
<td>4,204,388</td>
<td>6,180,140</td>
<td>5,250,118</td>
<td>5,790,521</td>
<td>3,912,320</td>
<td>1,195,427</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>3,849,196</td>
<td></td>
<td></td>
<td></td>
<td>3,994</td>
<td></td>
</tr>
<tr>
<td>Unitary</td>
<td>3,949,141</td>
<td>1,838,822</td>
<td>818,505</td>
<td>2,416,546</td>
<td>717,531</td>
<td>152,703</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>105,699,091</td>
<td>182,449,405</td>
</tr>
<tr>
<td>Upstream lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>189,689,492</td>
<td>167,808,802</td>
</tr>
<tr>
<td>Total</td>
<td>542,809,471</td>
<td>611,338,966</td>
<td>665,557,235</td>
<td>751,900,170</td>
<td>906,813,829</td>
<td>791,701,678</td>
</tr>
</tbody>
</table>

34 Savings from chillers are likely overstated, as some chillers in 2016 data are misidentified due to a data artifact in a PAs’ tracking system.
Figure 5-16 illustrates the 2011–2016 distribution of accounts installing upstream HVAC, upstream lighting, and non-upstream end uses by broad usage bin. It is important to note that 48% of upstream lighting participants and 41% of upstream HVAC participants were successfully matched to the billing data, and therefore upstream accounts are likely to be underrepresented in this chart (see section 3.4.7 for more detail).

The majority of upstream electric participants—both HVAC and lighting—are small accounts. For upstream lighting, 83% of matched accounts consume < 1.5 GWh. Furthermore, 53% of these accounts consume < 0.11 GWh. Similar to upstream lighting, 91% of linked upstream HVAC records are accounts that consume < 1.5 GWh, placing them in the smallest two electric consumption bins (see section 3.4.5 for more detail).
Figure 5-16. 2011–2016 upstream and non-upstream participating accounts by broad consumption bin, electric (excludes unlinked tracking data)
5.2.1 Deeper lighting analysis

The graphics below break down lighting savings and incentives by PA, drawing from analyses produced for the Advanced Lighting Deep Dive report. Figure 5-17 shows, in two different views, how the overall makeup of lighting savings has been changing since 2011.

Non-upstream lighting savings were relatively steady from 2013 to 2015. There was a sharp increase in total GWh savings for 2016. Upstream lighting and non-upstream lighting followed the same savings trend from 2013 until 2016, when they diverged, and upstream lighting savings dropped below its 2014 value.

Figure 5-17. 2011–2016 summary of gross lighting savings

---

Table 5-12 summarizes the total number of annual projects installing lighting measures each year, total annual kWh savings, and incentives paid. There is an apparent variation in non-upstream lighting projects year after year. Non-upstream projects decreased from 2014 to 2015, then rebounded in 2016. Upstream projects decreased substantially from 2014 to 2015 and then decreased again in 2016. Savings and incentives values trends corresponded to project trends for both programs.

Additionally, this table illustrates cost per kWh for lighting savings increasing every year. Comparisons of 2012 and 2016 incentive totals illustrate a substantial increase in incentives. Changes in lighting measures offered through energy efficiency programs over the past 6 years could drive these increases in incentives, where it now requires more money to engage customers in lighting energy efficiency.

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>End Use</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>Lighting</td>
<td>16,253</td>
<td>17,330</td>
<td>15,666</td>
<td>16,926</td>
<td>14,836</td>
<td>17,364</td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>NA</td>
<td>1,445</td>
<td>19,846</td>
<td>35,902</td>
<td>25,698</td>
<td>24,990</td>
</tr>
<tr>
<td>Savings (kWh)</td>
<td>Lighting</td>
<td>204,777,829</td>
<td>244,350,585</td>
<td>226,810,143</td>
<td>252,125,120</td>
<td>263,907,465</td>
<td>327,655,722</td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>NA</td>
<td>59,895,345</td>
<td>105,699,091</td>
<td>182,449,405</td>
<td>189,689,492</td>
<td>167,808,802</td>
</tr>
<tr>
<td>Incentives ($)</td>
<td>Lighting</td>
<td>42,509,616</td>
<td>52,500,654</td>
<td>72,662,940</td>
<td>80,982,631</td>
<td>94,452,157</td>
<td>114,111,867</td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>NA</td>
<td>1,669,985</td>
<td>14,787,595</td>
<td>24,220,136</td>
<td>43,590,652</td>
<td>21,832,722</td>
</tr>
<tr>
<td>$/kWh</td>
<td>Lighting</td>
<td>$0.21</td>
<td>$0.21</td>
<td>$0.32</td>
<td>$0.32</td>
<td>$0.36</td>
<td>$0.35</td>
</tr>
<tr>
<td></td>
<td>Upstream</td>
<td>$</td>
<td>$0.03</td>
<td>$0.14</td>
<td>$0.13</td>
<td>$0.23</td>
<td>$0.13</td>
</tr>
</tbody>
</table>
DNV GL developed the lighting breakdowns in Figure 5-18 with input from the PAs and EEAC Consultants during the reporting process for the Advanced Lighting Deep Dive Report referenced above. Originally, ballasts were a planned category under the “broad” classification. However, during the engineering review and assignment of the classifications to the lighting measure descriptions in the C&I Evaluation database, it was determined that ballasts were often entered as components of a lighting project, as opposed to single-line items in the data. Note that these categories apply to both upstream and non-upstream lighting.

**Figure 5-18. Advanced lighting categorization mapping**

The broad category “upstream data adjustment” is seen throughout this section. It signifies an adjustment made by DNV GL to PA data to ensure that upstream lighting savings from several sources match what each PA claimed in a given year. For more details on this adjustment, see section 3.4.7.1.

The category “other/custom” is a broad category denoting PA data that does not contain enough detailed information to be placed into any other bin. In these cases, the provided measure descriptions are either “lighting,” “custom lighting,” or similar, and simply cannot be further broken down. DNV GL has combined these types of less granular PA data into the single “other/custom” category, but the savings in the category were provided by the PAs.

Inside each broad category the specific category of “other” is also a possible bin, separate from “other/custom”; it is used when either the measure descriptions provided do not allow for a specific breakdown, or the specific category was not planned for in the Advanced Lighting Deep Dive analysis (e.g., “exit signs”).
Figure 5-19 and Figure 5-20 illustrate the annual breakdown of lighting projects and savings by broad lighting category. To aid the reader, upstream lighting (lamps) is depicted in shades of green and non-upstream lighting is depicted in shades of blue. Each chart’s legend also contains the total metric across the chart’s time horizon.

Taken together, Figure 5-19 and Figure 5-20 show that:

- Bulb types purchased through upstream lighting have varied year over year. Screw-based lamps continue to make up the majority of upstream lighting measures sold each year. However, these bulbs have been steadily declining since a peak in 2014. Interestingly, 2016 saw an increase in linear and other LED (not screw-based) bulbs by 230% compared to 2015 and 2014. This increase was not enough to offset the year-over-year decline in screw-based bulbs, resulting in overall lower upstream lighting savings than in 2015 and 2014. Twenty-five percent of the fluorescent bulbs installed in 2016 were via upstream. Interestingly, only 35% were sold to the smallest kWh customers (< 0.11 GWh). Eighteen percent of the 25% of upstream fluorescents were sold to the largest customers, who consume > 4.5 GWh.

- Through the upstream program, for fluorescent bulbs (linear and other, not screw-based):
  
  - In 2016 there were 2,448 projects.
  - In 2015 there were 4,445 projects.
  - In 2014 there were 6,911 projects.
  - In 2013 there were 4,196 projects.

- Lighting control measures increased by 94% in 2016 compared to 2015, and provided more electric savings than seen from 2011-2016.
- In 2016, non-upstream lighting measures identified as "custom/other" increased by 53% compared to 2015, and also provided more electric savings in 2016 than in previous years. These increases in controls and other custom lighting were the large drivers in the substantial amount of electric savings provided by non-upstream lighting in 2016.
- This year, 92% of non-upstream screw-based lamps were LEDs, and 8% were CFLs. The number of screw-based lamp projects increased slightly from 2015 to 2016. These have continued to increase every year, along with savings.
- Linear and other (not screw-based) fluorescent lamp projects increased by 68% from 2015 to 2016 (from 1,212 to 1,546). However, this is still down from the period from 2011-2014, when the average was 6,300 projects.
  
  - 75% of fluorescent bulbs installed in 2016 were via non-upstream. Of this 75%, 50% were installed by smallest customers (< 0.11 GWh) and 77% of this were installed by customers in the first and second smallest bins (< 0.47 GWh).
Figure 5-19. 2011–2016 breakdown of lighting projects by broad category
Figure 5-20. 2011–2016 breakdown of gross annual lighting savings (GWh) by broad category
5.2.1.1 Lighting by project track

Figure 5-21 compares lighting projects by track over the past 6 years. Since 2012, the upstream lighting track has generated more projects than the non-upstream tracks, which are generally driven by prescriptive lighting. Since 2014 upstream lighting projects have decreased. Lighting custom projects have steadily increased over time.

Figure 5-21. Breakdown of lighting projects by track, 2011-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Custom</th>
<th>Prescriptive</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>560</td>
<td>15,693</td>
<td>-</td>
</tr>
<tr>
<td>2012</td>
<td>1,771</td>
<td>15,559</td>
<td>1,445</td>
</tr>
<tr>
<td>2013</td>
<td>732</td>
<td>14,934</td>
<td>19,846</td>
</tr>
<tr>
<td>2014</td>
<td>913</td>
<td>16,013</td>
<td>35,902</td>
</tr>
<tr>
<td>2015</td>
<td>1,715</td>
<td>13,121</td>
<td>25,698</td>
</tr>
<tr>
<td>2016</td>
<td>3,047</td>
<td>14,560</td>
<td>24,990</td>
</tr>
</tbody>
</table>
Figure 5-22 summarizes the lighting evolution by track, showing each track’s contribution to total projects, savings, and incentives. This figure, along with Figure 5-21, shows the decreasing share of upstream projects and savings.

**Figure 5-22. 2011–2016 comparisons of lighting projects, savings, and incentives by project track**
While there are fewer custom lighting projects across all years, Table 5-13 illustrates that these custom projects generate a substantial proportion of annual savings. In 2016, custom lighting savings were 19% higher than ever, and prescriptive lighting savings reached a 6-year high. Evidently, both custom and prescriptive projects drove the large increase in non-upstream lighting savings in 2016.


<table>
<thead>
<tr>
<th>Savings (kWh)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom</td>
<td>48,543,476</td>
<td>92,329,965</td>
<td>81,224,616</td>
<td>111,421,358</td>
<td>119,885,482</td>
<td>164,012,176</td>
</tr>
<tr>
<td>Prescriptive</td>
<td>156,234,353</td>
<td>152,020,621</td>
<td>145,585,527</td>
<td>140,703,762</td>
<td>144,021,983</td>
<td>163,643,546</td>
</tr>
<tr>
<td>Upstream</td>
<td>59,895,345</td>
<td>105,699,091</td>
<td>182,449,405</td>
<td>189,689,492</td>
<td>163,808,802</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>204,777,829</td>
<td>304,245,930</td>
<td>332,509,234</td>
<td>434,574,525</td>
<td>453,596,957</td>
<td>495,464,524</td>
</tr>
</tbody>
</table>

Table 5-14. Summary of annual statewide lighting incentives by track, 2011–2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom</td>
<td>$9,769,505</td>
<td>$22,531,799</td>
<td>$17,652,859</td>
<td>$30,113,187</td>
<td>$32,850,027</td>
<td>$59,022,599</td>
</tr>
<tr>
<td>Prescriptive</td>
<td>$32,740,111</td>
<td>$29,968,854</td>
<td>$55,010,081</td>
<td>$50,869,445</td>
<td>$61,602,130</td>
<td>$55,089,268</td>
</tr>
<tr>
<td>Upstream</td>
<td>$1,669,985</td>
<td>$14,787,595</td>
<td>$24,220,136</td>
<td>$43,590,652</td>
<td>$21,832,722</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$42,509,616</td>
<td>$54,170,639</td>
<td>$87,450,535</td>
<td>$105,202,768</td>
<td>$138,042,809</td>
<td>$135,944,588</td>
</tr>
</tbody>
</table>
5.2.1.2 Lighting by project class

Analysis of lighting installations by class from 2011–2016 reveals that the majority of program activity occurs within either retrofit or upstream programs. Figure 5-23 and Figure 5-24 summarize statewide lighting activity over the past 6 years. These figures show the number of projects, the total annual gross kWh savings, and the annual incentives provided. New construction and retrofit projects continued to increase in 2016.

Figure 5-23. 2011–2016 breakdown of lighting projects by class

<table>
<thead>
<tr>
<th>Year</th>
<th>New Construction</th>
<th>Retrofit</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>506</td>
<td>15,747</td>
<td>-</td>
</tr>
<tr>
<td>2012</td>
<td>658</td>
<td>16,672</td>
<td>1,445</td>
</tr>
<tr>
<td>2013</td>
<td>693</td>
<td>14,973</td>
<td>19,846</td>
</tr>
<tr>
<td>2014</td>
<td>925</td>
<td>16,001</td>
<td>35,902</td>
</tr>
<tr>
<td>2015</td>
<td>1,008</td>
<td>13,828</td>
<td>25,698</td>
</tr>
<tr>
<td>2016</td>
<td>1,185</td>
<td>16,179</td>
<td>24,990</td>
</tr>
</tbody>
</table>

36 New Construction contains True New Construction, Replace on Failure, End of Useful Life, and Major Retrofit measures.
Figure 5-24. 2011–2016 comparisons of lighting projects, savings, and incentives by project class
Table 5-15 presents gross annual savings of lighting measures broken out by project class. The retrofit class shows the most overall savings each year. Retrofit measure savings were also larger in 2016 than in 2015. Both retrofit’s and new construction’s highest savings values were in 2016.

Table 5-15. Summary of annual statewide lighting savings by class, 2011–2016

<table>
<thead>
<tr>
<th>Savings (kWh)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td>18,218,165</td>
<td>20,042,146</td>
<td>19,305,150</td>
<td>22,253,825</td>
<td>33,088,175</td>
<td>34,319,130</td>
</tr>
<tr>
<td>Retrofit</td>
<td>186,559,665</td>
<td>224,308,440</td>
<td>207,504,993</td>
<td>229,871,295</td>
<td>230,819,290</td>
<td>293,336,592</td>
</tr>
<tr>
<td>Upstream</td>
<td>59,895,345</td>
<td>105,699,091</td>
<td>182,449,405</td>
<td>189,689,492</td>
<td>167,808,802</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>204,777,829</strong></td>
<td><strong>304,245,930</strong></td>
<td><strong>332,509,234</strong></td>
<td><strong>434,574,525</strong></td>
<td><strong>453,596,957</strong></td>
<td><strong>495,464,524</strong></td>
</tr>
</tbody>
</table>

Table 5-16 breaks down total incentives from 2011-2016. Incentives for non-upstream classes (retrofit and new construction) increased sharply from 2015 to 2016.

Table 5-16. Summary of annual statewide lighting incentives by class, 2011–2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td>$3,083,046</td>
<td>$2,435,164</td>
<td>$4,704,457</td>
<td>$5,076,629</td>
<td>$7,860,264</td>
<td>$8,789,844</td>
</tr>
<tr>
<td>Retrofit</td>
<td>$39,426,570</td>
<td>$50,065,489</td>
<td>$67,958,483</td>
<td>$75,906,002</td>
<td>$86,591,893</td>
<td>$105,322,023</td>
</tr>
<tr>
<td>Upstream</td>
<td>$1,669,985</td>
<td>$14,787,595</td>
<td>$24,220,136</td>
<td>$43,590,652</td>
<td>$21,832,722</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$42,509,616</strong></td>
<td><strong>$54,170,639</strong></td>
<td><strong>$87,450,535</strong></td>
<td><strong>$105,202,768</strong></td>
<td><strong>$138,042,809</strong></td>
<td><strong>$135,944,588</strong></td>
</tr>
</tbody>
</table>

5.2.2 Deeper HVAC analysis

This section summarizes high-level analyses of HVAC in the electric market. In the following analysis, all tracking data is restricted to reflect HVAC-only impacts (on number of projects, number of participating accounts, amount of kWh savings, and incentives paid). The electric market has two different sources of HVAC savings that will be noted throughout the analysis:

- Non-upstream HVAC, which exists across all years in the analysis
- Upstream HVAC, which began in 2013. The 2013 data, coming from the first year, has quality issues that disconnect savings from specific projects. This causes the 2013 data to be suppressed in tables throughout the section; for brevity, this is noted in the section as “data artifacts.”
Figure 5-25 summarizes the details of HVAC projects over the 6-year analysis period, as follows:

- Over time, the number of HVAC projects has increased. Beginning with 2014, increases were largely the result of the introduction and growth of the upstream HVAC program. Non-upstream project growth was relatively small, with individual years prior to 2014 showing some variability, and a steady decline following the peak reached in 2014.

The chart presenting HVAC savings over time (top right) illustrates somewhat of a decreasing trend in HVAC savings since 2012. The upstream program has helped provide additional savings for this end use; it appears that savings in 2015 would have been the lowest of the 6-year period if it weren’t for the upstream program. For 2016, HVAC electric savings did increase. Of electric participants who installed either upstream or non-upstream HVAC measures, 52% were from Eversource, and 42% were from National Grid. These measures were largely undertaken by accounts in Retail Trade, Professional Services, and Accommodation and Food Services. The highest electric HVAC savings provided in 2016 were from custom projects by a few large Manufacturing accounts from Eversource.

- It is important to note that the upstream program does not increase annual savings to the same degree that it increases the number of annual projects. Upstream HVAC includes many HVAC measures that used to be prescriptive or whose savings were calculated like prescriptive. These projects tend to address specific equipment rather than systems as a whole, which is partially why savings achieved are not as large as a custom HVAC project, for example.

- From 2011 to 2014, while the annual incentives paid in HVAC programs increased substantially, savings did not show a corresponding increase. This indicates that it was relatively costly to the PAs to achieve HVAC savings from 2012-2014.

- Although 2015 and 2016 show distinct drops in savings and incentives, the overall $/kWh savings remained relatively consistent with 2014.\footnote{The spike in the 2014 upstream incentive per savings measure is largely due to data quality. Several accounts recorded incentives, but no savings for 2016, causing this measure to be artificially inflated. Removing these accounts results in a $/kWh of $0.20.} In addition, the $/kWh spent for the upstream program was substantially higher than non-upstream, although often variable.
Figure 5-25. 2011–2016 summary of HVAC activity, electric

- Number of Annual HVAC Projects
- Annual HVAC savings (GWh)
- Total annual HVAC incentives (millions)
- Average annual HVAC $/kWh saved

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-upstream</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The figures show the comparison of non-upstream and upstream activities over the years 2011 to 2016.
Table 5-17 presents the data illustrated in Figure 5-25. Due to data artifacts, the 2013 upstream data has been suppressed.

### Table 5-17. 2011–2016 summary of statewide HVAC activity, electric

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-upstream</th>
<th>Upstream</th>
<th>Total</th>
<th>Non-upstream</th>
<th>Upstream</th>
<th>Total</th>
<th>Non-upstream</th>
<th>Upstream</th>
<th>Total</th>
<th>Non-upstream</th>
<th>Upstream</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>862</td>
<td>94,514,022</td>
<td>95,376,044</td>
<td>$14,516,657</td>
<td>$14,516,657</td>
<td>$14,516,657</td>
<td>1,015</td>
<td>$24,346,244</td>
<td>$24,346,244</td>
<td>$24,346,244</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>2012</td>
<td>1,105</td>
<td>137,519,282</td>
<td>138,624,787</td>
<td>$26,391,560</td>
<td>$26,391,560</td>
<td>$26,391,560</td>
<td>1,023</td>
<td>$26,391,560</td>
<td>$26,391,560</td>
<td>$26,391,560</td>
<td>0.21</td>
<td>0.21</td>
</tr>
<tr>
<td>2013</td>
<td>1,023</td>
<td>122,849,389</td>
<td>123,872,812</td>
<td>$27,370,614</td>
<td>$1,487,328</td>
<td>$28,857,942</td>
<td>1,190</td>
<td>$12,967,359</td>
<td>$12,967,359</td>
<td>$12,967,359</td>
<td>0.21</td>
<td>0.21</td>
</tr>
<tr>
<td>2014</td>
<td>1,190</td>
<td>128,133,546</td>
<td>129,323,636</td>
<td>$20,137,225</td>
<td>$0.25</td>
<td>$20,384,470</td>
<td>1,086</td>
<td>$7,656,994</td>
<td>$7,656,994</td>
<td>$7,656,994</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>2015</td>
<td>986</td>
<td>88,674,130</td>
<td>99,658,296</td>
<td>$17,176,279</td>
<td>$2,960,945</td>
<td>$20,137,225</td>
<td>2016</td>
<td>$19,343,132</td>
<td>$23,726,544</td>
<td>$0.19</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>797</td>
<td>103,493,631</td>
<td>111,291,268</td>
<td>$15,343,132</td>
<td>$50,037,509</td>
<td>$65,380,641</td>
<td>1,064</td>
<td>$19,343,132</td>
<td>$23,726,544</td>
<td>$0.19</td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

Total: 4,304

*Lines have been suppressed and removed from Total

### 5.2.2.1 Project-level track summary

Table 5-18 shows how HVAC projects are split between the various programs for each PA in 2016. Statewide, the custom program is the primary driver of annual HVAC savings, while prescriptive and upstream are the primary drivers of the number of annual projects. Among all PAs, as projects increase, savings per projects increases as well. This metric is calculated by dividing savings by project in the table below.

- Eversource experienced a substantial increase in savings achieved per project for 2016. Total custom HVAC projects decreased compared to 2015 (257 custom HVAC projects), but savings achieved by the 155 custom HVAC projects increased by 150% compared to 2015’s value. This suggest in increase comprehensiveness for these projects.

### Table 5-18. Tracking statistics by fuel, PA, and track; 2016 electric – HVAC

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Custom Projects</th>
<th>Custom Savings (kWh)</th>
<th>Custom % Projects</th>
<th>Custom % Savings</th>
<th>Prescriptive Projects</th>
<th>Prescriptive Savings (kWh)</th>
<th>Prescriptive % Projects</th>
<th>Prescriptive % Savings</th>
<th>Upstream Projects</th>
<th>Upstream Savings (kWh)</th>
<th>Upstream % Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>16</td>
<td>438,407</td>
<td>14%</td>
<td>37%</td>
<td>24</td>
<td>318,479</td>
<td>22%</td>
<td>27%</td>
<td>71</td>
<td>417,025</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>211</td>
<td>53,942,454</td>
<td>21%</td>
<td>70%</td>
<td>223</td>
<td>15,182,488</td>
<td>22%</td>
<td>20%</td>
<td>580</td>
<td>7,656,994</td>
<td>57%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>75</td>
<td>9,255,703</td>
<td>10%</td>
<td>27%</td>
<td>248</td>
<td>24,202,132</td>
<td>34%</td>
<td>70%</td>
<td>413</td>
<td>1,173,339</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>Unifi</td>
<td>*</td>
<td>-</td>
<td>0%</td>
<td>0%</td>
<td>*</td>
<td>153,968</td>
<td>67%</td>
<td>56%</td>
<td>*</td>
<td>119,584</td>
<td>33%</td>
</tr>
</tbody>
</table>

Total: 302

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class tables.
Figure 5-26 shows the historical yearly composition of HVAC project track by PA:

- Cape Light Compact has consistently had greater customer HVAC engagement in its prescriptive program than the other PAs, although this has lessened with the introduction of upstream.
- Unitil has more variation than the other PAs in program engagement, likely due to its smaller overall population, which might not be able to sustain consistent year-over-year HVAC projects.
- Prior to the creation of the upstream HVAC program, engagement across the PAs was due primarily to prescriptive installations. The upstream program has substantially shifted the mix of HVAC projects away from prescriptive.
- Eversource has historically experienced heavy engagement from custom projects, though this has been decreasing over time. Figure 5-27 shows that custom projects still remain a substantial source of savings each year.

**Figure 5-26. 2011–2016 trends of custom versus prescriptive versus upstream projects, electric – HVAC only**

<table>
<thead>
<tr>
<th>Year</th>
<th>Custom Projects</th>
<th>Prescriptive Projects</th>
<th>Upstream Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 5-27 illustrates the savings associated with each track. The custom track is generally the largest contributor to savings each year, despite the overall lower number of projects falling in this track. Both Eversource and National Grid show a trend of decreased proportional savings from custom projects over time, which could indicate that it is becoming more difficult and costly to engage customers in these high-impact custom opportunities (see Figure 5-25). The availability of upstream options could also be serving customers not previously reached by other offerings. Eversource has consistently generated a higher percentage of savings from custom projects than the other PAs, which may indicate that its recruitment strategies for customers needing custom solutions have a larger impact and could be emulated by the other PAs.

**Figure 5-27. 2011–2016 trends of custom versus prescriptive versus upstream savings, electric (kWh) – HVAC only**

---

38 Upstream HVAC includes many HVAC measures that used to be prescriptive (deemed) like unitary systems and dual enthalpy economizers (DEEC). These projects tend to address specific equipment rather than systems as a whole, which is why project savings often are not as large as a custom HVAC project, for example.
### 5.2.2.2 Project-level class summary

Table 5-19 summarizes the 2016 breakdown between the retrofit, new construction, and upstream classes. It is important to note that there is not a direct, one-to-one relationship between project track and project class: this causes differences in project counts. In 2016, upstream installations replaced retrofit installations as the primary source of HVAC projects. Retrofit was the primary contributor to savings by a substantial margin, which indicates that these projects typically have high savings associated with each installation. Upstream HVAC is currently an offering under the new construction program, but has been included as its own class to increase overall transparency. Generally, upstream participation falls under "replace on failure" or "true new construction."

Retrofit projects account for 31% of HVAC projects but 74% of savings in 2016. Manufacturing projects led the Retrofit track with 25% of savings; interestingly, National Grid completed 84% of the Manufacturing retrofit projects, while Eversource produced 74% of the savings.

<table>
<thead>
<tr>
<th>PA</th>
<th>Projects</th>
<th>Savings (kWh)</th>
<th>% Projects</th>
<th>% Savings</th>
<th>Projects</th>
<th>Savings (kWh)</th>
<th>% Projects</th>
<th>% Savings</th>
<th>Projects</th>
<th>Savings</th>
<th>% Projects</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>*</td>
<td>443,601</td>
<td>13%</td>
<td>38%</td>
<td>25</td>
<td>313,285</td>
<td>23%</td>
<td>27%</td>
<td>71</td>
<td>417,025</td>
<td>65%</td>
<td>36%</td>
</tr>
<tr>
<td>Eversource</td>
<td>142</td>
<td>16,273,711</td>
<td>14%</td>
<td>21%</td>
<td>279</td>
<td>52,851,231</td>
<td>28%</td>
<td>69%</td>
<td>580</td>
<td>7,656,994</td>
<td>58%</td>
<td>10%</td>
</tr>
<tr>
<td>National Grid</td>
<td>58</td>
<td>3,317,306</td>
<td>8%</td>
<td>10%</td>
<td>263</td>
<td>30,140,529</td>
<td>36%</td>
<td>87%</td>
<td>413</td>
<td>1,173,339</td>
<td>56%</td>
<td>3%</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>*</td>
<td>67%</td>
<td>56%</td>
<td>*</td>
<td>-</td>
<td>0%</td>
<td>0%</td>
<td>*</td>
<td>119,584</td>
<td>33%</td>
<td>44%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>200</strong></td>
<td><strong>20,034,617</strong></td>
<td><strong>11%</strong></td>
<td><strong>18%</strong></td>
<td><strong>567</strong></td>
<td><strong>83,305,046</strong></td>
<td><strong>31%</strong></td>
<td><strong>74%</strong></td>
<td><strong>1,064</strong></td>
<td><strong>9,366,940</strong></td>
<td><strong>58%</strong></td>
<td><strong>8%</strong></td>
</tr>
</tbody>
</table>

Figure 5-28 shows that both National Grid and Eversource have had proportionally fewer HVAC-related new construction projects over the past 6 years, with National Grid showing the most consistent decrease over time. Cape Light Compact’s new construction HVAC projects represent a more variable portion of overall projects, with clear spikes in 2012 and 2013.
Figure 5-28. 2011–2016 trends of new construction versus retrofit versus upstream project counts, electric – HVAC only

<table>
<thead>
<tr>
<th>Year</th>
<th>New Construction</th>
<th>Retrofit</th>
<th>Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>2012</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>2013</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>2014</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>2015</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>2016</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure 5-29 shows that retrofit HVAC projects provide the majority of electric savings for Eversource and National Grid. Most of CLC’s savings came from a mix of New Construction and Upstream HVAC projects, contrasting to previous years’ savings mixes. Similarly, Unitil’s savings from HVAC projects was made up almost equally of New Construction and Upstream HVAC projects.
5.2.2.3 Population-level analysis

General population

To provide a more holistic view of the role HVAC plays in achieving annual results, this section discusses participating HVAC accounts in more depth. This includes a look at annual billing data and at the contribution of HVAC installations toward decreasing annual consumption. This view is slightly more restricted than the project-level view, as it is possible for a single account to participate in multiple HVAC projects over the course of a single year.
Figure 5-30 shows the overall statewide electric trends for HVAC in terms of annual participation rates and population savings achieved (see section 3.3 for information about this metric). The introduction of the upstream HVAC program had a substantial impact on annual HVAC participation rates, almost doubling the rates seen prior to 2014. Annual population savings closely mirrors the trend for total program savings seen in Figure 5-25, with a large increase observed between 2011 and 2012 and a slight declining trend since 2012—although 2016 shows a substantial increase compared to 2015, potentially signaling a plateau in this trend. The participation rate increase and simultaneous annual savings decrease suggests that the upstream program is not achieving the same savings per project as the other HVAC programs.

Figure 5-30. 2011–2016 statewide participation rate and population savings achieved, electric – HVAC only
Figure 5-31 provides a by-PA breakdown of annual participation rates, with details into the role played by the upstream program:

- HVAC participation in Cape Light Compact increased from 2011 to 2015, due to both non-upstream and upstream program participants. 2016 showed lower participation, with upstream making up a substantially larger portion than previous years.
- Eversource non-upstream participation spiked in 2014, but has been decreasing overall since 2011. The upstream HVAC program has helped encourage additional participation, especially in 2016.
- National Grid saw a participation spike in 2015, also due to the upstream program. Its non-upstream participation has remained fairly consistent since 2013, although 2016 showed a notable decrease.
- Unitil has a highly variable annual participation rate, largely due to its small number of accounts. Overall, participation increased from 2011-2016, with 2014 showing a particular spike.

Figure 5-31. 2011–2016 account participation of non-upstream, upstream, and dual-stream – HVAC only

Figure 5-32 provides details into the annual population savings achieved that are attributed to HVAC programs:
- Cape Light Compact’s population savings achieved decreased from 2011 to 2013, then spiked in 2014 before decreasing again. 2016 was the lowest year for non-upstream savings achieved.
- Eversource had 3 years with high levels of population savings achieved between 2012-2014. In 2015, population savings achieved decreased back to its 2011 level; without the impact of the upstream HVAC program, savings were even lower than the 2011 level. There appears to have been a return to the earlier high levels in 2016, with upstream playing a larger role.
- Though savings in individual years vary, National Grid has seen a steady increase in HVAC population savings achieved since 2011, although 2016 showed a decrease. Upstream savings achieved form a substantially smaller share for National Grid compared to the other PAs.

**Figure 5-32. 2011–2016 non-upstream vs upstream savings achieved, electric – HVAC only**
Table 5-20, Table 5-21, and Table 5-22 provide specific details for the above charts.

**Table 5-20. 2011–2016 tracking summary, electric – unique HVAC participants**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>46</td>
<td>69</td>
<td>61</td>
<td>98</td>
<td>146</td>
<td>108</td>
<td>505</td>
</tr>
<tr>
<td>Eversource</td>
<td>511</td>
<td>509</td>
<td>470</td>
<td>798</td>
<td>734</td>
<td>978</td>
<td>3,502</td>
</tr>
<tr>
<td>National Grid</td>
<td>277</td>
<td>486</td>
<td>451</td>
<td>804</td>
<td>824</td>
<td>720</td>
<td>3,223</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>834</strong></td>
<td><strong>1,064</strong></td>
<td><strong>982</strong></td>
<td><strong>1,700</strong></td>
<td><strong>1,704</strong></td>
<td><strong>1,806</strong></td>
<td><strong>7,249</strong></td>
</tr>
</tbody>
</table>

**Table 5-21. 2011–2016 tracking summary, electric – HVAC savings (kWh)**

<table>
<thead>
<tr>
<th>PA</th>
<th>2011 Participant Savings (kWh)</th>
<th>2012 Participant Savings (kWh)</th>
<th>2013 Participant Savings (kWh)</th>
<th>2014 Participant Savings (kWh)</th>
<th>2015 Participant Savings (kWh)</th>
<th>2016 Participant Savings (kWh)</th>
<th>Total Savings 2011–2016 (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>1,929,163</td>
<td>1,077,543</td>
<td>1,006,955</td>
<td>4,361,905</td>
<td>2,187,482</td>
<td>1,173,910</td>
<td>11,736,959</td>
</tr>
<tr>
<td>Eversource</td>
<td>70,142,144</td>
<td>96,614,662</td>
<td>87,667,491</td>
<td>90,930,966</td>
<td>50,011,008</td>
<td>76,781,936</td>
<td>472,148,207</td>
</tr>
<tr>
<td>National Grid</td>
<td>22,441,559</td>
<td>39,693,834</td>
<td>33,594,491</td>
<td>36,382,601</td>
<td>48,045,475</td>
<td>34,631,173</td>
<td>214,789,134</td>
</tr>
<tr>
<td>Unitil</td>
<td>2,180,154</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>2,180,154</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>94,512,866</strong></td>
<td><strong>137,386,039</strong></td>
<td><strong>122,268,938</strong></td>
<td><strong>131,675,472</strong></td>
<td><strong>100,243,965</strong></td>
<td><strong>112,587,020</strong></td>
<td><strong>700,854,454</strong></td>
</tr>
</tbody>
</table>

**Table 5-22. 2011–2016 tracking summary, electric – HVAC incentives**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>$290,726</td>
<td>$1,676,621</td>
<td>$394,390</td>
<td>$1,370,339</td>
<td>$1,087,913</td>
<td>$631,264</td>
<td>$5,451,253</td>
</tr>
<tr>
<td>Eversource</td>
<td>$10,670,990</td>
<td>$14,549,177</td>
<td>$17,155,642</td>
<td>$17,036,942</td>
<td>$9,444,795</td>
<td>$14,514,235</td>
<td>$83,371,781</td>
</tr>
<tr>
<td>National Grid</td>
<td>$3,554,591</td>
<td>$8,053,022</td>
<td>$8,734,729</td>
<td>$10,440,887</td>
<td>$9,585,272</td>
<td>$7,598,021</td>
<td>$47,966,522</td>
</tr>
<tr>
<td>Unitil</td>
<td>$2,350</td>
<td>$67,425</td>
<td>$304,209</td>
<td>$9,775</td>
<td>$19,244</td>
<td>$33,023</td>
<td>$436,026</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$14,518,657</strong></td>
<td><strong>$24,346,244</strong></td>
<td><strong>$26,588,970</strong></td>
<td><strong>$28,857,942</strong></td>
<td><strong>$20,137,225</strong></td>
<td><strong>$22,776,544</strong></td>
<td><strong>$137,225,582</strong></td>
</tr>
</tbody>
</table>
Industry sector

Table 5-23 summarizes the 2016 HVAC activity by industry sector. Educational Services and Manufacturing stand out with participation rates of about 1%. These sectors also had some of the highest population savings achieved values, along with Real Estate and Rentals and Leasing.

### Table 5-23. Participation rates by industry sector, electric – HVAC only

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Upstream Participating Accounts</td>
<td>Upstream Only Participating Accounts</td>
<td>Dual Stream Participating Accounts</td>
<td>Total Participating Accounts</td>
<td>2016 Savings (kWh)</td>
<td>2016 Gross Participant Upstream Savings (kWh)</td>
<td>2016 Incentives Paid</td>
<td>2015 Full Year Usage (kWh)</td>
<td>2016 Account Participation Rate</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>93</td>
<td>85</td>
<td>*</td>
<td>183</td>
<td>43,131</td>
<td>7,420,676</td>
<td>1,985,120</td>
<td>$2,185,992</td>
<td>2,494,195,798</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>4,359</td>
<td>43,671</td>
<td>*</td>
<td>*</td>
<td>125,826,696</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>700</td>
<td>1,736</td>
<td>*</td>
<td>*</td>
<td>14,460,225</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>17</td>
<td>34</td>
<td>*</td>
<td>51</td>
<td>5,367</td>
<td>1,395,299</td>
<td>222,888</td>
<td>$430,140</td>
<td>499,509,210</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>15</td>
<td>10,912</td>
<td>726,841</td>
<td>*</td>
<td>$166,643</td>
<td>301,816,543</td>
</tr>
<tr>
<td>Educational Services</td>
<td>116</td>
<td>39</td>
<td>*</td>
<td>157</td>
<td>7,659</td>
<td>14,021,872</td>
<td>371,344</td>
<td>$3,035,802</td>
<td>1,965,553,588</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>26</td>
<td>54</td>
<td>*</td>
<td>81</td>
<td>9,003</td>
<td>1,435,067</td>
<td>441,898</td>
<td>$535,864</td>
<td>877,151,317</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>50</td>
<td>68</td>
<td>*</td>
<td>120</td>
<td>14,787</td>
<td>10,952,700</td>
<td>508,517</td>
<td>$1,943,297</td>
<td>2,377,872,202</td>
</tr>
<tr>
<td>Information</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>17</td>
<td>15,160</td>
<td>3,289,408</td>
<td>*</td>
<td>$571,522</td>
<td>947,606,366</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>126</td>
<td>16,800</td>
<td>*</td>
<td>*</td>
<td>124,708,138</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>56</td>
<td>86</td>
<td>*</td>
<td>142</td>
<td>9,221</td>
<td>22,628,088</td>
<td>231,125</td>
<td>$3,820,099</td>
<td>3,924,183,695</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>Other Services (except Public Administration)</td>
<td>*</td>
<td>19</td>
<td>*</td>
<td>31</td>
<td>19,570</td>
<td>1,863,523</td>
<td>254,245</td>
<td>$311,025</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>81</td>
<td>113</td>
<td>*</td>
<td>197</td>
<td>93,745</td>
<td>10,066,858</td>
<td>972,301</td>
<td>$2,132,101</td>
<td>4,134,258,672</td>
</tr>
<tr>
<td>Public Administration</td>
<td>76</td>
<td>39</td>
<td>*</td>
<td>157</td>
<td>7,659</td>
<td>14,021,872</td>
<td>371,344</td>
<td>$3,035,802</td>
<td>1,965,553,588</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>95</td>
<td>70</td>
<td>*</td>
<td>165</td>
<td>33,745</td>
<td>22,316,188</td>
<td>717,075</td>
<td>$3,772,626</td>
<td>3,039,723,779</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>68</td>
<td>165</td>
<td>*</td>
<td>234</td>
<td>33,940</td>
<td>4,611,260</td>
<td>1,886,112</td>
<td>$1,123,642</td>
<td>3,197,840,185</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>10,577</td>
<td>323,213</td>
<td>*</td>
<td>*</td>
<td>375,091,912</td>
<td>*</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>3,619</td>
<td>3,800,026</td>
<td>*</td>
<td>*</td>
<td>449,486,203</td>
<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>4,990</td>
<td>430,480</td>
<td>*</td>
<td>*</td>
<td>423,958,008</td>
<td>*</td>
</tr>
<tr>
<td>Unknown</td>
<td>33</td>
<td>237</td>
<td>*</td>
<td>271</td>
<td>33,977</td>
<td>4,280,877</td>
<td>1,328,339</td>
<td>$1,060,706</td>
<td>375,678,089</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>711</strong></td>
<td><strong>1,003</strong></td>
<td><strong>-</strong></td>
<td><strong>1,773</strong></td>
<td><strong>375,717</strong></td>
<td><strong>112,860,571</strong></td>
<td><strong>9,079,123</strong></td>
<td><strong>$22,114,272</strong></td>
<td><strong>26,964,430,700</strong></td>
</tr>
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</table>
Table 5-24 shows the 2016 average participant results by industry sector. Participant savings achieved are particularly notable for the Public Administration and Information sectors.

Table 5-24. 2016 participant savings achieved by industry sector, electric – HVAC only

<table>
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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5,445,953</td>
<td>42,217</td>
<td>11,323</td>
<td>105,261,490</td>
<td>$1,299,875</td>
<td>5.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>2,739</td>
<td>1,369</td>
<td>1,369</td>
<td>605,194</td>
<td>$2,034</td>
<td>0.5%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>1,736</td>
<td>868</td>
<td>868</td>
<td>69,327</td>
<td>$626</td>
<td>2.5%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>1,232,721</td>
<td>38,523</td>
<td>7,921</td>
<td>32,798,809</td>
<td>$368,414</td>
<td>3.8%</td>
</tr>
<tr>
<td>Construction</td>
<td>642,464</td>
<td>49,420</td>
<td>3,644</td>
<td>27,585,132</td>
<td>$114,018</td>
<td>2.3%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>12,216,300</td>
<td>103,528</td>
<td>40,535</td>
<td>578,533,701</td>
<td>$2,709,109</td>
<td>2.1%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1,137,595</td>
<td>28,440</td>
<td>15,109</td>
<td>95,082,628</td>
<td>$307,092</td>
<td>1.2%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>9,796,795</td>
<td>124,010</td>
<td>9,127</td>
<td>434,757,442</td>
<td>$1,634,436</td>
<td>2.3%</td>
</tr>
<tr>
<td>Information</td>
<td>2,976,391</td>
<td>212,599</td>
<td>43,826</td>
<td>29,889,523</td>
<td>$492,306</td>
<td>10.0%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>16,800</td>
<td>16,800</td>
<td>16,800</td>
<td>497,038</td>
<td>$4,800</td>
<td>3.4%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>21,973,421</td>
<td>274,668</td>
<td>34,728</td>
<td>628,712,578</td>
<td>$3,689,760</td>
<td>3.5%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1,611,204</td>
<td>61,969</td>
<td>3,397</td>
<td>36,576,800</td>
<td>$220,437</td>
<td>4.4%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>9,057,003</td>
<td>66,596</td>
<td>5,978</td>
<td>344,505,650</td>
<td>$1,773,774</td>
<td>2.6%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>1,745,298</td>
<td>31,166</td>
<td>17,057</td>
<td>15,019,617</td>
<td>$580,368</td>
<td>11.6%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>20,707,003</td>
<td>152,257</td>
<td>22,977</td>
<td>375,425,662</td>
<td>$3,591,996</td>
<td>5.5%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>2,790,776</td>
<td>27,908</td>
<td>5,896</td>
<td>68,854,644</td>
<td>$619,857</td>
<td>4.1%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>757,523</td>
<td>151,505</td>
<td>974</td>
<td>103,991,290</td>
<td>$70,326</td>
<td>0.7%</td>
</tr>
<tr>
<td>Utilities</td>
<td>3,800,026</td>
<td>422,225</td>
<td>137,336</td>
<td>66,170,998</td>
<td>$465,251</td>
<td>5.7%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>428,571</td>
<td>61,224</td>
<td>11,472</td>
<td>7,996,346</td>
<td>$104,012</td>
<td>5.4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>118,064</td>
<td>9,839</td>
<td>6,257</td>
<td>1,061,681</td>
<td>$29,196</td>
<td>11.1%</td>
</tr>
<tr>
<td>Total</td>
<td>96,458,383</td>
<td>2,953,395,551</td>
<td>$18,077,687</td>
<td>3.3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5-25 shows each technology type’s contribution to total HVAC only savings since 2011. The blue bars shading each cell show each detailed end use’s share of the total. The top 5 largest savings technologies account for 93% of total HVAC only savings. These technologies are:

- Motors/drives (31% of 6-year kWh savings)
- Controls (28% of 6-year kWh savings)
- Chillers (26% of 6-year kWh savings)
- Other (8% of 6-year kWh savings)
- Upstream HVAC, which accounts for 4% of 6-year kWh savings—but fully 26% of 6-year projects, in spite of only 3 years of program availability.

Table 5-25. 2011–2016 summary HVAC technology savings (kWh), electric – HVAC only

<table>
<thead>
<tr>
<th>Detailed end use</th>
<th>Projects all years</th>
<th>Savings all years (therms)</th>
<th>Incentives all years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>2,600</td>
<td>6,296,101</td>
<td>$ 22,252,320</td>
</tr>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Chiller</td>
<td>165</td>
<td>2,981,995</td>
<td>$ 4,671,249</td>
</tr>
<tr>
<td>Combination Boilers</td>
<td>215</td>
<td>346,293</td>
<td>$ 750,150</td>
</tr>
<tr>
<td>Controls</td>
<td>3,488</td>
<td>10,413,853</td>
<td>$ 18,915,983</td>
</tr>
<tr>
<td>DCV</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>DEEC</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Equipment</td>
<td>21</td>
<td>288,390</td>
<td>$ 474,728</td>
</tr>
<tr>
<td>Furnace</td>
<td>613</td>
<td>216,982</td>
<td>$ 783,587</td>
</tr>
<tr>
<td>Heat Pump</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Heaters</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>28</td>
<td>761,188</td>
<td>$ 584,505</td>
</tr>
<tr>
<td>Infrared Heaters</td>
<td>159</td>
<td>373,373</td>
<td>$ 726,006</td>
</tr>
<tr>
<td>Insulation</td>
<td>549</td>
<td>1,181,029</td>
<td>$ 1,404,393</td>
</tr>
<tr>
<td>Motors/Drives</td>
<td>31</td>
<td>206,065</td>
<td>$ 531,948</td>
</tr>
<tr>
<td>Other</td>
<td>383</td>
<td>5,772,844</td>
<td>$ 9,343,339</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>574</td>
<td>7,288,797</td>
<td>$ 3,761,217</td>
</tr>
<tr>
<td>Water Heaters</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,826</strong></td>
<td><strong>36,126,910</strong></td>
<td><strong>$ 64,199,426</strong></td>
</tr>
</tbody>
</table>

40 HVAC as a technology indicates that the only detail provided for these end uses was “HVAC.” These are largely custom in nature.
5.2.3 Specific end uses

Table 5-26 through Table 5-29 show the percent of projects and the percent of savings within both broad and specific end uses for 2016. These tables offer insight into the importance of specific end uses in generating participation and savings. Each broad end use can encompass one or more specific end uses, labeled in these tables as "sub uses." Conversely, each sub use can fall under one or more broad end use categories. The first two tables illustrate the distribution of various sub uses within each end use for projects and savings. The second two tables illustrate how broad end use categories make up projects and savings for each sub use. Columns represent the broader end use categories, and rows represent the more specific sub uses. Within each cell, the presence of a number indicates at least some non-zero share of projects or savings associated with that end use-sub use combination, even if rounding has resulted in the value displaying as 0.0%. 
### Table 5-26. Distribution of electric measure categories by project count within end use

<table>
<thead>
<tr>
<th>Measure Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>HVAC</th>
<th>CHP</th>
<th>Compressed Air</th>
<th>Food Service</th>
<th>Lighting</th>
<th>Motors/Drives</th>
<th>Refrigeration</th>
<th>N/A</th>
<th>Other</th>
<th>Upstream HVAC</th>
<th>Upstream Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>96.0%</td>
<td></td>
<td>3.6%</td>
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</tr>
<tr>
<td>Building Shell</td>
<td>1.4%</td>
<td></td>
<td>100%</td>
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<tr>
<td>CDA</td>
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<tr>
<td>Chiller</td>
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<td>CHP</td>
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<tr>
<td>Compressed Air-Other</td>
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<td>Compressor</td>
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<tr>
<td>Controls</td>
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</tr>
<tr>
<td>Cooking</td>
<td>31.3%</td>
<td></td>
<td>100%</td>
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<td>14.6%</td>
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<tr>
<td>Equipment</td>
<td>34.3%</td>
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<tr>
<td>Heat Pump</td>
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<tr>
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<tr>
<td>Lighting</td>
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</tr>
<tr>
<td>Low-flow Showerhead</td>
<td>14.4%</td>
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<td></td>
</tr>
<tr>
<td>Motors</td>
<td>23.3%</td>
<td></td>
<td>37.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.7%</td>
<td></td>
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</tr>
<tr>
<td>Other</td>
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<td></td>
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</tr>
<tr>
<td>Process</td>
<td>35.0%</td>
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</tr>
<tr>
<td>Refrigeration</td>
<td>3.0%</td>
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<td></td>
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Table 5-28. Distribution of electric measure categories by project count within sub use

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<td>Upstream Lighting</td>
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</tr>
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Table 5-29. Distribution of electric measure category savings contributions within sub use

<table>
<thead>
<tr>
<th>Measure Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>HVAC</th>
<th>Chp</th>
<th>Compressed Air</th>
<th>Food Service</th>
<th>Lighting</th>
<th>Motors/Drives</th>
<th>Refrigeration</th>
<th>N/A</th>
<th>Other</th>
<th>Upstream HVAC</th>
<th>Upstream Lighting</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>72.3%</td>
<td>27.7%</td>
<td>100.0%</td>
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<tr>
<td>Building Shell</td>
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<td>Chiller</td>
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<tr>
<td>Compressed Air-Other</td>
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<tr>
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<tr>
<td>Motors</td>
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<td>0.2%</td>
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<td>12.8%</td>
<td>11.4%</td>
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<td>Refrigeration</td>
<td>98.9%</td>
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</table>
5.3 Industry sector

This section breaks statewide kWh consumption and savings into 22 distinct industry sector bins, based on 2-digit NAICS code descriptions. Using these bins makes it possible to discern differences in outcomes at a statewide level and across PAs. It is important to remember that when comparing absolute savings achieved for a sector, a low savings value does not indicate under-engagement, as the sector may also be a low contributor to total annual kWh usage. This section provides a number of different views into the different industry sectors:

- Tables summarizing the 2016 results
- Bubble plots providing a graphical view of the relative impacts and results of each industry sector
- Historical tables and figures showing key metrics from 2011-2016
- Summaries of participating accounts that could be successfully linked to the billing data

For additional details about industry sector, see sections 3.4.3 and 6.3.

DNV GL created the industry sector field starting with the 2013 C&I Customer Profile project. We leveraged the time series data, links between billing and tracking data, and third-party data to achieve a high level of data completeness for accounts’ industry sector fields for 2011 through 2016. The improvements of our assignment efforts for the electric market are seen in Table 5-30. In addition, here we define again the one other DNV GL class leveraged in the tables:

- **Unknown** is used when the PA provides a code, but it is identified as 99999 or a mis-keyed code that does not have a match in the NAICS, SIC, or other crosswalk indices. “Unknown” is also used when no sector data is provided for an account.

Table 5-30. 2011–2016 electric billing data, percent of accounts with industry sector matches

<table>
<thead>
<tr>
<th>Year</th>
<th>% Industry Sector Available</th>
<th>Frequency Industry Sector Available</th>
<th>Total Number of Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>84.0%</td>
<td>290,798</td>
<td>346,351</td>
</tr>
<tr>
<td>2012</td>
<td>94.4%</td>
<td>315,569</td>
<td>334,306</td>
</tr>
<tr>
<td>2013</td>
<td>96.0%</td>
<td>336,480</td>
<td>350,638</td>
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<tr>
<td>2014</td>
<td>95.1%</td>
<td>300,279</td>
<td>315,614</td>
</tr>
<tr>
<td>2015</td>
<td>95.2%</td>
<td>319,779</td>
<td>335,955</td>
</tr>
<tr>
<td>2016</td>
<td>91.1%</td>
<td>348,472</td>
<td>382,316</td>
</tr>
</tbody>
</table>

Table 5-31 and Figure 5-33 present the account participation and population savings achieved by industry sector for all electric accounts in 2016. DNV GL included all 2016 upstream lighting data that could be linked to an industry sector, and updated this data from 2015. Because we continue to assign more of the upstream data to industry sectors, the inclusion of upstream no longer results in a large number of missing sectors. Similar to 2015, 2016’s report bundles sectors “N/A,” “No Data,” and “Unknown” into the single variable “Unknown.” For more information on these three slight variations, refer to section 3.4.3. Data in this section combines upstream and non-upstream lighting. Therefore, any lighting that is referenced as a primary end use driver for a particular industry sector is a combination of upstream and non-upstream. Similar to the 2015 report, we expanded the table to separate participation (non-upstream-only vs. upstream-only vs. dual-stream...
participants). In addition, we included incentives paid by industry sector for 2016. Interesting findings include the following:

- While DNV GL continues to improve upon upstream account ID assignments, we were still unable to match some IDs to any account. As a result, participation rates can be overestimated in each sector, as further explained in Appendix A section 8.1.7. While this artifact of the data impacts all sectors, it is especially apparent in the Professional, Scientific, and Technical Services sector, and the Retail Trade sector.
- As seen in previous years, lighting measures continue to drive electric participation and savings for all industry sectors. Table 5-31 illustrates that similar to 2015, upstream-only makes up a large portion of electric program participation. Ninety-four percent of upstream participants installed lighting measures.
- As seen in 2015, Manufacturing continues to be the industry sector with the highest gross kWh consumption and the highest gross kWh savings. Unlike 2015, 59% of participating accounts in this sector installed non-upstream lighting measures and 28% installed upstream lighting measures. In 2015, 90% percent of savings in this sector came from upstream lighting.
- For 2016, Transportation and Warehousing provided the highest population savings achieved in 2016 at 6.5%. This contrasts with 2015, when Educational Services provided the highest population savings achieved at 6.2%. Upstream lighting provided the majority of 2015 savings for the Educational Services sector. Transportation and Warehousing attributed much of its savings to accounts that installed process and non-upstream lighting measures.
- Similar to 2015, the Arts, Entertainment, and Recreation sector provided the highest percent participation, with 26% in 2016. It did not provide the highest proportion of savings as it did in 2015. In 2015, this sector's savings was driven largely by upstream lighting measures from Eversource and National Grid. In 2016, there appears to be an even split of non-upstream and upstream lighting measures installed.
- Also like 2015, the Professional, Scientific, and Technical Services sector had the highest number of participating accounts. In 2016, this sector saw an increase in non-upstream lighting participation (as did Manufacturing), leading the proportion of end use measures installed at 51%. In 2015, more than half of this sector's accounts installed upstream lighting measures. In 2016, 40% of this sector's accounts installed upstream lighting. In 2016, a variety of custom CHP, HVAC, process, and non-upstream lighting measures drove this sector's savings.
- The Retail Trade sector saw decreases in electric program participation and savings in 2016. Most of this accompanied decreased upstream lighting participation. Similar to other industry sectors in 2016, the largest-saving project was in custom lighting by National Grid.
- Real Estate and Rental and Leasing's 2016 participation and population savings achieved increased compared to 2015's values. The primary drivers of this sector's savings were Eversource accounts installing custom HVAC, CHP, and lighting.

Lighting continues to yield the most electric savings across all industry sectors. Sectors such as Educational Services, Professional Services, and Retail Trade contributed large proportions to upstream-only savings in 2016.
### Table 5-31. Summary of electric account participation and population savings by industry sector, includes unlinked and upstream data

<table>
<thead>
<tr>
<th>Industry sector</th>
<th>2016 tracking accounts</th>
<th>2016 billing accounts</th>
<th>2016 savings (kWh)</th>
<th>2016 incentives paid</th>
<th>2015 full year usage (kWh)</th>
<th>2016 account participation rate</th>
<th>2016 population savings achieved</th>
<th>2016 upstream population savings achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-upstream</td>
<td>Upstream only</td>
<td>Dual-stream</td>
<td>Total participating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>participating accounts</td>
<td>participating accounts</td>
<td>accounts</td>
<td>accounts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>631</td>
<td>1,873</td>
<td>86</td>
<td>2,590</td>
<td>43,131</td>
<td>$13,658,156</td>
<td>6.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>32</td>
<td>54</td>
<td>*</td>
<td>90</td>
<td>4,359</td>
<td>$797,707</td>
<td>21%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Remediation Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>25</td>
<td>1,403</td>
<td>$277,702</td>
<td>125%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>177</td>
<td>2,055</td>
<td>21</td>
<td>1,403</td>
<td>4,359</td>
<td>$499,509,210</td>
<td>261%</td>
<td>4.8%</td>
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<tr>
<td>Construction</td>
<td>141</td>
<td>242</td>
<td>*</td>
<td>395</td>
<td>9,479,215</td>
<td>$777,944</td>
<td>301%</td>
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<td>Educational Services</td>
<td>359</td>
<td>1,218</td>
<td>87</td>
<td>1,664</td>
<td>10,912</td>
<td>$1,165,243</td>
<td>947%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>163</td>
<td>343</td>
<td>30</td>
<td>700</td>
<td>1,427</td>
<td>$4,013,182</td>
<td>877%</td>
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</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>255</td>
<td>1,105</td>
<td>67</td>
<td>1,427</td>
<td>10,912</td>
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<td>109</td>
<td>*</td>
<td>172</td>
<td>8,745,837</td>
<td>$28,813,218</td>
<td>947%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
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<td>*</td>
<td>*</td>
<td>126</td>
<td>124,708,138</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Manufacturing</td>
<td>466</td>
<td>915</td>
<td>92</td>
<td>1,473</td>
<td>4,316</td>
<td>$28,813,218</td>
<td>947%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td>478</td>
<td>25</td>
<td>973</td>
<td>19,570</td>
<td>$5,460,945</td>
<td>580%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>1,383</td>
<td>4,154</td>
<td>103</td>
<td>5,640</td>
<td>94,189,799</td>
<td>$24,285,059</td>
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</tr>
<tr>
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<td>129</td>
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<td>39</td>
<td>716</td>
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<td>*</td>
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<td>60</td>
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<td>$1,428,172</td>
<td>449,466%</td>
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<td>Wholesale Trade</td>
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<td>134</td>
<td>24</td>
<td>318</td>
<td>11,114,360</td>
<td>$3,224,843</td>
<td>423,958%</td>
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<tr>
<td>Unknown</td>
<td>330</td>
<td>897</td>
<td>*</td>
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<td>33,797</td>
<td>$8,111,026</td>
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<td>Total</td>
<td>6,935</td>
<td>16,546</td>
<td>720</td>
<td>24,281</td>
<td>375,799</td>
<td>$198,388,959</td>
<td>27,024,177%</td>
<td>6.5%</td>
</tr>
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</table>
Figure 5-33. Electric account population size and savings achieved by industry sector (includes unlinked tracking data)
Figure 5-34 shows each sector’s percent contribution to the 2016 electric participant kWh savings. Manufacturing contributed the largest proportion of participant kWh savings in 2016, as it did in 2015. Unlike 2015, the second largest contributing sector to savings is Health Care and Social Assistance, which increased from 6.8% of savings to almost 12% of savings in 2016. Participant savings contributed by the Professional, Scientific, and Technical Services sector also increased a great degree, from 6.8% in 2015 to 11.9% in 2016.

**Figure 5-34. Distribution of electric participant savings by industry sector (includes unlinked tracking data)**
Figure 5-35 graphically represents the 2016 electric account participation and population savings percentages by industry sector. As mentioned in the beginning of this section, 2015’s sections “Unknown,” “N/A,” and “No Data” have all been bundled into the single variable “Unknown” in 2016.

The highest-electric saving projects in 2016 were custom process projects in Health Care and Social Assistance and Manufacturing through Eversource and National Grid. Eversource’s custom electric savings were driven largely by retrofit CHP, HVAC, and process projects.

**Figure 5-35. Electric account participation and population savings (including unlinked upstream) by industry sector**
Table 5-32 illustrates an interesting shift in participation and savings in 2016. Participation and savings did not universally increase for all industry sectors as they had previously year after year. In addition, statewide participation and savings rates decreased for the first time ever in 2016. Not all industry sectors experienced a decrease; industry sector highlights include:

- Mining, Quarrying, and Oil and Gas Extraction saw a dramatic increase in participation and savings compared to previous years. This sector contributed the highest population savings ratio of the 6-year period, at 4.1%.
  - All the electric savings from Mining, Quarrying, and Oil and Gas Extraction were from National Grid accounts installing upstream and non-upstream lighting measures. One of the custom lighting projects undertaken provided some of the largest state-wide electric savings for 2016, and accounted for 99% of the electric savings in the sector. Sectors with participation rates greater than 10% are driven largely by upstream lighting efforts.41

- Agriculture, Forestry, Fishing and Hunting also saw a substantial increase in electric participation and savings compared to previous years. In 2016, this sector had a population savings achieved of 5.2%; in 2015 this number was 1.2%. Most of these accounts provided savings from installing prescriptive retrofit lighting measures under Eversource, National Grid, and Unitil.

- Similar to 2015, the upstream program made up the majority of participation across all industry sectors. Non-upstream programs were the key drivers of 2016 savings.
- Transportation and Warehousing saw a substantial increase in population savings for 2016. This was driven largely by accounts installing custom process and lighting retrofit measures. Interestingly, this sector’s participation decreased from 8.9% in 2015 to 5.2% in 2016. The measures installed by this smaller group of participants provided much greater depth of savings for this industry sector in 2016.
- There was also a substantial increase in population savings for the Health Care and Social Assistance sector in 2016. The spike in savings for this sector was driven largely by a few Eversource accounts installing custom CHP measures and HVAC-chiller measures in 2016. One very large health care account installed a CHP project that contributed 30% of this sector’s total electric savings and 4% of state wide electric savings in 2016.
- It is important to keep in mind that some increases in participation for all industry sectors are the result of DNV GL’s further success in assigning industry sectors to participating accounts in 2016.

---

41 This was due to one very large lighting project that was confirmed to be within the Mining, Quarrying, and Oil and Gas Extraction sector. This project was the 15th largest electric project by savings, and the largest lighting project, in 2016.
### Table 5-32. 2011–2016 of electric account participation and population savings by industry sector – including unlinked upstream data

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<tr>
<td>Accommodation and Food Services</td>
<td>2.2%</td>
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<td>1.7%</td>
<td>2.3%</td>
<td>1.5%</td>
<td>5.0%</td>
<td>3.3%</td>
<td>6.1%</td>
<td>3.1%</td>
<td>6.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
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<td>0.4%</td>
<td>0.9%</td>
<td>0.9%</td>
<td>1.1%</td>
<td>0.9%</td>
<td>2.1%</td>
<td>1.4%</td>
<td>1.9%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.8%</td>
<td>0.4%</td>
<td>0.3%</td>
<td>1.1%</td>
<td>1.2%</td>
<td>2.3%</td>
<td>2.6%</td>
<td>4.8%</td>
<td>2.1%</td>
<td>1.2%</td>
<td>3.6%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>3.7%</td>
<td>1.4%</td>
<td>3.4%</td>
<td>1.7%</td>
<td>4.3%</td>
<td>1.9%</td>
<td>7.6%</td>
<td>4.0%</td>
<td>12.6%</td>
<td>5.6%</td>
<td>26.1%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.8%</td>
<td>1.3%</td>
<td>0.9%</td>
<td>1.3%</td>
<td>1.0%</td>
<td>2.6%</td>
<td>4.8%</td>
<td>2.1%</td>
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<td>2.1%</td>
<td>2.1%</td>
<td>2.1%</td>
</tr>
<tr>
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<td>7.6%</td>
<td>3.1%</td>
<td>24.5%</td>
<td>4.6%</td>
<td>26.8%</td>
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<td>21.7%</td>
<td>4.1%</td>
</tr>
<tr>
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<td>0.9%</td>
<td>2.0%</td>
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<td>5.4%</td>
<td>1.5%</td>
<td>3.4%</td>
<td>2.6%</td>
<td>6.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>2.0%</td>
<td>4.9%</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.9%</td>
<td>2.3%</td>
<td>3.7%</td>
<td>1.7%</td>
<td>13.2%</td>
<td>2.6%</td>
<td>2.7%</td>
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<td>Information</td>
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<td>0.6%</td>
<td>0.9%</td>
<td>1.4%</td>
<td>0.5%</td>
<td>1.3%</td>
<td>0.7%</td>
<td>1.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
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<td>2.3%</td>
<td>0.6%</td>
<td>6.7%</td>
<td>0.5%</td>
<td>8.7%</td>
<td>0.4%</td>
<td>10.3%</td>
<td>0.3%</td>
</tr>
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<td>5.3%</td>
<td>2.2%</td>
<td>5.4%</td>
<td>2.4%</td>
<td>7.1%</td>
<td>1.8%</td>
<td>17.9%</td>
<td>4.8%</td>
<td>10.0%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>4.1%</td>
<td>0.5%</td>
<td>2.5%</td>
<td>0.1%</td>
<td>2.5%</td>
<td>0.2%</td>
<td>2.6%</td>
<td>0.1%</td>
<td>1.2%</td>
<td>0.6%</td>
<td>6.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td>1.2%</td>
<td>2.4%</td>
<td>1.4%</td>
<td>2.2%</td>
<td>1.3%</td>
<td>5.2%</td>
<td>2.2%</td>
<td>3.7%</td>
<td>2.5%</td>
<td>5.0%</td>
<td>3.1%</td>
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<tr>
<td>Professional Scientific, and Technical Services</td>
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<td>1.4%</td>
<td>1.5%</td>
<td>1.8%</td>
<td>1.9%</td>
<td>2.4%</td>
<td>2.7%</td>
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<td>6.4%</td>
<td>3.5%</td>
<td>8.0%</td>
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<tr>
<td>Public Administration</td>
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<td>1.9%</td>
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<td>2.1%</td>
<td>1.3%</td>
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<td>2.7%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td>1.0%</td>
<td>1.5%</td>
<td>1.4%</td>
<td>1.9%</td>
<td>1.3%</td>
<td>3.6%</td>
<td>1.9%</td>
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<td>1.6%</td>
<td>3.8%</td>
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<tr>
<td>Retail Trade</td>
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<td>5.3%</td>
<td>1.8%</td>
<td>4.8%</td>
<td>2.2%</td>
<td>10.8%</td>
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<td>14.2%</td>
<td>2.8%</td>
<td>10.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
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<td>1.1%</td>
<td>1.5%</td>
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<td>1.3%</td>
<td>8.9%</td>
<td>1.6%</td>
<td>5.2%</td>
<td>6.5%</td>
</tr>
<tr>
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<td>1.0%</td>
<td>1.2%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>4.2%</td>
<td>2.5%</td>
<td>1.0%</td>
<td>1.3%</td>
<td>1.7%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>2.8%</td>
<td>1.4%</td>
<td>2.8%</td>
<td>1.6%</td>
<td>2.7%</td>
<td>1.8%</td>
<td>4.2%</td>
<td>2.3%</td>
<td>4.1%</td>
<td>2.5%</td>
<td>6.4%</td>
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<td>31.1%</td>
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<td><strong>Statewide</strong></td>
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<td>2.0%</td>
<td>5.6%</td>
<td>2.3%</td>
<td>6.7%</td>
<td>2.6%</td>
<td>7.7%</td>
<td>3.3%</td>
<td>6.5%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>
Figure 5-36. 2011–2016 of account participation by industry sector, electric part 1
Figure 5-38. 2011–2016 of account population savings by industry sector, electric part 1
Figure 5-39. 2011–2016 of account population savings by industry sector, electric part 2

- Non-Upstream Population
- Upstream Population Savings
The 2016 Customer Profile leverages tax data linked to PA billing and CIS data integration improvements made under the PAs’ ongoing Data Enhancement Project. Previous iterations of the tax data relied on locational matching only; the current iteration leverages spatial proximity (the geographic closeness of similar addresses), algorithmic text matching (similarities between business name, contact name, etc. and nearby tax information), and direct string matches (matches involving the phone number or building number). This continued refinement to the tax data matching has yielded the most robust and highest coverage of the location-level EUI maps since this analysis was first introduced. The material here is at the location level, and is the subset of accounts and locations that DNV GL was able to integrate with the tax data. As with previous years, the intended value of the maps included in this section is not to target specific accounts, but rather to identify areas of higher or lower EUI within sectors relative to the rest of the state sector population. Not all PA accounts are represented in the tax maps, and not all towns contain square footage data for their tax records. In this regard, the EUI analyses present a subset of the PA populations: those accounts that can be matched with tax data. Areas in white indicate towns served by the PAs; areas in gray indicate towns not served by the PAs.

The EUI maps present the data as standard deviations from the mean EUI for the analysis grain of the map. In order to appropriately display standard deviations, DNV GL must have locational EUI in a relatively normal distribution. To accomplish this, we transform the actual locational EUIs using a natural log transformation. To aid with map reading, we have not included the re-transformed numbers in the map legends, but rather have left the unit-less “standard deviations” so that maps from different sectors can be evaluated against one another and across fuels. Readers who are interested in the actual mean and median EUI numbers should consult the EUI tables and charts included in this section of the C&I Customer Profile report. Finally, in some instances the maps may not include the extreme ends of the standard deviations; this occurs when there are very few records in those tails, at which point they are grouped into the next closest class. DNV GL has kept the color schemes consistent across the maps so the absence of extreme tails does not impact the ability to compare maps by shifting the colors.

Figure 5-40 presents the EUI, irrespective of industry sector, for all electric locations in the EUI analysis. At this level, some interesting trends are observable. The towns surrounding Boston, particularly to the northwest, generally have higher average EUIs than Boston proper; locally though, some areas of Boston, such as areas by the waterfront, do have higher EUIs. It is important to reiterate that these maps do not capture density of accounts, and should be interpreted cautiously, as some cells’ “average” may represent a single account and location while others may represent over 100 accounts and numerous locations. Consequently, in Boston there are accounts with substantially higher EUIs that are balanced out to a degree by the large populations of smaller accounts with lower EUIs. Downtown Worcester in central MA exhibits a similar phenomenon due to large populations.

Integrating locational analytics into future iterations of C&I Customer Profile analysis stands to offer even greater geotargeted findings and actionable insight for the PAs and local stakeholders. Such analytics could include proximity and cluster analysis on individual locations, and could identify statistically significant clusters of high EUI buildings within average EUI locations.

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42 EUI analysis was first introduced as a pilot effort within the 2013 C&I Customer Profile report.
43 EUI is the locational consumption divided by the matched tax data’s building square footage; this may not reflect the whole building’s EUI.
44 For most maps, this is a specific industry sector; e.g., the manufacturing EUI map shows areas in the state where the average grid cell has higher or lower manufacturing EUIs than the average EUI for manufacturing statewide.
Figure 5-40. Electric landscape EUI – all sectors billing data that linked to tax data
Table 5-33 presents the summary-level tables of electric EUIs by industry sector for the population of billing accounts that matched with tax data and are used in the maps. These are the actual averages (not log transformed), and a 1% trim has been applied to the means to remove an equal number of records from each tail of the distribution. This minimizes the influence of very large or small populations on the means; we have also provided median values. We offer these numbers to complement the GIS maps and lend context to the transformed values used in those maps to achieve a normal distribution. It is important to note that some sectors with small populations can be heavily impacted by even two large accounts.

Table 5-33. Summary of electric mean and median kWh and kBTU EUI by industry sector for linked tax and billing accounts only

<table>
<thead>
<tr>
<th>NAICS Sector Equivalent</th>
<th>Mean EUI (kWh / SqFt)</th>
<th>Mean EUI (kBtu / SqFt)</th>
<th>Median EUI (kWh / SqFt)</th>
<th>Median EUI (kBtu / SqFt)</th>
</tr>
</thead>
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<tr>
<td>Accommodation and Food Services</td>
<td>4.4</td>
<td>15.1</td>
<td>0.3</td>
<td>1.2</td>
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<tr>
<td>Administrative and Support and Waste</td>
<td>2.3</td>
<td>7.8</td>
<td>0.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>5.8</td>
<td>19.9</td>
<td>1.5</td>
<td>5.2</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>8.3</td>
<td>28.3</td>
<td>3.3</td>
<td>11.2</td>
</tr>
<tr>
<td>Construction</td>
<td>2.5</td>
<td>8.4</td>
<td>0.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Educational Services</td>
<td>18.9</td>
<td>64.4</td>
<td>3.3</td>
<td>11.4</td>
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<tr>
<td>Finance and Insurance</td>
<td>8.1</td>
<td>27.8</td>
<td>3.6</td>
<td>12.2</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>9.5</td>
<td>32.4</td>
<td>3.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Information</td>
<td>6.1</td>
<td>20.9</td>
<td>1.8</td>
<td>6.2</td>
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<tr>
<td>Management of Companies and Enterprises</td>
<td>3.6</td>
<td>12.3</td>
<td>1.4</td>
<td>4.9</td>
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<tr>
<td>Manufacturing</td>
<td>14.8</td>
<td>50.5</td>
<td>3.9</td>
<td>13.4</td>
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<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>11.6</td>
<td>39.5</td>
<td>2.6</td>
<td>8.8</td>
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<tr>
<td>Other Services (except Public Administration)</td>
<td>4.6</td>
<td>15.8</td>
<td>2.6</td>
<td>8.7</td>
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<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2.8</td>
<td>9.5</td>
<td>0.6</td>
<td>2.0</td>
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<tr>
<td>Public Administration</td>
<td>10.3</td>
<td>35.2</td>
<td>2.9</td>
<td>10.0</td>
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<td>5.9</td>
<td>20.2</td>
<td>0.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>10.8</td>
<td>36.9</td>
<td>3.7</td>
<td>12.5</td>
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<tr>
<td>Transportation and Warehousing</td>
<td>6.4</td>
<td>21.8</td>
<td>2.0</td>
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<tr>
<td>Utilities</td>
<td>18.9</td>
<td>64.6</td>
<td>2.8</td>
<td>9.5</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>6.5</td>
<td>22.2</td>
<td>2.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.2</td>
<td>7.5</td>
<td>0.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>
DNV GL has included a breakdown of the median EUI by industry sector in Table 5-34 and Table 5-35. Consistent with previous years, the median EUIs for the smallest class are generally much lower, and are impacted by items like billboard lighting.

Table 5-34. Median electric kWh EUI by industry sector and consumption bin, linked tax and billing accounts only

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>&lt; 0.11 GWh</th>
<th>0.11 – 0.47 GWh</th>
<th>0.47 – 1.5 GWh</th>
<th>1.5 – 4.5 GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>0.3</td>
<td>21.8</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.5</td>
<td>7.2</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>1.4</td>
<td>18.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>2.6</td>
<td>7.4</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>0.7</td>
<td>4.5</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>2.3</td>
<td>5.4</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>2.8</td>
<td>10.3</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>2.4</td>
<td>8.3</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>1.8</td>
<td>11.5</td>
<td>40.1</td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>1.1</td>
<td></td>
<td></td>
<td>75.8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2.1</td>
<td>6.7</td>
<td>19.8</td>
<td></td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>2.0</td>
<td></td>
<td></td>
<td>9.9</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>2.5</td>
<td>7.0</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>0.6</td>
<td>5.6</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>Public Administration</td>
<td>2.1</td>
<td>9.0</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>0.7</td>
<td>3.4</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>2.9</td>
<td>12.6</td>
<td>10.4</td>
<td></td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1.6</td>
<td>12.6</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>2.2</td>
<td>50.3</td>
<td>80.3</td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.8</td>
<td>6.3</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0.4</td>
<td>9.7</td>
<td>9.8</td>
<td></td>
</tr>
</tbody>
</table>

The median EUI is presented for all classes where there were more than 15 records. This filter was applied in accordance with the DPU 14.140 ruling to protect confidentiality. Since there were fewer than 15 matched records for all industry sectors in the 4.5 GWh or greater bin, it was excluded from this table.
Table 5-35. Median electric kBTU EUI by industry sector and consumption bin, linked tax and billing accounts only

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Less than 110,000 kWh</th>
<th>110,000 kWh to 470,000 kWh</th>
<th>470,000 kWh to 1.5 Million kWh</th>
<th>1.5 Million kWh to 4.5 Million kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>0.9</td>
<td>68.6</td>
<td>52.4</td>
<td></td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>1.5</td>
<td>22.6</td>
<td>34.9</td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>4.3</td>
<td>59.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>8.2</td>
<td>23.4</td>
<td>43.3</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>2.2</td>
<td>14.3</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>7.3</td>
<td>16.9</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>8.8</td>
<td>32.5</td>
<td>39.3</td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>7.5</td>
<td>25.9</td>
<td>41.1</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>5.6</td>
<td>36.2</td>
<td>125.9</td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>6.7</td>
<td>21.0</td>
<td>62.1</td>
<td>238.3</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>6.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>7.8</td>
<td>21.9</td>
<td>31.2</td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>1.7</td>
<td>17.7</td>
<td>24.2</td>
<td></td>
</tr>
<tr>
<td>Public Administration</td>
<td>6.4</td>
<td>28.4</td>
<td>36.1</td>
<td></td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>2.1</td>
<td>10.8</td>
<td>24.5</td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>9.2</td>
<td>39.5</td>
<td>32.8</td>
<td></td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>5.1</td>
<td>22.7</td>
<td>26.6</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>7.0</td>
<td>158.2</td>
<td>252.3</td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>5.6</td>
<td>19.9</td>
<td>29.9</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>1.2</td>
<td>30.4</td>
<td>30.8</td>
<td></td>
</tr>
</tbody>
</table>

46 There were fewer than 15 matched records for all industry sectors in the 4.5 GWh or greater bin and so it was excluded from this table.
Figure 5-41. Scatterplot of median electric EUI (kBTU / SqFt) by industry sector and consumption bin, linked tax and billing accounts only
The following EUI maps are of three critical industry sectors in 2016; Professional, Scientific, and Technical Services, Health Care and Social Assistance, and Retail Trade. As with Table 5-15, these EUI maps present the data as standard deviations from the mean industry sector EUI for the analysis grain of the map.

**Figure 5-42. Professional, Scientific, and Technical Services industry sector EUI**
Figure 5-43. Health Care and Social Assistance industry sector electric EUI

1km Grid Cell Average Consumption: Standard Deviations from Statewide Mean
- No PA Service
- PA Served Town
- < -2.5 Std. Dev.
- -2.5 - -1.5 Std. Dev.
- -1.5 - -0.5 Std. Dev.
- -0.50 - 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- 1.5 - 2.5 Std. Dev.
- > 2.5 Std. Dev.

Boston Area
Figure 5-44. Retail Trade industry sector electric EUI
Table 5-36 presents lifetime savings by industry sector for 2016, along with each sector’s contribution to total lifetime savings in 2016. There was an overall decrease from 2015 in lifetime savings. At the same time, particular sectors had remarkable increases in lifetime savings in 2016. Health Care and Social Assistance increased from 6% of lifetime savings in 2015 to 14.9% in 2016, while Real Estate and Rental and Leasing increased from 4.6% in 2015 to 10.9% in 2016.

Table 5-36. Lifetime savings by industry sector 2016, electric (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>% of Lifetime Savings 2016</th>
<th>2016 Lifetime Savings (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5.1%</td>
<td>412,977,754</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.3%</td>
<td>22,392,553</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.1%</td>
<td>8,395,088</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>1.6%</td>
<td>130,177,161</td>
</tr>
<tr>
<td>Construction</td>
<td>1.1%</td>
<td>90,704,641</td>
</tr>
<tr>
<td>Educational Services</td>
<td>9.5%</td>
<td>761,787,001</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1.4%</td>
<td>113,580,230</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>14.9%</td>
<td>1,197,767,544</td>
</tr>
<tr>
<td>Information</td>
<td>1.2%</td>
<td>95,342,492</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.1%</td>
<td>4,449,193</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>19.1%</td>
<td>1,536,945,131</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.4%</td>
<td>30,344,031</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>2.1%</td>
<td>171,516,635</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>9.6%</td>
<td>772,754,187</td>
</tr>
<tr>
<td>Public Administration</td>
<td>2.4%</td>
<td>194,763,044</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>10.9%</td>
<td>876,761,203</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>9.9%</td>
<td>795,097,984</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>3.6%</td>
<td>286,317,634</td>
</tr>
<tr>
<td>Unknown</td>
<td>4.0%</td>
<td>320,051,014</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.1%</td>
<td>85,363,538</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.6%</td>
<td>129,904,407</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>8,037,392,465</strong></td>
</tr>
</tbody>
</table>
Table 5-37 presents electric participant savings achieved by industry sector for 2016. In sectors with few participants—such as Agriculture and Mining—the percentages can be somewhat misleading, since each individual customer accounts for a large percentage of the total.47

### Table 5-37. 2015 Electric participant savings achieved by industry sector, excluding unlinked upstream lighting data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>40,795,635</td>
<td>29,498</td>
<td>6,288</td>
<td>616,755,049</td>
<td>$10,791,746</td>
<td>6.6%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>1,977,308</td>
<td>24,411</td>
<td>4,146</td>
<td>23,193,562</td>
<td>$841,871</td>
<td>8.5%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>666,918</td>
<td>35,101</td>
<td>8,510</td>
<td>4,318,436</td>
<td>$263,637</td>
<td>15.4%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>11,280,236</td>
<td>35,810</td>
<td>10,465</td>
<td>165,369,533</td>
<td>$3,926,007</td>
<td>6.8%</td>
</tr>
<tr>
<td>Construction</td>
<td>8,439,110</td>
<td>24,748</td>
<td>4,283</td>
<td>78,223,462</td>
<td>$3,040,473</td>
<td>10.8%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>52,770,645</td>
<td>87,224</td>
<td>16,322</td>
<td>1,085,727,050</td>
<td>$15,176,095</td>
<td>4.9%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>10,420,433</td>
<td>22,506</td>
<td>4,330</td>
<td>315,439,625</td>
<td>$3,550,007</td>
<td>3.3%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>80,294,672</td>
<td>112,932</td>
<td>5,965</td>
<td>1,164,934,205</td>
<td>$15,633,538</td>
<td>6.9%</td>
</tr>
<tr>
<td>Information</td>
<td>8,085,431</td>
<td>55,003</td>
<td>6,439</td>
<td>144,973,383</td>
<td>$1,854,483</td>
<td>5.6%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>307,874</td>
<td>30,787</td>
<td>18,986</td>
<td>7,783,294</td>
<td>$93,958</td>
<td>4.0%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>117,821,584</td>
<td>141,783</td>
<td>13,610</td>
<td>2,389,945,698</td>
<td>$30,939,798</td>
<td>4.9%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>2,471,035</td>
<td>494,207</td>
<td>3,008</td>
<td>54,928,755</td>
<td>$637,007</td>
<td>4.5%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>14,804,767</td>
<td>18,121</td>
<td>5,281</td>
<td>111,800,524</td>
<td>$5,332,270</td>
<td>13.2%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>75,910,807</td>
<td>29,196</td>
<td>6,303</td>
<td>1,091,681,867</td>
<td>$22,086,681</td>
<td>7.0%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>12,196,518</td>
<td>26,688</td>
<td>7,642</td>
<td>170,278,855</td>
<td>$4,174,229</td>
<td>7.2%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>61,246,200</td>
<td>52,527</td>
<td>10,492</td>
<td>1,040,974,617</td>
<td>$19,010,498</td>
<td>5.9%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>73,670,620</td>
<td>37,377</td>
<td>9,010</td>
<td>822,883,403</td>
<td>$22,511,187</td>
<td>9.0%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>16,124,461</td>
<td>108,949</td>
<td>4,640</td>
<td>173,596,384</td>
<td>$4,533,620</td>
<td>9.3%</td>
</tr>
<tr>
<td>Utilities</td>
<td>7,306,850</td>
<td>132,852</td>
<td>21,526</td>
<td>151,803,750</td>
<td>$1,415,087</td>
<td>4.8%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>10,152,791</td>
<td>36,131</td>
<td>9,851</td>
<td>136,833,418</td>
<td>$3,824,381</td>
<td>7.4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>13,040,508</td>
<td>36,224</td>
<td>7,410</td>
<td>84,591,665</td>
<td>$3,888,245</td>
<td>15.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>619,784,404</strong></td>
<td><strong>9,836,036,535</strong></td>
<td><strong>$173,524,817</strong></td>
<td><strong>6.3%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

47 In small populations, the sense of scale can be lost when presenting results in terms of percentages. As an example, at the gross level, there does not seem to be much of a difference between “5 out of 5” people participating versus “4 out of 5” — at this level, the impression is that “most” of the population participated. Stating this in percentage terms (100% participation versus 80% participation) yields a very different impression. Thus, we recommend mindfulness when interpreting these results.
Figure 5-45 presents the proportion of overall savings for every industry sector in 2016. Similar to 2015, the Manufacturing sector realized the majority of savings. Unlike 2015, Health Care and Social Assistance and Professional, Scientific, and Technical Services are closest behind Manufacturing. In 2015, Retail Trade followed Manufacturing most closely in proportion of overall participant savings.

Figure 5-45. Proportion of overall participant savings, electric (excludes unlinked tracking data)
Figure 5-46 further illustrates each industry sector’s proportion of contributed savings from 2011 to 2016. The Health Care sector saw a substantial increase in its contribution to overall savings in 2016. This large proportional increase was due to a few large accounts installing CHP measures, as mentioned above in the text for Table 5-37 and Figure 5-39.

- Accommodation and Food Services also contributed a larger proportion to participant savings in 2016 due to Eversource and National Grid accounts installing custom HVAC chillers, lighting, and process measures.
- The spike in proportional participant savings from Manufacturing in 2015 was due to a few CHP measure installations.
- Figure 5-47 shows a similar figure, but presents savings in terms of participant savings achieved for each industry across all years, rather than each industry’s contribution to overall savings.
- Most industry sectors saw decreases in participant savings achieved in 2016, compared to 2015. Within each industry sector, participant savings achieved appears to fluctuate slightly year over year.
- Agriculture, Forestry, Fishing and Hunting Industry’s savings achieved saw a modest spike in participant savings achieved for 2016. As explained above for Table 5-32, this is the result of many accounts from National Grid, Eversource, and Unitil installing prescriptive retrofit lighting measures.
Figure 5-46. 2011–2016 proportion of overall participant savings, electric (excludes unlinked tracking data)
Figure 5-47. 2011–2016 participant savings achieved by electric industry sector (excludes unlinked tracking data)
5.4 By PA summary

This chapter presents a detailed view of how individual PAs fit into the statewide picture. Despite most of the C&I energy efficiency programs being run at the statewide level, each PA has a unique set of variables and constraints that are likely to yield different results. PAs also have varying geographic elements in their service populations, ranging from dense development in the Boston area to seasonal use patterns in smaller buildings on the Cape and in western Massachusetts.

The majority of the sections in this chapter require that the tracking accounts be linked to billing accounts to generate the report metrics—specifically the consumption-weighted participation, participant savings achieved, proportional consumption ratio, and contribution ratio metrics, as well as any industry sector or consumption sections. The match rates and supporting details for the billing and tracking data for each PA are presented in section 3.4.1 earlier in this report.

5.4.1 Participation and savings

This section breaks out electric PA participation and savings into two primary types of analysis: statewide and participant-only analysis. To perform the participant-only analysis, each account must be matched to the billing data, which allows for the account-level calculations of savings achieved.

Table 5-38 shows the 2016 account participation for each electric PA, and the total average participation rate. As in the 2015 report, this table extracts participation by non-upstream-only, upstream-only, and dual-stream. In addition, DNV GL incorporated incentives for each PA. It is important to note that the inclusion of the upstream lighting data substantially impacted both current and past participation rates. As in 2015, diversifying participation shows that the bulk of account participation across all PAs comes from the upstream-only program.

- The overall average account participation rate for 2016 is 6.4%. This is lower than the previous 2 years (7.8% in 2015 and 6.6% in 2014). Population savings achieved also followed this decreasing trend from 3.3% in 2015 to 2.9% in 2016.
- In 2016, the largest PAs saw large increases in accounts billed. This led to an increase in total billed accounts in 2016 compared to 2015.
- Unitil was the only electric PA who reflected an increase from 2015 in its account participation rate. This was a direct result of an increase in upstream participation.
- The extraction of upstream participation illustrates its critical role in overall account participation, making up more than two-thirds of total participating accounts for all PAs. This proportion of upstream participation is higher than was seen in 2015, although overall upstream participation declined in 2016.
- In 2016, Eversource’s and National Grid’s savings were driven largely by custom retrofit projects where accounts installed CHP, HVAC, and process measures. In 2015, the primary driver of savings for Eversource was the upstream lighting program.
Table 5-38. Account participation rates and population savings achieved by electric PA, electric - including upstream data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light</td>
<td>25,842</td>
<td>775,972,136</td>
<td>535</td>
<td>754</td>
<td>21</td>
<td>1,310</td>
<td>19,153,339</td>
<td>9,029,895</td>
<td>5.1%</td>
</tr>
<tr>
<td>Eversource</td>
<td>170,795</td>
<td>14,391,731,622</td>
<td>3,183</td>
<td>8,124</td>
<td>329</td>
<td>11,636</td>
<td>425,683,296</td>
<td>102,145,101</td>
<td>6.8%</td>
</tr>
<tr>
<td>National Grid</td>
<td>181,869</td>
<td>11,816,120,800</td>
<td>3,133</td>
<td>7,590</td>
<td>420</td>
<td>11,143</td>
<td>341,711,732</td>
<td>65,186,179</td>
<td>6.1%</td>
</tr>
<tr>
<td>Unitil</td>
<td>3,810</td>
<td>314,624,410</td>
<td>105</td>
<td>96</td>
<td>*</td>
<td>201</td>
<td>5,221,182</td>
<td>814,568</td>
<td>5.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>382,316</strong></td>
<td><strong>27,298,448,968</strong></td>
<td><strong>6,956</strong></td>
<td><strong>16,564</strong></td>
<td><strong>770</strong></td>
<td><strong>24,290</strong></td>
<td><strong>791,769,548</strong></td>
<td><strong>177,175,742</strong></td>
<td><strong>6.4%</strong></td>
</tr>
</tbody>
</table>

*This column is the sum of non-suppressed values from non-upstream, upstream only, and dual participation columns. If any columns contain suppressed values, those values are not included in this column.

Table 5-39 shows the mean and median participant savings by PA over time. This table uses the full tracking data present in each year. One interesting trend visible in this table is the overall drop in mean and median savings across all PAs in 2013. A decrease in average savings and median savings, without a decrease in overall savings, indicates that more small accounts are present, and are therefore pulling the average savings down. This decrease in mean yearly savings across all PAs is a consistent trend for 2015 and 2016. The inclusion of upstream lighting data in 2013 and upstream HVAC in 2014 is the likely explanation for the overall decreases in average and median savings, as more small customers take advantage of these programs, and savings per project tend to be lower.

In addition to the upstream program, PAs’ increased engagement with mid-sized customers would decrease mean and median savings, which would explain this continual decrease. This conclusion is based in part on the consistent pattern of substantially higher mean savings than median savings, indicating that a small number of very large projects regularly dominate the year for each PA.

Table 5-39. Mean and median participant kWh savings by PA (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>Mean Yearly Savings</th>
<th>Median Yearly Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>21,030</td>
<td>20,792</td>
</tr>
<tr>
<td>Eversource</td>
<td>67,352</td>
<td>81,314</td>
</tr>
<tr>
<td>National Grid</td>
<td>82,522</td>
<td>54,270</td>
</tr>
<tr>
<td>Unitil</td>
<td>387,631</td>
<td>52,829</td>
</tr>
</tbody>
</table>
Figure 5-48 and Figure 5-49 show historical electric participation and population savings rates, including upstream data. It should be reiterated that it is possible to overestimate these overall participation bars due to the upstream data’s unique account ID assignments. Refer to Appendix Section 8.1.7 for further explanations of this issue.

- All electric PAs saw a decrease in account participation and savings achieved in 2016, compared to 2015. For some PAs, this decrease is lower than 2014 values.
- Upstream participation continues to make up a large proportion of electric projects for all electric PAs. Eversource contributed the most upstream HVAC projects in 2016.
- For most electric PAs, the non-upstream program continues to provide the majority of savings. The upstream program made up half of Cape Light Compact’s savings achieved in 2016.

Upstream data does not contribute the same apparent degree of increase to savings rate as it does to participation rate, largely because the upstream program is dominated by smaller purchases. There are, in fact, quantity limits for upstream. The large population that undertakes lighting each year is why—despite lower individual savings—lighting projects contribute the largest share of overall savings, as seen in Table 5-7 in section 5.2.

**Figure 5-48. 2011–2016 account participation rates, electric - including upstream data**
Figure 5-49. 2011–2016 population savings rates, electric - including upstream data

Figure 5-50 compares the ratio of population savings achieved to the ratio of account participation for each PA over the 6-year period of 2011 to 2016, to show any changing dynamic between participation and savings rates. The changes in this ratio can capture the impact of participation by large accounts on PAs in any given year. This impact can be quite substantial for the smaller PAs.

As seen in 2015, the integration of the upstream lighting data caused a fundamental shift in the trends observed from the 2013 report, with nearly all PAs showing an overarching downward trend in the ratio. This trend is particularly pronounced for smaller PAs, where upstream lighting is becoming a prominent energy efficient measure choice for many smaller PAs’ accounts.

Aside from the downward trend reported after the integration of the upstream program, Eversource and National Grid continue to see increases in the savings ratio relative to the participation ratio, even when overall participation decreased in 2016 compared to 2015.
Table 5-40 presents lifetime savings for 2016, where savings could be derived. This means that the PA provided either lifetime savings or additional metrics that allowed DNV GL to easily calculate lifetime savings. This table is liable to vary quite a bit across years, as different amounts of data are provided each year. In 2016, Cape Light Compact did not provide the data for DNV GL to calculate lifetime savings. This is likely the reason why both non-upstream savings and total savings decreased in 2016. National Grid’s and Eversource’s non-upstream savings and lifetime savings make up 99% of these savings in 2016.

Table 5-40. 2016 lifetime savings distribution for measures where savings could be derived, electric (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Non-Upstream Savings</th>
<th>Total Lifetime Savings</th>
<th>Total Incentives</th>
<th>Proportion of Total Annual Savings</th>
<th>Proportion of Total Lifetime Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>323,486,985</td>
<td>4,518,800,904</td>
<td>$85,114,277</td>
<td>53%</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>277,698,892</td>
<td>3,457,558,839</td>
<td>$80,770,131</td>
<td>46%</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>4,526,198</td>
<td>61,032,721</td>
<td>$1,688,429</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>605,712,075</td>
<td>8,037,392,465</td>
<td>$167,572,837</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 5-41 shows the electric participant savings achieved by each PA in 2016. In 2016, Cape Light Compact yielded the largest average savings achieved, at 7.4%. This ratio has been consistent for Cape Light Compact over the past three years. In 2015, National Grid had the largest average savings achieved, at 8.1%.

- Statewide participant savings achieved in 2016 remains relatively steady with 2015 (6.4%). This is of interest, as overall participation and population savings decreased from 2015. This metric consists of the ratio of savings to usage, for participating accounts only. So although the number of participants statewide decreased, participants maintained the same savings achieved.

<table>
<thead>
<tr>
<th>PA</th>
<th>2016 Participant kWh Savings</th>
<th>2016 Participant kWh Usage 2015</th>
<th>2016 Participant Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>11,895,910</td>
<td>160,882,399</td>
<td>7.4%</td>
</tr>
<tr>
<td>Eversource</td>
<td>308,940,295</td>
<td>5,125,902,803</td>
<td>6.0%</td>
</tr>
<tr>
<td>National Grid</td>
<td>294,955,201</td>
<td>4,402,284,944</td>
<td>6.7%</td>
</tr>
<tr>
<td>Unitil</td>
<td>4,168,115</td>
<td>145,641,103</td>
<td>2.9%</td>
</tr>
<tr>
<td>Total</td>
<td>619,959,521</td>
<td>9,834,711,248</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

In each year of data, there are records where the annual savings from installed measures exceed the account’s usage from the previous year (Table 5-42). This can occur for multiple reasons. DNV GL hypothesizes that the most common reason is that existing accounts have undergone expansions in conjunction with the new efficiency measures installed, and so historical consumption (while accurate) may not reflect the new consumption of the account.

A second possibility is related to the fact that while PAs’ tracking systems usually require a single primary account as part of the record entry, measures may actually be installed at multiple accounts. In these instances, the consumption is understated because only the primary account’s consumption is reflected.48

Across the electric PAs, nearly 10% of the matched accounts had a percent savings achieved of over 100%. If these accounts were removed from the analysis completely, the participant savings achieved would fall from 6.3% to 5.0%.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>2016 Accounts</th>
<th>2016 Accounts with Achieved Savings &lt; 100%</th>
<th>% 2016 Accounts where Savings Achieved &lt; 100%</th>
<th>% 2016 Accounts where Savings Achieved &gt; 100%</th>
<th>Average Percent Savings Achieved for 2016 Accounts &lt; 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>798</td>
<td>721</td>
<td>90%</td>
<td>10%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Eversource</td>
<td>5,836</td>
<td>5,116</td>
<td>88%</td>
<td>12%</td>
<td>5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>National Grid</td>
<td>6,162</td>
<td>5,607</td>
<td>91%</td>
<td>9%</td>
<td>5.6%</td>
<td></td>
</tr>
<tr>
<td>Unitil</td>
<td>147</td>
<td>139</td>
<td>95%</td>
<td>5%</td>
<td>2.8%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12,943</td>
<td>11,583</td>
<td>89%</td>
<td>11%</td>
<td>5.0%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5-51 provides a year-over-year comparison of electric participant savings for each PA over the 6-year period from 2011 to 2016. In Table 5-41, Cape Light Compact shows the highest 2016 savings achieved. In Figure 5-51, Eversource is the only PA whose participant savings achieved increased from 2015. The spike

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48 National Grid provided DNV GL with a list of accounts in 2014 for which this was known to happen, so that we could determine if these situations had a major impact. As with the 2013 results, in 2015 DNV GL did not see a major impact on the outcome metrics. Only 3.5% of the identified parent/child accounts in the database fall into the greater than 100% of consumption category in 2014.
in National Grid’s 2015 participant savings achieved was due to a concentration of large CHP measures installed by multiple accounts.

The two spikes seen in 2011 and 2013 for Unitil were the result of two specific projects: a large prescriptive retrofit motors/drives project in 2011, and a custom retrofit HVAC project in 2013. Based on this volatility, we suspect large accounts have a strong influence on participant savings ratios for small PAs.

The effect of large one-off projects is visible for all PAs, large and small. For the larger PAs, these often appear to be CHP projects; for the smaller PAs they tend to be process or HVAC. While these types of projects are important in helping PAs achieve their annual savings goals, it is not always possible for PAs to complete a project of this atypically large size each year.

**Figure 5-51. 2011–2016 participant savings achieved by electric PA (excludes unlinked tracking data)**

Figure 5-52 presents the median savings over time in graphical format. Unlike 2015, in 2016 every PA saw an increase in median participant savings. This indicates that these PAs were able to engage larger customers in 2016 than in 2015. Median values were still lower than their 2013 levels, reflecting increased participation in small- and medium-sized accounts in the upstream program.
Figure 5-52. Median participant gross annual kWh savings by PA (excludes unlinked tracking data)
5.4.2 Market segmentation

To identify high-level differences among the PAs that could impact comparisons between PAs, DNV GL calculated the ratio of proportional savings contribution relative to proportional consumption contribution for each decile bin of the PA accounts. This calculation creates a “contribution ratio” that allows the reader to discern how each PA derives savings from each customer bin, regardless of the raw number of accounts or the relative size of those accounts.\(^{49}\) This ratio has been referenced throughout the report and is further explained in sections 3.3 and 8.1.3. The calculation of the contribution ratio requires that the tracking data be linked to the billing data. For this reason, any unlinked upstream lighting accounts as well as any tracking data that could not be matched to billing records are dropped from the analysis. The result is that the total savings reported in the contribution ratio analysis is smaller than the savings for the full tracking population.

The equation is:

\[
\text{Contribution Ratio} = \frac{\text{Proportion of the PAs Total Savings from the individual analysis bin}}{\text{Proportion of PAs Total Consumption from the individual analysis bin}}
\]

While the contribution ratio is a unit-less number, the magnitude of the value can aid in comparing both across and within a PA, across bins:

- \(<1\) indicates that the bin contributes less towards total savings than it does towards consumption
- \(=1\), or close to 1, indicates that the bin contributes equally towards total savings and consumption
- \(>1\) indicates that the bin contributes more towards total savings than it does towards consumption

In addition to the upstream data and linking caveat above, two additional caveats go into creating the contribution ratio metric:

1. Accounts that showed annual savings greater than total annual consumption were dropped from the analysis on the basis that these accounts either have incomplete savings data or were undergoing a large renovation that would substantially increase consumption from the base year.
2. For PAs with smaller populations, a small absolute increase in yearly participants could potentially create a large impact in the smaller consumption bins. For example, 15 participants in a bin are much more impactful if the bin population is 15 rather than 100. This dynamic can result in a more pronounced staircase pattern in the contribution ratio.

Table 5-43 shows the number of accounts in each of the PA’s percentile bins in 2016, which is 10% of each PA’s total billed population per bin. These totals will increase or decrease each year, relative to the increase or decrease in each PA’s overall population.

**Table 5-43. Total billed accounts per percentile bin, electric**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Number of Billed Accounts per Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Cape Light Compact</td>
<td>2,602</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>14,566</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>15,949</td>
</tr>
<tr>
<td></td>
<td>Unitil</td>
<td>398</td>
</tr>
</tbody>
</table>

\(^{49}\) The hypothesis here is that in effect, if there are no differences between how PAs derive proportional savings relative to proportional consumption, there will be no change in the contribution ratio across PAs for any given size class.
Figure 5-53 shows the percentile consumption breakpoints across the electric PAs in 2016. Large differences do not begin to appear across the PAs until the 80th percentile, at which point a clear separation occurs between lines for different PAs.

- Furthermore, at the 80th percentile, all PAs’ slopes become much steeper, reflecting more drastic changes in consumption between PAs 80th and 90th largest sized accounts. Eversource reflects the steepest change in consumption between these large customer sizes. The table embedded in the chart supports this increase, where the consumption breakpoint for Eversource’s 90th percentile bin is much larger than the breakpoints for its 80th percentile size bin.
- Cape Light Compact’s and Unitil’s percentile size bin breakpoints also do not differ drastically until the 80th percentile.

Consistent with previous years’ results, this figure suggests that at the smaller ends of the decile bins, the consumption size of the underlying accounts is not a driver of differences in the PA charts.

The difference in these relative sizes may have implications for the strategies and approaches the PAs—particularly the larger PAs—develop to engage customers in smaller percentile ranges. For example, if Unitil develops a successful approach to engage customers in its 80th percentile bin, then Eversource and National Grid can possibly leverage aspects of this approach to target their 70th percentile bins, which reflect comparable consumption break points values.

Above the 90th percentile, each of the PAs has customers with annual consumption over 20 GWh per year. This bin represents over 75% of the total annual consumption for each of the electric PAs in 2016. This heavy concentration of consumption helps explain why each PA tends to achieve savings in this population segment, as seen below in Figure 5-54. A potential implication of this dynamic is that PAs may continue to concentrate on savings from customers in their largest bin, given the overwhelming percentage of savings these customers contribute for each PA.
Figure 5-53. Consumption breakpoints for percentile bin, electric

![Figure 5-53](image)

Figure 5-54 shows the results of the contribution ratio analysis for the electric PAs. This figure illustrates that for the electric market, the contribution ratio for each decile bin is relatively similar across PAs (i.e., PAs derive similar ratios of savings relative to consumption for each bin).

Key takeaways from Figure 5-54 include the following:

- Unitil’s curve remained consistent with the spike seen in the 2015 report for customers in its 90th percentile bin. These customers’ proportional savings rate is lower than 2015. Their proportional usage also decreased, allowing the bin to still reflect a large contribution ratio, close to 1.8. This indicates that proportional savings for Unitil’s customers in this bin were almost double proportional usage. In addition, Unitil’s 8th (80th percentile) usage bin presented a contribution ratio >1, where the bin’s contribution to PA savings was greater than its contribution to usage. This was also the case in 2015 for Unitil.

- In 2016, most electric PAs saw increases in contribution ratios for their 6th and 7th percentile of customers. As Figure 5-53 reflects, this is the point where consumption sizes start to change drastically between PAs, but as a whole the population’s 60th and 70th percentile of customers achieved more proportional savings to usage.

- Consistent with previous years, each PA realized comparable amounts of total savings from its largest customers in 2016, with contribution ratios just above 1.0. This indicates that each PA’s largest customers are contributing a slightly proportion of savings relative to their proportion of consumption. This does not mean that the gross amount of consumption or the savings size of the measures installed was the same across PAs—only that each PA realized close to the same proportional savings from its largest accounts.
Figure 5-54. Contribution ratio distributions by PA, electric (excludes unlinked tracking data)
5.4.3 Six-year market summaries

As part of the 6-year universe analysis, DNV GL examined total market penetration rates of account participation through different lenses. This included calculating the consumption-weighted participation statistic to assess how much of PA consumption is associated with the program participants.

5.4.3.1 By PA

Table 5-44 shows the 6-year market penetration rates for electric. As was seen in the 2015 report, electric PAs tend to have less spread in the range of consumption-weighted participation, with all electric PAs falling between 48.9% and 65.2%. This range in consumption-weighted participation is higher than seen in 2015 with the 5-year market summary. Presented in the 2015 report is the time series savings achieved metric, which looks at participants’ energy savings over the entire time horizon of the report (2011–2016) relative to the total energy consumption for all customers over the same period. Over the past 6 years, this metric has not varied much across PAs. In 2016, though, as in 2015, Eversource claimed the highest time series savings achieved (2.8%) over the 6-year span. This value is identical to what was seen in 2015 for Eversource’s 5-year time series savings achieved.

Table 5-44. Electric PA six-year market summary (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>Total Billing Accounts</th>
<th>Total Consumption (GWh)</th>
<th>Total Participants</th>
<th>Total</th>
<th>Total Savings (GWh)</th>
<th>Upstream Savings (GWh)</th>
<th>Total Incentives</th>
<th>6-year Account Market Penetration Rate</th>
<th>Consumption-Weighted Market Penetration Rate</th>
<th>Longitudinal Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>36,569</td>
<td>5,059.31</td>
<td>2,443</td>
<td>2,840</td>
<td>182</td>
<td>5,465</td>
<td>111.56</td>
<td>$29,262,203</td>
<td>14.9%</td>
<td>48.9%</td>
</tr>
<tr>
<td>Eversource</td>
<td>224,293</td>
<td>91,997.97</td>
<td>16,612</td>
<td>24,930</td>
<td>2,442</td>
<td>43,984</td>
<td>2,405.38</td>
<td>$432,052,641</td>
<td>19.6%</td>
<td>63.5%</td>
</tr>
<tr>
<td>National Grid</td>
<td>255,397</td>
<td>74,362.31</td>
<td>13,532</td>
<td>23,891</td>
<td>2,519</td>
<td>39,942</td>
<td>1,706.62</td>
<td>$357,135,382</td>
<td>15.6%</td>
<td>62.6%</td>
</tr>
<tr>
<td>Unitil</td>
<td>5,376</td>
<td>1,535.98</td>
<td>334</td>
<td>339</td>
<td>55</td>
<td>736</td>
<td>46.62</td>
<td>$8,960,600</td>
<td>13.7%</td>
<td>65.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>521,635</strong></td>
<td><strong>172,955.57</strong></td>
<td><strong>32,921</strong></td>
<td><strong>52,000</strong></td>
<td><strong>5,208</strong></td>
<td><strong>90,129</strong></td>
<td><strong>4,270.19</strong></td>
<td><strong>$827,410,826</strong></td>
<td><strong>17.3%</strong></td>
<td><strong>62.7%</strong></td>
</tr>
</tbody>
</table>

DNV GL conducted the time series geographic analysis using the full billing and tracking populations, including upstream data and unlinked tracking data. As in previous Customer Profiles, the use of both full populations was possible because although data could not always be linked through the account number (due to a missing number or unmatched numbers), most tracking data included an address and other associated geographic data. Each unique tracking record is counted only once, as is each unique billing record. In assessing these figures, it is important to keep in mind the potential for overstating unique account participation for small towns, due to upstream lighting temporary account assignments. This is described in further detail in section 3.4.6.

Figure 5-55 shows that the participation for unique accounts from 2011-2016 has been relatively consistent statewide, with most towns having participation rates between 16% and 20%. There are several towns that did not have any participants identified in the tracking data from 2011-2016; these towns are all rural towns with small populations, and the lack of participation even across a 6-year period does not suggest systemic issues. As noted in previous reports, the unique participation map suggests that all PAs continue to
have sizable numbers of C&I accounts that appear not to have engaged in energy efficiency programs in the past 6 years.\textsuperscript{50} Although these accounts constitute a large population when taken together, individually they are likely to be smaller consumers, who might represent potential challenges for the PAs to engage.

\textbf{Figure 5-55. 2011–2016 account penetration rate by town 2011-2016, electric – includes unlinked tracking data}

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\textsuperscript{50} It is possible that they have participated in an upstream program and cannot be linked to a billing data record. It is also possible that for smaller accounts in particular, those with lighting systems as the primary energy-consuming object are participating through store retail channels that are more focused on residential data than C&I program offerings. Such an example would be a small out-patient medical office deciding to replace failed CFL bulbs with LED bulbs purchased though their local hardware store.
Figure 5-56 presents the consumption-weighted participation. Particularly when it is compared against the overall account participation though time, the consumption-weighted participation illustrates that many PA-served towns have engaged their larger accounts, leading to high consumption-weighted participation. What is not captured in this graphic is the depth to which these accounts have been engaged.

**Figure 5-56.** 2011–2016 consumption-weighted account penetration rate by town 2011-2016, electric (excludes unlinked tracking data)
Figure 5-57 shows a time series of savings relative to consumption. These maps look at the single-year gross savings, against the time series consumption for each town. Details on how this is calculated are presented in section 3.3. Figure 5-57 shows that the majority of electric towns experienced savings over time of around 2% to 3% of consumption. As with the other geographic analyses, smaller population towns tended to experience more variability.

**Figure 5-57. 2011–2016 savings achieved by town 2011-2016, electric (includes unlinked tracking data)**

Dual fuel-served town dynamics were also assessed for the 6-year period from 2011 to 2016. This metric provides insight into how participation and populations vary across towns with the same electric and gas PA, and across towns that have multiple or different electric and gas PAs.
Table 5-45 lists consumption values from 2011-2015 and participation values from 2012-2016. This allows for an accurate time series savings achieved metric.

**Table 5-45. Town level electric savings ratio and consumption-weighted participation by electric and gas PA combination (includes unlinked tracking data)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Same PA (Electric; Gas)</td>
<td>86</td>
<td>54,554,062,997</td>
<td>51,625</td>
<td>33,946,610,590</td>
<td>24,758</td>
<td>57.0%</td>
<td>16.2%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy; Eversource Energy</td>
<td>24</td>
<td>2,288,569,844</td>
<td>52,897</td>
<td>14,941,272,780</td>
<td>9,956</td>
<td>59.3%</td>
<td>18.7%</td>
<td></td>
</tr>
<tr>
<td>National Grid; National Grid</td>
<td>59</td>
<td>30,244,199,325</td>
<td>96,964</td>
<td>16,055,274,497</td>
<td>14,185</td>
<td>56.1%</td>
<td>15.4%</td>
<td></td>
</tr>
<tr>
<td>Unigas; Unigas</td>
<td>3</td>
<td>1,424,173,828</td>
<td>4,774</td>
<td>950,063,313</td>
<td>617</td>
<td>55.0%</td>
<td>12.7%</td>
<td></td>
</tr>
<tr>
<td>Different PA (Electric; Gas)</td>
<td>125</td>
<td>77,820,104,186</td>
<td>237,167</td>
<td>50,268,796,891</td>
<td>40,353</td>
<td>60.7%</td>
<td>21.8%</td>
<td></td>
</tr>
<tr>
<td>Cape Light Compact; National Grid</td>
<td>12</td>
<td>4,534,214,489</td>
<td>31,730</td>
<td>2,250,944,998</td>
<td>4,239</td>
<td>46.6%</td>
<td>13.1%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, Municipal; Columbia Gas</td>
<td>1</td>
<td>867,853</td>
<td>32</td>
<td>545,825</td>
<td>106</td>
<td>62.9%</td>
<td>331.3%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Berkshire Gas</td>
<td>1</td>
<td>21,763,035</td>
<td>191</td>
<td>10,075,152</td>
<td>70</td>
<td>46.3%</td>
<td>36.6%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Columbia Gas</td>
<td>2</td>
<td>433,617,297</td>
<td>2,566</td>
<td>196,867,645</td>
<td>641</td>
<td>44.0%</td>
<td>24.7%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Liberty Utilities</td>
<td>1</td>
<td>117,786,834</td>
<td>1,421</td>
<td>51,427,324</td>
<td>381</td>
<td>43.7%</td>
<td>26.8%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, Berkshire Gas</td>
<td>12</td>
<td>4,414,265,946</td>
<td>12,249</td>
<td>2,786,188,321</td>
<td>2,602</td>
<td>58.7%</td>
<td>22.2%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, Columbia Gas</td>
<td>16</td>
<td>9,526,381,269</td>
<td>26,892</td>
<td>6,109,033,588</td>
<td>5,776</td>
<td>88.0%</td>
<td>23.8%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid</td>
<td>18</td>
<td>19,464,976,851</td>
<td>45,667</td>
<td>12,884,436,962</td>
<td>8,420</td>
<td>59.5%</td>
<td>19.2%</td>
<td></td>
</tr>
<tr>
<td>National Grid, Municipal; Columbia Gas</td>
<td>1</td>
<td>55,154,805</td>
<td>349</td>
<td>29,015,960</td>
<td>81</td>
<td>53.7%</td>
<td>23.2%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Berkshire Gas</td>
<td>8</td>
<td>1,533,611,095</td>
<td>5,307</td>
<td>1,020,665,195</td>
<td>971</td>
<td>51.0%</td>
<td>17.9%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Columbia Gas</td>
<td>30</td>
<td>19,342,004,081</td>
<td>53,036</td>
<td>12,705,513,551</td>
<td>9,025</td>
<td>57.9%</td>
<td>18.2%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Columbia Gas, Eversource Energy</td>
<td>1</td>
<td>63,448,992</td>
<td>398</td>
<td>17,889,407</td>
<td>66</td>
<td>28.2%</td>
<td>16.6%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Eversource Energy</td>
<td>16</td>
<td>14,720,257,560</td>
<td>43,739</td>
<td>10,088,104,806</td>
<td>5,648</td>
<td>63.0%</td>
<td>17.2%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Liberty Utilities</td>
<td>4</td>
<td>2,873,857,411</td>
<td>11,545</td>
<td>1,842,421,152</td>
<td>1,989</td>
<td>59.6%</td>
<td>21.4%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Unigas</td>
<td>2</td>
<td>6,978,869,607</td>
<td>2,045</td>
<td>475,467,004</td>
<td>338</td>
<td>66.5%</td>
<td>17.9%</td>
<td></td>
</tr>
<tr>
<td>Multiple PAs, Some Shared (Electric; Gas)</td>
<td>8</td>
<td>35,040,692,686</td>
<td>81,345</td>
<td>21,656,721,745</td>
<td>12,429</td>
<td>54.6%</td>
<td>17.8%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Columbia Gas, National Grid</td>
<td>1</td>
<td>350,683,055</td>
<td>1,063</td>
<td>180,351,623</td>
<td>335</td>
<td>51.4%</td>
<td>31.5%</td>
<td></td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Columbia Gas, National Grid</td>
<td>1</td>
<td>34,356,287,139</td>
<td>78,427</td>
<td>21,303,901,693</td>
<td>11,783</td>
<td>57.3%</td>
<td>15.0%</td>
<td></td>
</tr>
<tr>
<td>National Grid; Columbia Gas, National Grid</td>
<td>1</td>
<td>92,453,114</td>
<td>639</td>
<td>53,165,073</td>
<td>86</td>
<td>57.5%</td>
<td>13.5%</td>
<td></td>
</tr>
<tr>
<td>National Grid; National Grid, Eversource Energy</td>
<td>1</td>
<td>119,712,475</td>
<td>595</td>
<td>37,389,181</td>
<td>121</td>
<td>31.2%</td>
<td>20.3%</td>
<td></td>
</tr>
<tr>
<td>National Grid; National Grid, Unigas</td>
<td>1</td>
<td>121,556,903</td>
<td>621</td>
<td>81,914,175</td>
<td>104</td>
<td>67.4%</td>
<td>16.7%</td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>219</td>
<td>167,414,859,869</td>
<td>473,347</td>
<td>105,872,139,226</td>
<td>77,540</td>
<td>59.0%</td>
<td>19.4%</td>
<td></td>
</tr>
</tbody>
</table>
There continue to be variations within individual PAs under the annual and 6-year market penetration lenses. Figure 5-58 and Figure 5-59 present account participation and consumption-weighted account participation for the electric PAs by year. Each figure also includes a gray bar representing the 6-year total of unique participants. This is the first year all PAs have seen decreases in overall participation. Some decreases have brought them below their 2014 participation rates. It should be noted that with the increasing ability to link upstream data across years, these ratios are likely to decrease, since the former inability to link accounts resulted in overestimating participation.

**Figure 5-58. Electric account participation market penetration rates by PA and year (includes unlinked tracking data)**
Figure 5-59 shows that, statewide, the participating accounts over the past 6 years continue to make up over 50% of the statewide consumption. This is a consistent trend seen in previous years.

- Similar to 2015, Cape Light Compact had the lowest consumption-weighted participation rate in 2016. However, this rate increased to its largest value over the 6-year period. This indicates Cape Light Compact increased its engagement for larger-sized customers.
- Eversource and National Grid have engaged a similar portion of the consumption-weighted population. In addition, both PAs saw a decrease in their consumption-weighted participation rates, close to their 2011 values. This reflects the overall participation decline above, and perhaps also an increase in participation proportion of smaller-sized customers.
- For electric, the total consumption-weighted market penetration rate declined in 2016, as it did in 2015. Though this rate still remains above 60%, this metric has been declining since its peak in 2014. Unitil and Cape Light Compact engaged some of their largest customers in 2016, as seen in spikes in Figure 5-59. The total trend still reflects the decreases seen by National Grid and Eversource.

Figure 5-59. Electric account consumption-weighted participation market penetration rates by PA and year (excludes unlinked tracking data)

In order to provide a more in-depth view into the size of customers that the PAs are engaging each year, Figure 5-60 illustrates the ratio of weighted to unweighted participation each year. Below is the equation for this ratio. The higher the consumption-weighted participation, the larger the ratio, indicating that the
The majority of savings are coming from a small number of large accounts. If a PA sees a declining ratio trend, this is an indication that more, relatively smaller, accounts are being engaged each year in order to achieve each PA’s savings results.

\[
\frac{W}{U} \text{ Ratio} = \frac{\text{Consumption weighted participation}}{\text{Unweighted participation}}
\]

Figure 5-60 shows that in 2016, this ratio increased for the first time in 6 years. Some PAs’ 2016 ratio is even larger than their 2014 ratio. This reflects more large account participation in 2016.

**Figure 5-60. Ratio of weighted market penetration/unweighted market penetration - electric (includes unlinked tracking data)**

As seen in the 2015 C&I Customer Profile, DNV GL assessed market penetration over the 6-year period from 2011 to 2016. Unique to 2016, DNV GL replaced these bins with broad consumption (kWh) rather than demand (kW) under PA and EEAC guidance. This table still provides an idea of how many of all accounts in a size bin participated in the 6-year period, rather than just the percentage that participated in any given year. One important data element to note is that while an account is assigned to a single consumption bin for each year, the consumption bin for the account does not necessarily remain consistent over time. The 6-year total consumption in these charts does not include accounts that had negative consumption with them, which results in a slightly higher overall consumption for the tables. Finally, this section only includes
tracking data that could be linked to billing records, as the billing link is needed to assign a consumption class.51

Table 5-46 presents the electric consumption bin market penetration summary. As the consumption bin size increases, the market penetration ratio increases. Because the larger bins have fewer accounts, every participating account has a larger effect on market penetration. In the highest bin, the unique participants account for 1.5% of the 6-year participation identified, but contribute 40% of the total savings for the tracking accounts that could be matched to billing accounts. This reinforces a finding consistent throughout previous reports, and explored in detail in Section 5.1, about the contribution that larger accounts make toward gross savings.

Table 5-46. 6-year market penetration rates by consumption bin (excludes unlinked tracking data).

<table>
<thead>
<tr>
<th>Broad Consumption Bin</th>
<th>Total Billing Accounts</th>
<th>Total Consumption (GWh)</th>
<th>Total Participants</th>
<th>Total Savings (GWh)</th>
<th>6 Year Account Market Penetration Rate</th>
<th>Consumption Weighted Market Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>486,788</td>
<td>27,581</td>
<td>35,729</td>
<td>478</td>
<td>7.3%</td>
<td>4.5%</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>34,841</td>
<td>27,872</td>
<td>12,289</td>
<td>425</td>
<td>35.3%</td>
<td>11.0%</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>9,032</td>
<td>27,307</td>
<td>4,518</td>
<td>462</td>
<td>50.0%</td>
<td>18.0%</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>3,426</td>
<td>33,045</td>
<td>2,180</td>
<td>575</td>
<td>63.6%</td>
<td>27.9%</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>1,149</td>
<td>58,404</td>
<td>871</td>
<td>1,293</td>
<td>75.8%</td>
<td>54.2%</td>
</tr>
<tr>
<td>Total</td>
<td>535,236</td>
<td>174,209</td>
<td>55,587</td>
<td>3,233</td>
<td>10.4%</td>
<td>28.7%</td>
</tr>
</tbody>
</table>

51 Please see section 1.1 for details and success rates of linking billing and tracking data.
Figure 5-61 presents the participation rate for linked tracking data by consumption bin and year, as well as the aggregate unique participation across the 6 years of data. Among all size ranges, statewide there is a decrease in participation rates for linked tracking data. This is particularly visible for the 1.5 – 4.5 GWh bin (second largest). As seen in 2015, the unique accounts that could be linked with tracking data in this chart represent almost half of the total unique population. Most of these participants have participated in an energy efficiency offering since 2011.

**Figure 5-61. Account participation market penetration rates by consumption bin and year (excludes unlinked tracking data)**
5.4.3.2 Industry sector

DNV GL assessed market penetration by sector over the 6-year period from 2011 to 2016. This provides an idea of how many of all accounts in an industry sector participated in the 6-year period, rather than just the percent that participated in any given year. Table 5-47 presents the electric industry sector market penetration summary.

Overall, market penetration continues to increase from 5.8% in 2014, 7.0% in 2015 and now 9.7% in 2016. There were increases in market penetration rates for all industry sectors. Mining, Quarrying, and Oil and Gas Extraction had enough participants in 2016 to be part of the chart (at least 15). With this, their small number of participants for the past 6 years encompassed a fairly large penetration rate of 13.5%. The industry sector with the largest increase in market penetration for the 6-year period, compared to 2015, was Arts, Entertainment, and Recreation, with 18.4% (up from 11.2% in 2015).

Table 5-47. Market penetration rate by industry sector 2011-2016, electric (excludes unlinked tracking data)52

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Total Matched Participants 2011-2016</th>
<th>Total Billed Accounts 2011-2016</th>
<th>Market Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5,477</td>
<td>58,011</td>
<td>9.44%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>353</td>
<td>5,239</td>
<td>6.74%</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>66</td>
<td>809</td>
<td>8.16%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>1,225</td>
<td>6,649</td>
<td>18.42%</td>
</tr>
<tr>
<td>Construction</td>
<td>1,103</td>
<td>13,289</td>
<td>8.30%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>2,186</td>
<td>8,714</td>
<td>25.09%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1,468</td>
<td>10,888</td>
<td>13.48%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>2,184</td>
<td>16,974</td>
<td>12.87%</td>
</tr>
<tr>
<td>Information</td>
<td>697</td>
<td>16,469</td>
<td>4.23%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>184</td>
<td>1,931</td>
<td>9.53%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2,443</td>
<td>12,378</td>
<td>19.74%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>15</td>
<td>111</td>
<td>13.51%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>3,186</td>
<td>23,954</td>
<td>13.30%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>11,074</td>
<td>110,779</td>
<td>10.00%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>2,254</td>
<td>22,150</td>
<td>10.18%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>3,603</td>
<td>39,785</td>
<td>9.06%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>8,517</td>
<td>42,145</td>
<td>20.21%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>830</td>
<td>12,343</td>
<td>6.72%</td>
</tr>
<tr>
<td>Utilities</td>
<td>228</td>
<td>4,128</td>
<td>5.52%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>949</td>
<td>6,034</td>
<td>15.73%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1,976</td>
<td>102,339</td>
<td>1.93%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50,018</strong></td>
<td><strong>515,119</strong></td>
<td><strong>9.7%</strong></td>
</tr>
</tbody>
</table>

52 Participant numbers <15 are labeled *** to ensure customer privacy.
Table 5-48 shows the consumption-weighted market penetration across the sectors spanning 6 years. In this table, the consumption-weighted market penetration rates for many industry sectors are close to or greater than 50%. This was also the case for 2015, suggesting that a sizable representation of large accounts have continued to participate in these sectors within the 6-year period. The majority of the largest participating accounts are multi-year participants.

For 2016, Mining, Quarrying, and Oil and Gas Extraction presents the largest consumption-weighted market penetration rate, at 95%. This means, in terms of size, that nearly this entire sector has participated over the past 6 years. In 2016, consumption-weighted penetration was 81% for the Educational Services sector and 84% for Manufacturing; these are substantial increases over the 2015 values of 64% and 74%, respectively.

### Table 5-48. 2011–2016 consumption-weighted market penetration by industry sector, electric (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Total Participant Consumption 2011-2016</th>
<th>Total Billed Consumption 2011-2016</th>
<th>Market Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>9,091,134,764</td>
<td>14,869,888,325</td>
<td>61.14%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>404,577,313</td>
<td>844,901,902</td>
<td>47.88%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>35,962,570</td>
<td>84,221,298</td>
<td>42.70%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>2,255,843,724</td>
<td>3,316,822,079</td>
<td>68.01%</td>
</tr>
<tr>
<td>Construction</td>
<td>796,002,843</td>
<td>1,638,829,563</td>
<td>48.57%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>11,157,221,960</td>
<td>13,781,104,743</td>
<td>80.96%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>2,977,407,777</td>
<td>5,372,510,159</td>
<td>55.42%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>10,430,042,606</td>
<td>14,283,360,067</td>
<td>73.02%</td>
</tr>
<tr>
<td>Information</td>
<td>2,644,780,189</td>
<td>5,859,287,809</td>
<td>45.14%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>1,051,204,058</td>
<td>1,759,735,466</td>
<td>59.74%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>20,365,982,443</td>
<td>24,108,417,574</td>
<td>84.48%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>334,901,948</td>
<td>352,090,543</td>
<td>95.12%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1,631,482,799</td>
<td>3,574,615,676</td>
<td>45.64%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>12,688,919,265</td>
<td>22,063,030,528</td>
<td>57.51%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>4,182,787,647</td>
<td>8,054,238,875</td>
<td>51.93%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>9,899,884,061</td>
<td>16,506,630,931</td>
<td>60.52%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>12,172,734,227</td>
<td>19,293,985,931</td>
<td>63.09%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1,871,342,524</td>
<td>3,774,050,875</td>
<td>49.58%</td>
</tr>
<tr>
<td>Utilities</td>
<td>1,649,963,147</td>
<td>2,785,687,842</td>
<td>59.23%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1,542,275,664</td>
<td>2,558,012,977</td>
<td>60.29%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1,113,566,067</td>
<td>6,565,576,080</td>
<td>16.96%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>108,388,017,594</strong></td>
<td><strong>171,446,998,606</strong></td>
<td><strong>63.2%</strong></td>
</tr>
</tbody>
</table>
As presented in the 2015 report, Table 5-49 provides electric savings, usage, and market penetration rates for industry sectors from 2011 to 2016. This table illustrates how much an industry sector has contributed to savings over the past 6 years relative to its proportion of total usage over this time period. Market penetration rates are also provided to illustrate where potential large accounts exist in certain sectors.

- As was the case in 2015, manufacturing is the leading industry sector in proportion of total savings across the 6-year span. In addition, its proportion of total savings is greater than its proportion of total usage, meaning that its contribution ratio is greater than 1. Contribution ratios are explained in more detail in 5.4.2. Lastly, this sector’s consumption-weighted market penetration rate indicates that nearly 85% of the market has been engaged over the past 6 years.
- Educational Services also presents a historical proportion of savings greater than its proportion of usage. This, paired with its 81% consumption-weighted participation rate, indicates that with the addition of 2016, this sector has engaged 81% of its population, resulting in a larger contribution to savings than to usage.
- An interesting finding for accounts with smaller consumption-weighted participation rates is that their historical proportion of savings is typically less than their proportion of usage. This indicates that these sectors tend to engage smaller sized customers, but savings from their participation doesn’t contribute to these sectors as much as their usage.

**Table 5-49. 2011–2016 analysis summary by industry sector, electric**

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Longitudinal proportion of total savings</th>
<th>Longitudinal proportion of total usage</th>
<th>Market penetration rate</th>
<th>Consumption-weighted market penetration rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>7.2%</td>
<td>8.6%</td>
<td>9.4%</td>
<td>61.1%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.30%</td>
<td>0.49%</td>
<td>6.74%</td>
<td>47.9%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.04%</td>
<td>0.05%</td>
<td>8.16%</td>
<td>42.7%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>2.16%</td>
<td>1.92%</td>
<td>18.42%</td>
<td>68.0%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.89%</td>
<td>0.95%</td>
<td>8.30%</td>
<td>48.6%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>11.82%</td>
<td>7.97%</td>
<td>25.09%</td>
<td>81.0%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>2.05%</td>
<td>3.11%</td>
<td>13.48%</td>
<td>55.4%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>10.70%</td>
<td>8.26%</td>
<td>12.87%</td>
<td>73.0%</td>
</tr>
<tr>
<td>Information</td>
<td>1.19%</td>
<td>3.39%</td>
<td>4.23%</td>
<td>45.1%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.70%</td>
<td>1.02%</td>
<td>9.53%</td>
<td>59.7%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>19.54%</td>
<td>13.94%</td>
<td>19.74%</td>
<td>84.5%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.08%</td>
<td>0.20%</td>
<td>13.51%</td>
<td>95.1%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1.86%</td>
<td>2.07%</td>
<td>13.30%</td>
<td>45.6%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>12.38%</td>
<td>12.76%</td>
<td>10.00%</td>
<td>57.5%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>3.39%</td>
<td>4.66%</td>
<td>10.18%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>7.47%</td>
<td>9.54%</td>
<td>9.06%</td>
<td>60.5%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>10.93%</td>
<td>11.16%</td>
<td>20.21%</td>
<td>63.1%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>2.26%</td>
<td>2.18%</td>
<td>6.72%</td>
<td>49.6%</td>
</tr>
<tr>
<td>Utilities</td>
<td>1.09%</td>
<td>1.61%</td>
<td>5.52%</td>
<td>59.2%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.40%</td>
<td>1.48%</td>
<td>15.73%</td>
<td>60.3%</td>
</tr>
<tr>
<td>Unknown</td>
<td>2.45%</td>
<td>3.80%</td>
<td>1.93%</td>
<td>17.0%</td>
</tr>
</tbody>
</table>
5.4.3.3 Multi-year participation

Figure 5-62 presents the yearly distribution of savings for multi-year participants, ranging from 2-year to 6-year participants.

- As seen in 2015, two-year participants yield the highest overall savings of any multi-year participants, as they occur most frequently, regardless of the year.
- Interestingly, the 6-year participants appear to have increased savings compared to 5- and 4-year participants. This increase in savings for an additional year has never been seen until 2016.

Figure 5-62. Yearly savings distribution for multi-year participants, electric – including unlinked tracking data

DNV GL explored whether there was any difference between accounts that undertook large-saving measures first, and smaller measures second (or vice versa). Each account’s savings was binned, relative to total savings, into one of three possible categories (low, medium, and high savers) for each participating year.
These fields were determined in each year by rank ordering account savings and binning them into quartiles. Table 5-50 shows the basic logic used on each year’s savings numbers.

**Table 5-50. Savings size bin relative breakpoint logic**

<table>
<thead>
<tr>
<th>Savings Size Bin</th>
<th>Breakpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Total Savings &lt;= 25th Percentile</td>
</tr>
<tr>
<td>Medium</td>
<td>25th Percentile &lt; Total Savings &lt; 75th Percentile</td>
</tr>
<tr>
<td>High</td>
<td>Total Savings &gt;= 75th Percentile</td>
</tr>
</tbody>
</table>

Table 5-51 presents the breakdowns for electric accounts that participated in 2 years of energy efficiency programs. In 2016, most multi-year participants started with medium projects in the first year and completed medium projects in the second year as well. In 2015, most multi-year participants engaged in large projects first and second. Though the high-high combination of project installations achieves the highest proportion of total savings, medium-sized savings projects undertaken with large projects, either before or after, also contribute a representative proportion to savings.

**Table 5-51. Proportion of total savings for multi-year participants by savings category – 2-year electric, including unlinked tracking**

<table>
<thead>
<tr>
<th>Year 1 Class</th>
<th>Year 2 Class</th>
<th>Year 1 Savings as a Percent of Total Savings</th>
<th>Year 2 Savings as a Percent of Total Savings</th>
<th>Number of Participants</th>
<th>Total 2 Year Savings</th>
<th>Proportion of Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>55.6%</td>
<td>45.1%</td>
<td>779</td>
<td>1,503,488</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>20.1%</td>
<td>80.1%</td>
<td>984</td>
<td>9,577,501</td>
<td>1.2%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>2.2%</td>
<td>97.8%</td>
<td>357</td>
<td>37,735,120</td>
<td>4.6%</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td>90.9%</td>
<td>9.4%</td>
<td>1,096</td>
<td>13,826,870</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>56.5%</td>
<td>43.5%</td>
<td>2,354</td>
<td>52,657,553</td>
<td>6.4%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>20.0%</td>
<td>80.0%</td>
<td>763</td>
<td>86,918,963</td>
<td>10.5%</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>99.2%</td>
<td>0.8%</td>
<td>276</td>
<td>34,674,570</td>
<td>4.2%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>86.5%</td>
<td>13.5%</td>
<td>854</td>
<td>105,422,759</td>
<td>12.8%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>53.8%</td>
<td>46.2%</td>
<td>978</td>
<td>483,320,648</td>
<td>58.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>8,441</strong></td>
<td><strong>825,637,471</strong></td>
<td><strong>100.0%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-52 presents the percentage of the 6-year universe of accounts that participated in multiple program years. In 2016, Eversource had the highest proportion of its total unique billing population engage in programs over multiple years. This is unlike 2014 and 2015, when Cape Light Compact had the highest proportion across the electric PAs. Also of interest is that total multi-year participation increased for all PAs in 2016 from 2015, to an average of 2.27% accounts (up from 1.16% in 2015).

**Table 5-52. Multi-year participation by PA, electric excluding unlinked tracking data**

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>1.45%</td>
<td>0.37%</td>
<td>0.14%</td>
<td>0.04%</td>
<td>0.01%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Eversource</td>
<td>1.77%</td>
<td>0.44%</td>
<td>0.16%</td>
<td>0.05%</td>
<td>0.02%</td>
<td>2.45%</td>
</tr>
<tr>
<td>National Grid</td>
<td>1.51%</td>
<td>0.44%</td>
<td>0.14%</td>
<td>0.04%</td>
<td>0.02%</td>
<td>2.16%</td>
</tr>
<tr>
<td>Unitil</td>
<td>1.77%</td>
<td>0.26%</td>
<td>0.09%</td>
<td>0.06%</td>
<td>0.00%</td>
<td>2.18%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.62%</strong></td>
<td><strong>0.43%</strong></td>
<td><strong>0.15%</strong></td>
<td><strong>0.05%</strong></td>
<td><strong>0.02%</strong></td>
<td><strong>2.27%</strong></td>
</tr>
</tbody>
</table>

DNV GL – www.dnvgl.com March 19, 2018
The consumption-weighted multi-year population analysis presented below shows that over 40% of the electric PAs’ total consumption engaged in efficiency programs over multiple years. This is higher than the 30% seen in 2015, indicating the addition of 2016 resulted in an increase of larger customers’ participation. This is illustrated in Table 5-53. We hypothesize that memorandums of understanding signed with large customers to undertake projects over multiple years is a primary driver of high year-over-year consumption-weighted participation ratios. Table 5-54 supports this hypothesis with proportionally larger overall consumption-weighted savings achieved for Eversource and National Grid. Unitil presented the largest consumption-weighted savings achieved at 2.26%, which means that it engaged some of its largest accounts in 2016.

**Table 5-53. Multi-year participation by PA - consumption weighted, electric (excludes unlinked tracking data)**

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>9.77%</td>
<td>6.29%</td>
<td>3.06%</td>
<td>9.99%</td>
<td>0.49%</td>
<td>29.60%</td>
</tr>
<tr>
<td>Eversource</td>
<td>12.98%</td>
<td>8.82%</td>
<td>7.97%</td>
<td>6.48%</td>
<td>6.67%</td>
<td>42.92%</td>
</tr>
<tr>
<td>National Grid</td>
<td>14.82%</td>
<td>9.19%</td>
<td>7.39%</td>
<td>5.06%</td>
<td>5.61%</td>
<td>42.07%</td>
</tr>
<tr>
<td>Unitil</td>
<td>13.28%</td>
<td>3.89%</td>
<td>4.50%</td>
<td>27.58%</td>
<td>0.00%</td>
<td>49.25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13.68%</strong></td>
<td><strong>8.86%</strong></td>
<td><strong>7.55%</strong></td>
<td><strong>6.16%</strong></td>
<td><strong>5.97%</strong></td>
<td><strong>42.22%</strong></td>
</tr>
</tbody>
</table>

**Table 5-54. Multi-year 2011 – 2016 percent savings achieved by PA - consumption weighted, electric (excludes unlinked tracking data)**

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>0.33%</td>
<td>0.26%</td>
<td>0.22%</td>
<td>0.19%</td>
<td>0.03%</td>
<td>1.03%</td>
</tr>
<tr>
<td>Eversource</td>
<td>0.49%</td>
<td>0.35%</td>
<td>0.21%</td>
<td>0.24%</td>
<td>0.29%</td>
<td>1.58%</td>
</tr>
<tr>
<td>National Grid</td>
<td>0.45%</td>
<td>0.33%</td>
<td>0.22%</td>
<td>0.19%</td>
<td>0.35%</td>
<td>1.54%</td>
</tr>
<tr>
<td>Unitil</td>
<td>1.49%</td>
<td>0.14%</td>
<td>0.24%</td>
<td>0.39%</td>
<td>0.00%</td>
<td>2.26%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.48%</strong></td>
<td><strong>0.33%</strong></td>
<td><strong>0.22%</strong></td>
<td><strong>0.22%</strong></td>
<td><strong>0.30%</strong></td>
<td><strong>1.55%</strong></td>
</tr>
</tbody>
</table>
Table 5-55 shows account participation and consumption-weighted participation for multi-year electric participants, statewide, across industry sectors. This table also illustrates an increase from 2015 in consumption-weighted multi-year participation for all industry sectors (from 32% to 44%), with the largest increase coming from Mining, Quarrying, and Oil and Gas Extraction. This industry sector’s consumption weighted multi-year participation increased from 1% in 2015 to 90% in 2016. This dramatic increase indicates that 2016’s addition of tracking data for this industry sector encompassed accounts constituting the majority of this sector’s consumption.

Table 5-55. Multi-year account and consumption-weighted participation rates, electric – excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry sector</th>
<th>Account participation</th>
<th>Consumption weighted participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>0.01%</td>
<td>35.15%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>0.00%</td>
<td>20.29%</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>0.00%</td>
<td>31.20%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.03%</td>
<td>46.72%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.00%</td>
<td>20.52%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.20%</td>
<td>63.13%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>0.07%</td>
<td>37.78%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>0.11%</td>
<td>58.85%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>0.00%</td>
<td>24.78%</td>
</tr>
<tr>
<td>Information</td>
<td>0.17%</td>
<td>67.20%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.00%</td>
<td>29.32%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.00%</td>
<td>90.43%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.01%</td>
<td>19.23%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>0.00%</td>
<td>36.48%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>0.01%</td>
<td>30.92%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>0.03%</td>
<td>39.17%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>0.03%</td>
<td>35.57%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.03%</td>
<td>26.50%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.02%</td>
<td>35.62%</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.06%</td>
<td>35.94%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.00%</td>
<td>0.77%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2.3%</strong></td>
<td><strong>43.5%</strong></td>
</tr>
</tbody>
</table>
6 GAS MARKET ANALYSIS

This section presents notable findings and details about the C&I energy efficiency landscape for the gas market in Massachusetts.

For analyses presenting data that required tracking accounts to be linked to billing accounts—specifically the consumption-weighted participation and participant savings achieved metrics as well as any industry sector or consumption sections—we include only tracking data that could be linked to the billing population. Analyses presenting population-level metrics that did not require linking specific accounts include all tracking and billing records. The match rates and supporting details for the billing and tracking data for each PA are presented in section 3.4.1, earlier in this report.

Many of the sections in this chapter present analysis in which the gas C&I market is broken up by PA service territory, as shown in Figure 6-1. For towns where service territories overlap, participants and savings are split into each PA’s specific customers. The only exception to this rule is when results are presented at the town level; in these cases, each PA’s customers are used to compute any town-specific analysis.

**Figure 6-1. Map of MA gas PA service territories**

This section begins by providing details at the market level. Each subsequent subsection introduces different levels of granularity in order to explore the different dynamics of the gas energy efficiency landscape. Additional details about the structure of the report can be found in section 2.3.
6.1 Participation and savings

This section provides statewide summaries of the gas energy efficiency market using a variety of lenses, including town-level comparisons and consumption size bins. Table 6-1 provides an overall summary of the key metrics that are disaggregated throughout Section 6. In 2016, the overall account participation rate decreased slightly from 2015, although the total number of participating accounts increased. The increase in participating accounts was overshadowed by an 18% increase in the total number of billed accounts from 2015 to 2016. Population savings achieved increased in 2016, which suggests that participating accounts may be installing larger measures. The inclusion of new upstream hot water and food service programs accounted for nearly 10% of total gas savings in 2016.

- Figure 6-2 provides a time series summary of participation rates and population savings achieved over the past 6 years. This figure shows that there is more variability with large customer participation year over year for gas than for electric. It also shows that population savings achieved may have a cyclical trend of large project impacts every other year; this could be due to long lead times and/or long completion times for projects.

Table 6-1. Summary of 2016 key metrics

<table>
<thead>
<tr>
<th>Key Metrics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Billing Accounts</td>
<td>159,996</td>
</tr>
<tr>
<td>Population Therm Usage (2015)</td>
<td>1,418,729,203</td>
</tr>
<tr>
<td>Total Participating Accounts*</td>
<td>3,507</td>
</tr>
<tr>
<td>Gross Participant Therm Savings</td>
<td>14,385,990</td>
</tr>
<tr>
<td>2016 Incentives Paid</td>
<td>$28,298,861</td>
</tr>
<tr>
<td>2016 Account Participation</td>
<td>2.2%</td>
</tr>
<tr>
<td>2016 Population Savings Achieved</td>
<td>1.0%</td>
</tr>
<tr>
<td>2016 Percent of Total Savings from Upstream</td>
<td>9.8%</td>
</tr>
</tbody>
</table>
Figure 6-2. Time series statewide participation rate and population savings achieved – gas (includes unlinked tracking data)

Figure 6-3 summarizes the gas consumption analysis in a single snapshot; individual PA numbers are presented in section 8.4. The following definitions help clarify the chart below:

- **% population** = the percentage of the overall population that exists in each consumption bin
- **Population savings achieved** = the proportion of savings by this consumption bin among the overall population
- **% of consumption** = the percentage of consumption generated by the population in each consumption bin
- **Participant savings achieved** = the proportion of savings by this consumption bin among only the participating population
- **Account participation** = the proportion of participation by this consumption bin among the overall population
- **MDth saved** = Total therm savings associated with the consumption bin

Account participation increased in 2016 in every bin except the smallest (<8,000 therms), where it remained constant with 2015 levels. Although the number of largest customers (>1 million therms)
decreased by 8 compared to 2015, this bin accounted for the largest share of consumption, and more than doubled its total therm savings from 2015.

The impact of the largest accounts (>1 million therms) is driven by a small number of significant projects, with the largest 2 projects achieving 40% of the savings in this bin. Figure 6-4 provides a time series summary of the gas market over the past 6 years. The second-largest consumption bin (80,000-1 million therms) has been the primary source of savings over the past 6 years, though its participation rate is similar to the middle bin (40,000-80,000 therms). Furthermore, the largest consumption bin (>1 million therms) is nearing 50% market penetration.

**Figure 6-3. 2016 gas customer population summary by consumption bin (excludes unlinked tracking data)**

![Graph showing gas customer population summary by consumption bin](image-url)
Figure 6-4. 6-year customer population summary by consumption bin

2016 Therm Consumption Bin

- % Population
- % of Consumption
- Account Penetration
- Longitudinal Savings Achieved
- Longitudinal Participant Savings Achieved
- MDth Saved
Figure 6-5 shows the town-level participation for gas accounts. Several towns did not have any identified participation in 2016. Given the small population, these towns are unlikely to represent a substantial level of consumption as a group; as with electric, some individual accounts may represent one-off opportunities.

**Figure 6-5. 2016 Gas C&I account participation by town (includes unlinked tracking data)**
Figure 6-6 shows the town-level gas population savings achieved relative to the towns’ prior year’s full consumption. As noted in past years, higher participation does not always translate to larger savings ratios—particularly for gas measures—due in part to the lower impact of smaller prescriptive-type measures. As a percentage, these measures can have a large impact on the town-level participation while having a more muted impact on savings.

Individual towns were also impacted by large accounts, which tend to result in one-off instances of higher town-level savings relative to consumption via custom projects. Of the 7 towns with savings percentages higher than 5%, all had one process or comprehensive design project that accounted for more than 75% of the savings achieved.

**Figure 6-6. 2016 Gas C&I population savings achieved by town (includes unlinked tracking data)**
• <1, the town contributes less towards total statewide savings than it does towards statewide consumption
  ~1, the town contributes equally or almost equally towards total statewide savings and statewide consumption
  >1, the town contributes more towards total statewide savings than it does towards statewide consumption

Figure 6-7 presents the town-level contribution ratios. These maps provide an idea of how, geographically, towns are contributing to the share of savings relative to their share of consumption. In the simplest terms, contributions ratios can be used as follows:

• <1, the town contributes less towards total statewide savings than it does towards statewide consumption
• ~1, the town contributes equally or almost equally towards total statewide savings and statewide consumption
• >1, the town contributes more towards total statewide savings than it does towards statewide consumption

Figure 6-7. 2016 gas contribution ratio by town (includes unlinked tracking data)
6.1.1 Consumption bins

Table 6-2 shows the participation and savings statistics by consumption bin for gas accounts in 2016. As seen in previous years, and consistent with the electric results in Section 5.1.2, gas participation rates increased as consumption size increased in 2016. There are two primary explanations for this tendency for increased participation in larger consumption bins:

- The largest bin (>1 million therms) has fewer billed customers than any other bin. This means that each new participant has a larger proportional impact on the participation rate than a new participant in, for example, the middle bin (40,000-80,000 therms).

There has been a historic tendency to engage the largest accounts (>1 million therms), as they tend to provide higher absolute gross savings.

Table 6-2. Gas population participation and savings achieved by consumption bin

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8,000</td>
<td>1,281</td>
<td>106,088</td>
<td>989,017</td>
<td>206,647,910</td>
<td>$2,916,072</td>
<td>1.2%</td>
<td>0.5%</td>
<td>0.47</td>
</tr>
<tr>
<td>8,000-40,000</td>
<td>927</td>
<td>18,798</td>
<td>1,670,258</td>
<td>319,092,678</td>
<td>$4,588,603</td>
<td>4.9%</td>
<td>0.5%</td>
<td>0.52</td>
</tr>
<tr>
<td>40,000-80,000</td>
<td>272</td>
<td>2,716</td>
<td>1,060,571</td>
<td>152,792,057</td>
<td>$1,968,641</td>
<td>10.0%</td>
<td>0.7%</td>
<td>0.68</td>
</tr>
<tr>
<td>80,000-1,000,000</td>
<td>254</td>
<td>1,716</td>
<td>5,030,736</td>
<td>359,328,368</td>
<td>$8,904,827</td>
<td>14.8%</td>
<td>1.4%</td>
<td>1.38</td>
</tr>
<tr>
<td>&gt;1,000,000</td>
<td>21</td>
<td>82</td>
<td>2,654,518</td>
<td>382,114,564</td>
<td>$2,587,812</td>
<td>25.6%</td>
<td>0.7%</td>
<td>0.69</td>
</tr>
<tr>
<td>No Value or &lt;= 0</td>
<td>778</td>
<td>30,596</td>
<td>2,980,890</td>
<td>(1,246,373)</td>
<td>$7,334,858 see footnote</td>
<td>see footnote</td>
<td>see footnote</td>
<td>see footnote</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,533</strong></td>
<td><strong>159,996</strong></td>
<td><strong>14,385,990</strong></td>
<td><strong>1,418,729,203</strong></td>
<td><strong>$28,300,813</strong></td>
<td><strong>2.2%</strong></td>
<td><strong>1.0%</strong></td>
<td><strong>see footnote</strong></td>
</tr>
</tbody>
</table>

Figure 6-8 and Figure 6-9 provide time series summaries of participation rates and population savings achieved. 2016 participation levels are quite similar to 2015 across the board, with the exception of an uptick in the middle bin (40,000-80,000 therms). As in 2015, participation in the two smallest bins (<40,000 therms) is primarily driven by accounts installing hot water measures, specifically aerators and spray values. This is also true for accounts in the middle bin (40,000-80,000 therms), unlike in 2015, when those accounts were most heavily involved with HVAC measures. As in 2015, HVAC is the most prevalent installed end use across accounts in the two largest bins (>80,000 therms). Steam traps, controls, furnaces, and HVAC-heating are the most commonly installed HVAC measures for these two largest bins. Population savings achieved increased sharply for all consumption bins except for the smallest bin (<8,000 therms), which

---

53 A portion of the gas accounts that matched with records had at or less than zero consumption, or did not match to a gas account. These are included in this table to accurately capture the account participation and population savings rates, but the within-class proportion would not be meaningful since the consumption from these accounts is likely represented already in one of the usage bins. For this reason, DNV GL has not included the account participation or population savings metric for this bin.
ticked down slightly compared to 2015. Most notable are the two largest bins, with the second-largest bin (80,000-1 million therms) achieving the highest population savings of any year, and the largest bin (>1 million therms) more than doubling its 2015 population savings.

Figure 6-8. Gas population participation and savings achieved by consumption bin (includes unlinked tracking data)
Figure 6-9. Time series of gas population savings achieved by consumption bin (therms) (excludes unlinked tracking data)
Table 6-3 shows the savings and consumption of 2016 participating accounts by consumption bin. As in prior years, the participants in the smallest usage bins (<40,000 therms) had the largest savings relative to their consumption. This is partially an artifact of the data, as the smallest bin (<8,000 therms) is also the bin most likely to have savings exceeding consumption (see Table 6-4). In 2016, participant percent savings achieved decreased from 2015 levels, except in the middle and second-largest consumption bins (40,000 – 1 million therms). Compared to 2015, total participant therm savings increased in every bin except for the smallest (<8,000 therms).

Table 6-3. Participant savings achieved by gas consumption bin (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8,000</td>
<td>989,017</td>
<td>772</td>
<td>177</td>
<td>3,810,837</td>
<td>$2,916,072</td>
<td>26.0%</td>
</tr>
<tr>
<td>8,000 - 40,000</td>
<td>1,670,258</td>
<td>1,806</td>
<td>380</td>
<td>17,758,832</td>
<td>$4,588,603</td>
<td>9.4%</td>
</tr>
<tr>
<td>40,000 - 80,000</td>
<td>1,060,571</td>
<td>3,899</td>
<td>1,326</td>
<td>15,216,376</td>
<td>$1,968,641</td>
<td>7.0%</td>
</tr>
<tr>
<td>80,000 - 1,000,000</td>
<td>5,030,736</td>
<td>19,806</td>
<td>5,672</td>
<td>72,170,443</td>
<td>$8,904,827</td>
<td>7.0%</td>
</tr>
<tr>
<td>&gt; 1,000,000</td>
<td>2,654,518</td>
<td>126,406</td>
<td>49,458</td>
<td>56,769,527</td>
<td>$2,587,812</td>
<td>4.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,405,100</strong></td>
<td><strong>165,726,015</strong></td>
<td><strong>620,955</strong></td>
<td><strong>20,965,955</strong></td>
<td><strong>6.9%</strong></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Table 6-4 shows the impact of median and mean participant savings for each gas consumption bin, as a lens to explore a “typical account” within each bin. As in 2015, across all the consumption bins, mean savings are higher than median savings, indicating the presence of large accounts in each bin for which savings make up a large portion of the account’s total annual consumption.

Table 6-4. Relative impact of participants by gas consumption bin (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Usage Size Bin (Therms)</th>
<th>2016 Participant Therm Savings</th>
<th>Impact of Mean 2016 Participant</th>
<th>Impact of Median 2016 Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8,000</td>
<td>989,017</td>
<td>0.08%</td>
<td>0.02%</td>
</tr>
<tr>
<td>8,000 - 40,000</td>
<td>1,670,258</td>
<td>0.11%</td>
<td>0.02%</td>
</tr>
<tr>
<td>40,000 - 80,000</td>
<td>1,060,571</td>
<td>0.37%</td>
<td>0.13%</td>
</tr>
<tr>
<td>80,000 - 1,000,000</td>
<td>5,030,736</td>
<td>0.39%</td>
<td>0.11%</td>
</tr>
<tr>
<td>&gt; 1,000,000</td>
<td>2,654,518</td>
<td>4.76%</td>
<td>1.86%</td>
</tr>
</tbody>
</table>
Figure 6-10 provides a year-over-year comparison showing the gas participant savings achieved by consumption bin for 2011 to 2016. Spikes in savings achieved across the years are an indication of large accounts participating in each year and size bin. Other noteworthy observations include the following:

- Participant savings ratios decreased in 2016 in all but two bins:
  - The second-smallest bin (8,000-40,000 therms) ticked down, but remained similar to prior year values.
  - The smallest bin (<8,000 therms) decreased substantially from its high in 2015, partially as a result of a decrease in small accounts installing HVAC and hot water measures with savings that were close to their total annual consumption.

Figure 6-10. Time series participant savings achieved by gas consumption bin (excludes unlinked tracking data)\(^ {54}\)

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\(^ {54}\) The spike in 2015 for the small account size bin is the result of a data artifact provided that year. If this was removed, the 2015 participant savings achieved would be \(\approx 25\%\).
Table 6-5 presents the gas industry sector account population savings by consumption bin. Please note that there is a difference within the table between values that are 0% and blanks. Values listed as 0% do present some data; however, the savings are small in comparison to others, so with rounding they show as 0%. By contrast, blank cells in the table reflect a lack of any available data.

Statewide, populations savings achieved were close to their 2015 total, increasing from 0.9% to 1.0% in 2016. Although there is little change in the overall total, there are several substantial shifts within particular industry sectors compared to 2015:

- Population savings achieved in the Agriculture, Forestry, Fishing and Hunting sector spiked for the largest bin (>1,000,000 therms), from 1.2% in 2015 to 28% in 2016. Notably, 97% of the savings in this industry sector for 2016 were driven by a single National Grid custom process project.
- Another strong performer was the Finance and Insurance sector, where a handful of large HVAC and building shell projects for customers in the largest consumption bin (>1 million therms) pushed the sector total from 0.6% in 2015 to 2.8% in 2016.
- Educational Services increased its sector total from 1.4% in 2015 to 1.9% in 2016, in spite of a decrease in the smallest consumption bin (<8,000 therms) from 9.7% to 2.7%. Unlike other sectors with major increases, the largest increases were in the middle-sized bins (8,000-80,000 therms).
## Table 6-5. Industry sector account population savings by consumption bin, gas (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>&lt; 0.8 MDth</th>
<th>0.8 - 4.0 MDth</th>
<th>4.0 - 8.0 MDth</th>
<th>8.0 - 100 MDth</th>
<th>&gt;100 MDth</th>
<th>Sector Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.5%</td>
<td>1.2%</td>
<td>0.6%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.7%</td>
<td>0.1%</td>
<td>0.6%</td>
<td>0.5%</td>
<td>28.0%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.7%</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.2%</td>
<td>0.7%</td>
<td>0.0%</td>
<td>0.6%</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>2.7%</td>
<td>1.7%</td>
<td>2.0%</td>
<td>1.9%</td>
<td>0.3%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>0.4%</td>
<td>0.5%</td>
<td>0.1%</td>
<td>1.3%</td>
<td>25.2%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>1.4%</td>
<td>1.2%</td>
<td>0.8%</td>
<td>1.8%</td>
<td>1.8%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Information</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0.7%</td>
<td>0.6%</td>
<td></td>
<td>0.6%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td>1.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>1.8%</td>
<td>1.0%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>1.2%</td>
<td>2.4%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.3%</td>
<td>1.6%</td>
<td>0.8%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.7%</td>
<td>0.4%</td>
<td>0.9%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>0.6%</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.8%</td>
<td>0.2%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.4%</td>
<td>0.4%</td>
<td>5.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.0%</td>
<td></td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.5%</td>
<td>0.3%</td>
<td></td>
<td></td>
<td></td>
<td>0.3%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.1%</td>
<td>0.7%</td>
<td>0.4%</td>
<td></td>
<td></td>
<td>0.3%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.6%</td>
<td>0.4%</td>
<td>0.2%</td>
<td>2.1%</td>
<td>1.8%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.7%</td>
<td>0.7%</td>
<td>0.7%</td>
<td>1.4%</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td><strong>Statewide</strong></td>
<td><strong>0.5%</strong></td>
<td><strong>0.5%</strong></td>
<td><strong>0.7%</strong></td>
<td><strong>1.4%</strong></td>
<td><strong>0.7%</strong></td>
<td><strong>1.0%</strong></td>
</tr>
</tbody>
</table>

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6.2 End uses

This section breaks PA savings into two different end use classifications which are based on, but not identical to, the Massachusetts Technical Resource Library (TRL). The two fields are:

- **Broad**, which provides a high-level classification for end uses. End uses that would appear as “custom” under the MA TRL have been re-classed into more specific end uses, such as process or CHP.
- **Specific**, which provides a more granular look at the broad measures installed. This report also refers to specific end uses as “sub uses.” Measures in this classification bin can appear in multiple “broad” end use bins. An example of this would be “controls,” which can appear under HVAC and hot water end uses.

For additional details about end uses, see section 3.4.4.

In order to provide details into the types of energy efficiency measures being installed in the MA gas market, this section presents analysis in a few different views:

- Tables summarizing the 2016 results
- Times series tables and figures showing key metrics from 2011-2016
- Cross-tab tables showing the relationship between the broad and specific end use classifications

Table 6-6 shows the project and savings statistics by end use for gas accounts in 2016.\(^{55}\) Contribution ratio in this table is defined as the percentage of total savings from a particular end use divided by the percentage of total projects for that end use. To facilitate snapshot comparisons, Figure 6-11 provides a graphical representation of the percent of projects and percent of savings by end use. For the reader’s benefit, in 2016 we have changed this figure from a pie chart to a bar chart. In the legend, we have also labeled the percent of total projects and the percent of total savings.

- Non-upstream hot water projects decreased substantially in 2016, from 1,869 in 2015 to 1,171. Notably, the upstream hot water program, new in 2016, accounted for 1,014 projects. Within the non-upstream hot water program, aerators and spray valves remained the most frequently-installed measures, while steam traps contributed the largest share of savings achieved.

> It its first year, the upstream how water program delivered 1.4 million therms of gross savings for 2016. Non-upstream hot water savings contributed an additional 1.6 million therms. The combined savings from these two hot water programs represented a 68% increase in hot water savings from 2015, and an even more substantial increase over historical values.

- Comprehensive design increased from 50 projects in 2015 to 56 projects in 2016, and retained its position as the end use with the highest contribution ratio.
- Comprehensive design had a lower percent of savings and contribution ratio in 2016 than 2015, suggesting that these projects may be shifting to smaller but more numerous customers. Potentially related is the fact that in 2016, Educational Services overtook Manufacturing as the industry sector achieving the largest share of total savings within this end use.
- Only one PA, Eversource, engaged participants in the upstream food service program. While the number of projects was too small to permit inclusion in Table 6-6, these projects achieved a level of savings per project that was similar to the downstream food service program.

---

\(^{55}\) The gas savings suppressed in this table have been confirmed by the PA which provided the data.
• HVAC projects were virtually unchanged from 2015, with a decrease from 1,154 projects to 1,139. Controls replaced boilers as the most frequent sub use installed, while also achieving the largest share of savings. Steam traps are also responsible for a substantial share of savings achieved.

• Much like 2015, process measures are the second highest savings end use for gas, despite constituting a lower number of projects. Process savings continue to be derived primarily from customer-specific equipment installations, and primarily installed by accounts in the Manufacturing sector.

**Table 6-6. Population summary – gas end uses (includes unlinked tracking data)**

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>2016 projects</th>
<th>2016 population savings (therms)</th>
<th>2016 total incentives</th>
<th>% of 2016 projects</th>
<th>% of 2016 savings</th>
<th>Incentive per therm saved</th>
<th>2016 contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>174</td>
<td>1,270,019</td>
<td>$4,151,161</td>
<td>4.4%</td>
<td>8.8%</td>
<td>$3.27</td>
<td>2.02</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>56</td>
<td>1,899,765</td>
<td>$3,261,806</td>
<td>1.4%</td>
<td>13.2%</td>
<td>$1.72</td>
<td>9.38</td>
</tr>
<tr>
<td>Food Service</td>
<td>172</td>
<td>91,352</td>
<td>$288,784</td>
<td>4.3%</td>
<td>0.6%</td>
<td>$3.16</td>
<td>0.15</td>
</tr>
<tr>
<td>Hot Water</td>
<td>1,171</td>
<td>1,657,020</td>
<td>$2,725,400</td>
<td>29.4%</td>
<td>11.5%</td>
<td>$1.64</td>
<td>0.39</td>
</tr>
<tr>
<td>HVAC</td>
<td>1,139</td>
<td>4,609,288</td>
<td>$9,344,847</td>
<td>28.6%</td>
<td>32.0%</td>
<td>$2.03</td>
<td>1.12</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>233</td>
<td>3,039,927</td>
<td>$4,625,131</td>
<td>5.9%</td>
<td>21.1%</td>
<td>$1.52</td>
<td>3.61</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>1,014</td>
<td>1,407,883</td>
<td>$3,795,719</td>
<td>25.5%</td>
<td>9.8%</td>
<td>$2.70</td>
<td>0.38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,945</strong></td>
<td><strong>12,567,371</strong></td>
<td><strong>$24,397,128</strong></td>
<td><strong>25.5%</strong></td>
<td><strong>9.8%</strong></td>
<td><strong>$1.94</strong></td>
<td><strong>1.12</strong></td>
</tr>
</tbody>
</table>

*A project is the unique combination of fuel, PA, account ID, and project ID

** Total rows will decrease slightly due to suppression rules
Figure 6-11. Gas end use project count and savings proportions (includes unlinked tracking data)
Table 6-7 shows historical savings for each broad end use over the past 6 years. In 2016:

- Building shell savings nearly doubled, tracking a 50% increase in projects over 2015. These projects continue to be air sealing and insulation. In 2016, 96% of savings and 93% of projects were installed under the retrofit class.
- Comprehensive design reached a 6-year high in savings, although achieving only a modest increase over 2015.
- Building systems reappeared in 2016 after 2 years of dormancy due to a small number of projects in the Educational Services sector.

Hot water savings continued to rebound after reaching a low in 2013. The addition of upstream hot water illustrates this end use combined across both programs surpassed process as the second-highest saving end use after HVAC.

Table 6-7. 2011–2016 gross savings by end use, gas (therms)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>495,936</td>
<td>250,183</td>
<td>811,665</td>
<td>674,582</td>
<td>664,417</td>
<td>1,270,019</td>
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<tr>
<td>Building Systems</td>
<td>-</td>
<td>-</td>
<td>95,998</td>
<td>-</td>
<td>-</td>
<td>32,769</td>
</tr>
<tr>
<td>CHP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33,914</td>
<td>-</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>276,529</td>
<td>527,465</td>
<td>913,452</td>
<td>672,191</td>
<td>1,822,971</td>
<td>1,899,765</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12,026</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Food Service</td>
<td>57,433</td>
<td>141,017</td>
<td>144,860</td>
<td>192,819</td>
<td>118,978</td>
<td>91,352</td>
</tr>
<tr>
<td>Hot Water</td>
<td>1,105,847</td>
<td>1,941,574</td>
<td>830,606</td>
<td>1,039,881</td>
<td>1,505,338</td>
<td>1,657,020</td>
</tr>
<tr>
<td>HVAC</td>
<td>6,821,391</td>
<td>7,734,435</td>
<td>5,869,936</td>
<td>6,505,454</td>
<td>4,688,406</td>
<td>4,609,288</td>
</tr>
<tr>
<td>Lighting</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>120,893</td>
<td>158,437</td>
<td>1,424,231</td>
<td>2,380,029</td>
<td>220,309</td>
<td>371,347</td>
</tr>
<tr>
<td>Process</td>
<td>905,378</td>
<td>3,142,780</td>
<td>2,076,699</td>
<td>3,799,481</td>
<td>3,071,278</td>
<td>3,039,927</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>24,262</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6,620</td>
<td>-</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,407,883</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9,783,407</td>
<td>13,895,891</td>
<td>12,167,447</td>
<td>15,300,725</td>
<td>12,125,611</td>
<td>14,385,990</td>
</tr>
</tbody>
</table>

Figure 6-12 and Figure 6-13 show the historical proportional relationships for the number of projects and the total gross savings by broad end use:

- In 2016, hot water continued to be the most prevalent end use installed, while making up a smaller proportion of total gas savings. Hot water proportion savings illustrate a decreasing trend between 2011 and 2016.
- HVAC measures continued to contribute the highest proportion of total savings, although this share continues to decrease in each program year. This decrease was driven primarily by the presence of upstream hot water, which also drove many relative decreases across the board.
Figure 6-12. 2011–2016 project count proportion by gas end use impacted

Figure 6-13. 2011–2016 savings proportion by gas end use impacted
Table 6-8 shows the lifetime impact of end uses installed in 2016. It is important to note that lifetime savings are calculated only if the PAs provided lifetime data. When compared against the proportional impact of savings from Table 6-6, it is clear that building shell, comprehensive design, process, and upstream hot water measures achieve a higher share of lifetime savings than they do 2016 savings. For all but upstream hot water measures, this is likely due in part to longer measure lifetimes for those end uses.

Upstream hot water projects achieved almost twice the proportion of lifetime savings of non-upstream hot water, in spite of a slightly larger number of non-upstream projects and lower per-project savings from upstream hot water measures. This is likely due in part to the end use compositions within each program, as the upstream program comprises primarily boilers and water heaters (indirect, tankless, and condensing) while non-upstream hot water also includes measures such as showerheads, spray valves, and steam traps.

Table 6-8. Lifetime savings by end use 2016, gas (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Broad end use</th>
<th>Proportion of lifetime savings</th>
<th>Lifetime savings (therms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>9.0%</td>
<td>15,461,088</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>16.6%</td>
<td>28,542,377</td>
</tr>
<tr>
<td>Food Service</td>
<td>0.6%</td>
<td>1,010,954</td>
</tr>
<tr>
<td>Hot Water</td>
<td>7.2%</td>
<td>12,413,315</td>
</tr>
<tr>
<td>HVAC</td>
<td>30.2%</td>
<td>51,691,695</td>
</tr>
<tr>
<td>Other</td>
<td>0.5%</td>
<td>918,588</td>
</tr>
<tr>
<td>Process</td>
<td>22.7%</td>
<td>38,847,629</td>
</tr>
<tr>
<td>Building Systems</td>
<td>0.3%</td>
<td>491,535</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>12.9%</td>
<td>22,053,588</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>171,430,769</strong></td>
</tr>
</tbody>
</table>

Table 6-9 shows that measure categories associated with projects and energy savings in 2016 remain broadly consistent with what was found in the 2015 C&I Customer Profile report. The major exception is among hot water end uses, where aerators and spray valves decreased by 37%, boilers by 6%, and hot water by 66%. Considering the substantial number of projects installed through the upstream hot water program, it may be that many such projects that would have taken place in the non-upstream program were installed through upstream instead. Further supporting this hypothesis is the increase in low-flow showerheads (28%) and steam traps (37%), which could indicate that a shift between programs is the driver, rather than a whole-scale decrease in projects. Similar to electric, the equipment specific end use is almost entirely within the process end use, and includes little additional detail (see Table 6-22). Some projects include laundry, steamer, or heat recovery components. There are also a small number of gas equipment projects in the building systems end use; these are fume hoods.

Gas energy savings are broadly distributed across the different measure categories. Participation numbers remain heavily concentrated in aerators and spray valves, as in previous years, although upstream hot water nearly matches that end use in 2016. Controls, CDA, and building shell contribute the most of 2016 therm savings.

- HVAC controls made up of over 11% of total 2016 therm savings (contributing 1.6 million therms—more than 2015 or 2014). Educational Services contributed 33% of gas HVAC control savings. Within Accommodation and Food Services, controls accounted for nearly half of the savings derived from HVAC measures.
- HVAC controls and steam traps made up the most custom gas projects (45%) in 2016; process measures made up 15%.
Table 6-9. Population summary – gas measure categories (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Specific end use</th>
<th>2016 projects</th>
<th>2016 population savings (therms)</th>
<th>2016 total incentives paid</th>
<th>% of 2016 projects</th>
<th>% of 2016 savings</th>
<th>Incentive per therm saved</th>
<th>Contribution ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>1,040</td>
<td>383,694</td>
<td>$545,820</td>
<td>24.4%</td>
<td>2.7%</td>
<td>$1.42</td>
<td>0.11</td>
</tr>
<tr>
<td>Boilers</td>
<td>432</td>
<td>1,062,732</td>
<td>$3,928,233</td>
<td>10.1%</td>
<td>7.4%</td>
<td>$3.70</td>
<td>0.73</td>
</tr>
<tr>
<td>Building Shell</td>
<td>192</td>
<td>1,615,580</td>
<td>$4,401,664</td>
<td>4.5%</td>
<td>11.2%</td>
<td>$2.72</td>
<td>2.50</td>
</tr>
<tr>
<td>CDA</td>
<td>56</td>
<td>1,899,765</td>
<td>$3,261,806</td>
<td>1.3%</td>
<td>13.2%</td>
<td>$1.72</td>
<td>10.06</td>
</tr>
<tr>
<td>Cooking</td>
<td>172</td>
<td>90,976</td>
<td>$288,458</td>
<td>4.0%</td>
<td>0.6%</td>
<td>$3.17</td>
<td>0.16</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Equipment</td>
<td>66</td>
<td>1,462,296</td>
<td>$2,553,247</td>
<td>1.5%</td>
<td>10.2%</td>
<td>$1.75</td>
<td>6.57</td>
</tr>
<tr>
<td>Furnace</td>
<td>58</td>
<td>6,971</td>
<td>$39,459</td>
<td>1.4%</td>
<td>0.0%</td>
<td>$5.66</td>
<td>0.04</td>
</tr>
<tr>
<td>Hot Water</td>
<td>97</td>
<td>69,268</td>
<td>$333,387</td>
<td>2.3%</td>
<td>0.5%</td>
<td>$4.81</td>
<td>0.21</td>
</tr>
<tr>
<td>Hot Water-Controls</td>
<td>39</td>
<td>307,067</td>
<td>$791,254</td>
<td>0.9%</td>
<td>2.1%</td>
<td>$2.58</td>
<td>2.34</td>
</tr>
<tr>
<td>HVAC</td>
<td>22</td>
<td>236,822</td>
<td>$455,462</td>
<td>0.5%</td>
<td>1.6%</td>
<td>$1.92</td>
<td>3.19</td>
</tr>
<tr>
<td>HVAC-Controls</td>
<td>515</td>
<td>1,627,201</td>
<td>$3,336,586</td>
<td>12.1%</td>
<td>11.3%</td>
<td>$2.05</td>
<td>0.94</td>
</tr>
<tr>
<td>HVAC-Heating</td>
<td>20</td>
<td>8,040</td>
<td>$48,000</td>
<td>0.5%</td>
<td>0.1%</td>
<td>$5.97</td>
<td>0.12</td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>249</td>
<td>237,448</td>
<td>$309,771</td>
<td>5.8%</td>
<td>1.7%</td>
<td>$1.30</td>
<td>0.28</td>
</tr>
<tr>
<td>Motors</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>115</td>
<td>2,458,456</td>
<td>$3,122,061</td>
<td>2.7%</td>
<td>17.1%</td>
<td>$1.27</td>
<td>6.34</td>
</tr>
<tr>
<td>Process-Controls</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>163</td>
<td>1,490,509</td>
<td>$1,019,062</td>
<td>3.8%</td>
<td>10.4%</td>
<td>$0.68</td>
<td>2.71</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>1,014</td>
<td>1,407,883</td>
<td>$3,795,719</td>
<td>23.8%</td>
<td>9.8%</td>
<td>$2.70</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,236</td>
<td>12,956,825</td>
<td>$24,434,270</td>
<td>$1.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A project is the unique combination of fuel, PA, account ID, and project ID

** Total rows will decrease slightly due to suppression rules
Table 6-10 summarizes historical savings for the specific end uses from 2011 to 2016. Key points of interest include the following:

- Absolute savings from aerators and spray valves have continued to decrease since 2012. However, in 2016 they still accounted for 23% of projects installed. Liberty’s savings were almost solely made up of accounts installing these measures. This indicates that there may still be untapped opportunities for this end use, despite the decline in savings.

- Both National Grid and Eversource gas had substantially more programable thermostat installations than Columbia in 2016 (Columbia had a large number of programable thermostats in 2015). Eversource had a slightly larger number of programable thermostat installations than National Grid in 2016 despite a substantially smaller gas population.

- Building shell and comprehensive design provided substantial therm savings in 2016. Although the number of building shell projects increased only 30% from 2015 to 2016, savings increased 84%, indicating a substantially larger savings per project in 2016. Nearly 40% of the savings from building shell projects were achieved by accounts in the Healthcare and Social Assistance industry sector.

### Table 6-10. 2011–2016 gross savings by end use, gas

<table>
<thead>
<tr>
<th>Specific end use</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>792,262</td>
<td>1,552,424</td>
<td>876,581</td>
<td>501,164</td>
<td>494,692</td>
<td>383,694</td>
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<td>Boilers</td>
<td>1,166,908</td>
<td>1,670,502</td>
<td>1,048,483</td>
<td>1,403,943</td>
<td>875,337</td>
<td>1,062,732</td>
</tr>
<tr>
<td>Building Shell</td>
<td>661,391</td>
<td>461,581</td>
<td>905,415</td>
<td>737,178</td>
<td>875,991</td>
<td>1,615,580</td>
</tr>
<tr>
<td>CDA</td>
<td>276,529</td>
<td>527,465</td>
<td>913,452</td>
<td>672,191</td>
<td>1,822,971</td>
<td>1,899,765</td>
</tr>
<tr>
<td>CHP</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>33,914</td>
<td>-</td>
</tr>
<tr>
<td>Compressor</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7,281</td>
<td>-</td>
</tr>
<tr>
<td>Cooking</td>
<td>60,521</td>
<td>100,252</td>
<td>145,472</td>
<td>179,721</td>
<td>118,978</td>
<td>90,976</td>
</tr>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>50,150</td>
<td>-</td>
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<td>Dishwasher</td>
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<td>1,046</td>
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<td>884</td>
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<tr>
<td>Dryer</td>
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<td>-</td>
<td>-</td>
<td>4,745</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Equipment</td>
<td>299,174</td>
<td>378,532</td>
<td>1,954,569</td>
<td>3,225,399</td>
<td>2,728,702</td>
<td>1,462,296</td>
</tr>
<tr>
<td>Food Service-controls</td>
<td></td>
<td>35,390</td>
<td>-</td>
<td>11,006</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Furnace</td>
<td>79,268</td>
<td>51,064</td>
<td>36,892</td>
<td>5,299</td>
<td>37,488</td>
<td>6,971</td>
</tr>
<tr>
<td>Heat Pump</td>
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<td>-</td>
<td>-</td>
<td>18,664</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hot Water</td>
<td>263,755</td>
<td>297,066</td>
<td>85,594</td>
<td>169,201</td>
<td>96,056</td>
<td>69,268</td>
</tr>
<tr>
<td>Hot Water-controls</td>
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<td>-</td>
<td>3,388</td>
<td>11,260</td>
<td>53,623</td>
<td>307,067</td>
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<td>HVAC</td>
<td>1,097,365</td>
<td>709,342</td>
<td>1,254,595</td>
<td>600,114</td>
<td>236,822</td>
<td></td>
</tr>
<tr>
<td>HVAC-controls</td>
<td>1,461,789</td>
<td>2,727,743</td>
<td>2,052,904</td>
<td>1,363,867</td>
<td>1,205,532</td>
<td></td>
</tr>
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<td>HVAC-Heating</td>
<td>84,496</td>
<td>103,322</td>
<td>79,451</td>
<td>62,025</td>
<td>51,172</td>
<td></td>
</tr>
<tr>
<td>HVAC-Heating</td>
<td></td>
<td>1,254,595</td>
<td>600,114</td>
<td>236,822</td>
<td>8,040</td>
<td></td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>50,410</td>
<td>89,763</td>
<td>147,777</td>
<td>179,360</td>
<td>443,339</td>
<td></td>
</tr>
<tr>
<td>Refrigeration</td>
<td></td>
<td></td>
<td>3,850</td>
<td>8,061</td>
<td></td>
<td></td>
</tr>
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<td>Refrigeration-controls</td>
<td></td>
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<td>1,433</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam Traps</td>
<td>676,066</td>
<td>1,343,244</td>
<td>1,322,177</td>
<td>1,539,038</td>
<td>1,600,502</td>
<td></td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4,900,509</td>
<td></td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6,620</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9,783,407</td>
<td>13,926,522</td>
<td>12,167,447</td>
<td>15,300,725</td>
<td>12,125,611</td>
<td>14,385,990</td>
</tr>
</tbody>
</table>
Figure 6-14 illustrates the 2011–2016 distribution of accounts installing upstream hot water, upstream food service, and non-upstream end uses by usage bin. Unlike with electric upstream initiatives, upstream hot water and upstream food service records tend to match billing records.

Figure 6-14 shows that, similar to electric, upstream hot water and food service participants are made up largely of the smallest gas customers. Seventy six percent of upstream hot water, and 100% of upstream food service participants consume less than 40,000 therms in 2016.

**Figure 6-14. 2011–2016 upstream and non-upstream participating accounts by broad consumption bin, gas (excludes unlinked tracking data)**
6.2.1 Deeper HVAC analysis

This section summarizes high-level analyses of HVAC in the gas market. In the following analysis, all tracking data is restricted to reflect HVAC-only impacts (on number of projects, number of participating accounts, amount of therm savings, and incentives paid). The gas market has a single source of HVAC projects: the non-upstream program. (This stands in contrast to the electric market, where HVAC measures are available through both upstream and non-upstream programs.)

Figure 6-15 shows historic summary information for gas HVAC projects:

- The total number of annual HVAC projects has been steadily decreasing since 2011, with the exception of a spike in 2013.
- Similar to electric HVAC savings, the chart below also illustrates a decreasing trend in projects and savings coming from HVAC. The largest contributing factor to this outcome is very large projects that are unlikely to repeat or occur consistently over time.

HVAC projects and savings decreased from 2011 to 2016. Most HVAC participants installed controls and boilers in 2016. Eversource, National Grid, and Columbia all had increased HVAC control measures in 2016. In addition, 53% of gas HVAC participants were from National Grid, 23% were from Columbia, and 16% were from Eversource. Most gas HVAC projects undertaken in 2016 were in Educational Services, Real Estate, and Professional Services.

- The cost of HVAC gas savings rose sharply in 2016, from $1.64 per therm to over $2.00 per therm in 2016.
- As the number of annual projects and savings decreased, there was a corresponding decrease in annual incentives spent on HVAC projects and $/therm saved. There are many possible non-data elements causing this trend. Two hypotheses are:
  - The limited scope of high efficiency gas HVAC offerings may make it difficult to achieve savings, and it may be growing costlier to encourage participation over time. Changes in building codes also have an impact on annual savings achieved.
  - There may be an incongruity between customer needs and the current HVAC program offerings.
Figure 6-15. 2011–2016 summary of HVAC activity, gas
Table 6-11 provides the data illustrated in Figure 6-15.

### Table 6-11. 2011–2016 summary of statewide HVAC activity, gas

<table>
<thead>
<tr>
<th>Year</th>
<th>Projects</th>
<th>Savings (therms)</th>
<th>Incentives</th>
<th>Incentives per therm saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1,604</td>
<td>6,821,391</td>
<td>$12,510,712</td>
<td>$1.83</td>
</tr>
<tr>
<td>2012</td>
<td>1,289</td>
<td>7,734,435</td>
<td>$12,002,465</td>
<td>$1.55</td>
</tr>
<tr>
<td>2013</td>
<td>1,670</td>
<td>5,869,936</td>
<td>$10,797,031</td>
<td>$1.84</td>
</tr>
<tr>
<td>2014</td>
<td>1,226</td>
<td>6,505,454</td>
<td>$11,787,981</td>
<td>$1.81</td>
</tr>
<tr>
<td>2015</td>
<td>1,154</td>
<td>4,688,406</td>
<td>$7,974,020</td>
<td>$1.70</td>
</tr>
<tr>
<td>2016</td>
<td>1,139</td>
<td>4,609,288</td>
<td>$9,344,847</td>
<td>$2.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Projects</th>
<th>Savings (therms)</th>
<th>Incentives</th>
<th>Incentives per therm saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1,604</td>
<td>6,821,391</td>
<td>$12,510,712</td>
<td>$1.83</td>
</tr>
<tr>
<td>2012</td>
<td>1,289</td>
<td>7,734,435</td>
<td>$12,002,465</td>
<td>$1.55</td>
</tr>
<tr>
<td>2013</td>
<td>1,670</td>
<td>5,869,936</td>
<td>$10,797,031</td>
<td>$1.84</td>
</tr>
<tr>
<td>2014</td>
<td>1,226</td>
<td>6,505,454</td>
<td>$11,787,981</td>
<td>$1.81</td>
</tr>
<tr>
<td>2015</td>
<td>1,154</td>
<td>4,688,406</td>
<td>$7,974,020</td>
<td>$1.70</td>
</tr>
<tr>
<td>2016</td>
<td>1,139</td>
<td>4,609,288</td>
<td>$9,344,847</td>
<td>$2.03</td>
</tr>
</tbody>
</table>

#### 6.2.1.1 Project-level track summary

Table 6-12 shows the breakdown of 2016 gas HVAC projects by program. Overall, two-thirds of projects are installed under the prescriptive program, but 86% of savings are achieved by custom projects. National Grid and Liberty installed the largest shares of custom projects, both with 40%. Interestingly, per custom project, the average savings achieved by National Grid was about half that achieved by both Columbia and Eversource, suggesting that National Grid has installed a larger share of relatively small custom projects.

### Table 6-12. Tracking statistics by fuel, PA, and track; gas – HVAC only

<table>
<thead>
<tr>
<th>PA</th>
<th>Custom Projects</th>
<th>Savings (therms)</th>
<th>% Projects</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>72</td>
<td>1,113,128</td>
<td>26%</td>
<td>84%</td>
</tr>
<tr>
<td>Eversource</td>
<td>40</td>
<td>576,322</td>
<td>21%</td>
<td>83%</td>
</tr>
<tr>
<td>National Grid</td>
<td>235</td>
<td>2,099,768</td>
<td>40%</td>
<td>88%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>15</td>
<td>168,810</td>
<td>27%</td>
<td>80%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>15</td>
<td>72,754</td>
<td>27%</td>
<td>82%</td>
</tr>
<tr>
<td>Liberty</td>
<td>*</td>
<td>86,769</td>
<td>40%</td>
<td>83%</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>4,787</td>
<td>21%</td>
<td>44%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PA</th>
<th>Prescriptive Projects</th>
<th>Savings (therms)</th>
<th>% Projects</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>205</td>
<td>209,612</td>
<td>74%</td>
<td>16%</td>
</tr>
<tr>
<td>Eversource</td>
<td>148</td>
<td>114,889</td>
<td>79%</td>
<td>17%</td>
</tr>
<tr>
<td>National Grid</td>
<td>355</td>
<td>285,246</td>
<td>60%</td>
<td>12%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>40</td>
<td>41,513</td>
<td>73%</td>
<td>20%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>40</td>
<td>17,282</td>
<td>73%</td>
<td>18%</td>
</tr>
<tr>
<td>Liberty</td>
<td>*</td>
<td>18,218</td>
<td>60%</td>
<td>17%</td>
</tr>
<tr>
<td>Unitil</td>
<td>*</td>
<td>6,013</td>
<td>79%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Total: 362 Projects, 3,958,028 Savings (86% of total savings from project class table).

* Counts represent unique combinations of account, track, and end use. May exceed the number of projects from end use, and may not equal number of projects from project class table.
Figure 6-16 shows the historical trends of the number of annual HVAC projects falling into each program by PA:

- The overall source of projects is different for the small and large gas PAs: the smaller PAs have more engagement in their prescriptive programs than the large PAs.
- Custom projects have a substantially greater savings impact than prescriptive projects.
- National Grid shows a clearly increasing share of custom projects from 2011 to 2016. The other large PAs install a comparable share overall, but are more variable year after year.

**Figure 6-16. 2011–2016 trends of custom versus prescriptive projects, gas - HVAC only**
Figure 6-17 shows the trends in savings from each program over time. Across all the PAs, custom projects tend to be the primary source of savings.

**Figure 6-17. 2011–2016 trends of custom versus prescriptive savings, gas (therms) - HVAC only**
### Project-level class (initiative) summary

Table 6-13 summarizes 2016 HVAC projects broken out by initiative. While the number of projects is fairly evenly spread between the new construction and retrofit initiatives, retrofit was the primary source of HVAC savings in 2016 (93% of retrofit savings were from the custom track).

**Table 6-13. Summary statistics by fuel, PA, and class; gas 2016 – HVAC only**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Projects</th>
<th>Savings (therms)</th>
<th>% Projects</th>
<th>% Savings</th>
<th>Projects</th>
<th>Savings (therms)</th>
<th>% Projects</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>146</td>
<td>179,206</td>
<td>51%</td>
<td>14%</td>
<td>141</td>
<td>1,143,534</td>
<td>49%</td>
<td>86%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>71</td>
<td>126,679</td>
<td>37%</td>
<td>18%</td>
<td>121</td>
<td>564,532</td>
<td>63%</td>
<td>82%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>248</td>
<td>739,813</td>
<td>40%</td>
<td>31%</td>
<td>366</td>
<td>1,645,201</td>
<td>60%</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>33</td>
<td>38,967</td>
<td>54%</td>
<td>19%</td>
<td>28</td>
<td>171,356</td>
<td>46%</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>33</td>
<td>22,265</td>
<td>54%</td>
<td>24%</td>
<td>28</td>
<td>72,271</td>
<td>46%</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>*</td>
<td>5,934</td>
<td>33%</td>
<td>6%</td>
<td>*</td>
<td>99,053</td>
<td>67%</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td>Unitil Gas</td>
<td>*</td>
<td>10,768</td>
<td>92%</td>
<td>100%</td>
<td>*</td>
<td>32</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>498</td>
<td>1,084,665</td>
<td>43%</td>
<td>24%</td>
<td>656</td>
<td>3,524,623</td>
<td>57%</td>
<td>76%</td>
</tr>
</tbody>
</table>
Figure 6-18 shows the historical proportional breakdown of projects by PA and initiative. Eversource engages in a substantially larger share of retrofit projects than the other PAs, while Unitil has steadily increased its share of new construction projects since 2011. Figure 6-19 presents clearer trends about which initiatives are driving annual savings:

- Berkshire is more variable than the other PAs, though new construction savings have been increasing over the past 6 years.
- Despite having a large number of new construction projects, Columbia’s new construction savings are relatively small each year. This trend is also true for National Grid, though not to the same extent.
- Eversource derives savings primarily from its retrofit program. This source of savings has been increasingly prevalent since 2013, although less so in 2016.

**Figure 6-18. 2011–2016 trends of new construction versus retrofit projects, gas - HVAC only**
Figure 6-19. 2011–2016 trends of new construction versus retrofit savings, gas (therms) – HVAC only
6.2.1.3 Population-level analysis

General population

To provide a more holistic view of the role HVAC plays in achieving annual results, this section discusses participating HVAC accounts in more depth. This includes a look into annual billing data and at the contribution of HVAC installations toward decreasing annual consumption. Note that this view is slightly more restricted than the project-level view, as it is possible for a single account to participate in multiple HVAC projects over the course of a single year.

Figure 6-20 summarizes the statewide historic gas HVAC participation and population savings achieved rates since 2011. Participation rates have consistently decreased since 2011. On average, annual savings achieved have been decreasing steadily as well.

HVAC controls account for 29% of HVAC therm savings over the 6-year period.

Figure 6-20. 2011–2016 statewide participation rate and population savings achieved, gas – HVAC only

<table>
<thead>
<tr>
<th>HVAC Participation Rate</th>
<th>HVAC Population Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1.21%</td>
</tr>
<tr>
<td>2012</td>
<td>0.86%</td>
</tr>
<tr>
<td>2013</td>
<td>1.10%</td>
</tr>
<tr>
<td>2014</td>
<td>0.84%</td>
</tr>
<tr>
<td>2015</td>
<td>0.84%</td>
</tr>
<tr>
<td>2016</td>
<td>0.70%</td>
</tr>
<tr>
<td>2017</td>
<td>0.75%</td>
</tr>
<tr>
<td>2018</td>
<td>0.67%</td>
</tr>
<tr>
<td>2019</td>
<td>0.54%</td>
</tr>
<tr>
<td>2020</td>
<td>0.32%</td>
</tr>
<tr>
<td>2021</td>
<td>0.32%</td>
</tr>
</tbody>
</table>
Figure 6-21 provides details about PA-specific participation rates since 2011.

The variation inside and across PAs is substantial.

- On average, Eversource, National Grid, and Unitil have had decreasing participation rates since 2011. This matches the overall statewide trend.
- Columbia, Berkshire, and Liberty show generally increasing participation rates, which help balance out the decreasing rates from the other PAs, though not enough to fully reverse the decreasing trend over time. 2016 had the lowest participation rate for Liberty.
Figure 6-22 shows the historic summary of HVAC population savings achieved by PA (for more information on this statistic, see section 3.3). Notably, there is often a disconnect between participation rates and annual population savings achieved, with participation rate increases not corresponding with annual savings increases. One hypothesis is that this disconnect stems from the high frequency of prescriptive projects (see Figure 6-16), which often do not result in large annual savings.

- Eversource, National Grid, and Unitil have the strongest declines in savings achieved since 2011.

**Figure 6-22. 2011–2016 population savings achieved, gas – HVAC only**
Table 6-14. 2011–2016 tracking summary, gas - unique HVAC participants

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>205</td>
<td>294</td>
<td>390</td>
<td>261</td>
<td>264</td>
<td>268</td>
<td>1,560</td>
</tr>
<tr>
<td>Eversource</td>
<td>390</td>
<td>194</td>
<td>455</td>
<td>199</td>
<td>248</td>
<td>184</td>
<td>1,542</td>
</tr>
<tr>
<td>National Grid</td>
<td>900</td>
<td>656</td>
<td>675</td>
<td>598</td>
<td>527</td>
<td>584</td>
<td>3,534</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>94</td>
<td>135</td>
<td>122</td>
<td>158</td>
<td>91</td>
<td>70</td>
<td>648</td>
</tr>
<tr>
<td>Berkshire</td>
<td>50</td>
<td>76</td>
<td>74</td>
<td>52</td>
<td>65</td>
<td>55</td>
<td>345</td>
</tr>
<tr>
<td>Liberty</td>
<td>19</td>
<td>38</td>
<td>24</td>
<td>78</td>
<td>26</td>
<td>15</td>
<td>190</td>
</tr>
<tr>
<td>Unitil</td>
<td>25</td>
<td>21</td>
<td>24</td>
<td>28</td>
<td>*</td>
<td>*</td>
<td>113</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,589</strong></td>
<td><strong>1,279</strong></td>
<td><strong>1,642</strong></td>
<td><strong>1,216</strong></td>
<td><strong>1,130</strong></td>
<td><strong>1,106</strong></td>
<td><strong>7,284</strong></td>
</tr>
</tbody>
</table>

Table 6-15. 2011–2016 tracking summary, gas - HVAC savings (therms)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>1,154,913$</td>
<td>1,509,525$</td>
<td>1,212,260$</td>
<td>1,689,604$</td>
<td>1,147,315$</td>
<td>1,322,740$</td>
<td>8,036,357$</td>
</tr>
<tr>
<td>Eversource</td>
<td>1,753,260$</td>
<td>2,522,945$</td>
<td>2,134,563$</td>
<td>2,223,303$</td>
<td>1,361,955$</td>
<td>691,211$</td>
<td>10,687,237$</td>
</tr>
<tr>
<td>National Grid</td>
<td>3,821,348$</td>
<td>3,433,592$</td>
<td>2,302,985$</td>
<td>2,070,603$</td>
<td>2,039,600$</td>
<td>2,385,014$</td>
<td>16,053,141$</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>91,871$</td>
<td>268,373$</td>
<td>220,128$</td>
<td>521,944$</td>
<td>103,031$</td>
<td>199,523$</td>
<td>1,122,712$</td>
</tr>
<tr>
<td>Berkshire</td>
<td>38,752$</td>
<td>82,893$</td>
<td>77,861$</td>
<td>323,734$</td>
<td>77,456$</td>
<td>94,536$</td>
<td>695,232$</td>
</tr>
<tr>
<td>Liberty</td>
<td>10,764$</td>
<td>46,769$</td>
<td>92,744$</td>
<td>146,640$</td>
<td>25,575$</td>
<td>104,987$</td>
<td>427,479$</td>
</tr>
<tr>
<td>Unitil</td>
<td>42,355$</td>
<td>138,711$</td>
<td>49,523$</td>
<td>51,570$</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,821,391$</td>
<td>7,734,435$</td>
<td>5,869,936$</td>
<td>6,505,454$</td>
<td>4,651,901$</td>
<td>4,598,488$</td>
<td>35,899,447$</td>
</tr>
</tbody>
</table>

Table 6-16. 2011–2016 tracking summary, gas - HVAC incentives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>$1,855,484$</td>
<td>$2,479,028$</td>
<td>$2,219,534$</td>
<td>$2,704,167$</td>
<td>$1,833,683$</td>
<td>$2,068,747$</td>
<td>$13,160,643$</td>
</tr>
<tr>
<td>Eversource</td>
<td>$1,940,014$</td>
<td>$3,293,817$</td>
<td>$3,958,225$</td>
<td>$4,431,753$</td>
<td>$2,160,741$</td>
<td>$1,728,527$</td>
<td>$17,513,076$</td>
</tr>
<tr>
<td>National Grid</td>
<td>$8,468,049$</td>
<td>$5,752,240$</td>
<td>$3,663,577$</td>
<td>$3,660,221$</td>
<td>$3,653,972$</td>
<td>$5,194,192$</td>
<td>$30,392,251$</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>$247,166$</td>
<td>$477,381$</td>
<td>$955,695$</td>
<td>$991,840$</td>
<td>$325,624$</td>
<td>$353,381$</td>
<td>$3,351,087$</td>
</tr>
<tr>
<td>Berkshire</td>
<td>$99,975$</td>
<td>$256,318$</td>
<td>$146,633$</td>
<td>$463,670$</td>
<td>$214,541$</td>
<td>$283,009$</td>
<td>$1,464,145$</td>
</tr>
<tr>
<td>Liberty</td>
<td>$27,582$</td>
<td>$63,908$</td>
<td>$375,534$</td>
<td>$417,793$</td>
<td>$51,105$</td>
<td>$39,165$</td>
<td>$975,087$</td>
</tr>
<tr>
<td>Unitil</td>
<td>$119,609$</td>
<td>$157,155$</td>
<td>$433,529$</td>
<td>$110,377$</td>
<td>$59,979$</td>
<td>$31,207$</td>
<td>$911,854$</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$12,510,712$</td>
<td>$12,002,465$</td>
<td>$10,797,031$</td>
<td>$11,787,981$</td>
<td>$7,974,020$</td>
<td>$9,344,847$</td>
<td>$64,417,056$</td>
</tr>
</tbody>
</table>
Industry sector

Table 6-17 summarizes the 2016 gas HVAC energy efficiency activity across industry sectors. The top 5 industry sectors, as measured by annual consumption, account for 54% of total annual consumption and 41% of total annual savings. These 5 sectors are:

- Manufacturing
- Administrative and Support and Waste Management and Remediation Services
- Educational Services
- Real Estate and Rental and Leasing
- Accommodation and Food Services

Table 6-17. Gas account participation and population savings summary statistics by industry sector, 2016 – HVAC only

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>72</td>
<td>16,745</td>
<td>184,177</td>
<td>115,075,639</td>
<td>$352,197</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>*</td>
<td>2,083</td>
<td>34,979</td>
<td>165,190,755</td>
<td>$13,977</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>259</td>
<td>2,853</td>
<td>3,234,208</td>
<td>$2,757</td>
<td>1.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>28</td>
<td>3,015</td>
<td>64,176</td>
<td>23,229,771</td>
<td>$196,965</td>
<td>0.9%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>30</td>
<td>5,896</td>
<td>72,070</td>
<td>24,911,938</td>
<td>$200,359</td>
<td>0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>161</td>
<td>6,062</td>
<td>965,179</td>
<td>155,096,784</td>
<td>$1,782,127</td>
<td>2.7%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>15</td>
<td>4,512</td>
<td>454,076</td>
<td>18,690,490</td>
<td>$302,112</td>
<td>0.3%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>72</td>
<td>8,646</td>
<td>611,247</td>
<td>99,360,556</td>
<td>$862,298</td>
<td>0.8%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Information</td>
<td>*</td>
<td>1,320</td>
<td>25,316</td>
<td>7,110,903</td>
<td>$64,974</td>
<td>1.0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>213</td>
<td>3,092</td>
<td>1,038,719</td>
<td>$12,650</td>
<td>1.9%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>51</td>
<td>6,876</td>
<td>434,530</td>
<td>203,153,842</td>
<td>$604,923</td>
<td>0.7%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>73</td>
<td>14,299</td>
<td>81,684</td>
<td>65,101,294</td>
<td>$217,828</td>
<td>0.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>127</td>
<td>21,966</td>
<td>240,624</td>
<td>100,829,355</td>
<td>$596,497</td>
<td>0.6%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>74</td>
<td>4,097</td>
<td>401,108</td>
<td>56,515,390</td>
<td>$926,302</td>
<td>1.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>117</td>
<td>14,357</td>
<td>262,074</td>
<td>128,815,539</td>
<td>$1,201,891</td>
<td>0.8%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>50</td>
<td>19,826</td>
<td>244,107</td>
<td>90,131,144</td>
<td>$750,767</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>*</td>
<td>2,490</td>
<td>6,839</td>
<td>15,438,183</td>
<td>$20,202</td>
<td>0.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>412</td>
<td>33,660</td>
<td>11,946,093</td>
<td>$40,392</td>
<td>0.2%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>17</td>
<td>3,179</td>
<td>27,516</td>
<td>26,637,082</td>
<td>$74,153</td>
<td>0.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>190</td>
<td>20,934</td>
<td>459,982</td>
<td>106,732,102</td>
<td>$1,121,476</td>
<td>0.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,077</strong></td>
<td><strong>157,187</strong></td>
<td><strong>4,609,288</strong></td>
<td><strong>1,418,239,787</strong></td>
<td><strong>$9,344,847</strong></td>
<td><strong>0.7%</strong></td>
<td><strong>0.3%</strong></td>
</tr>
</tbody>
</table>

Table 6-18 shows participant savings achieved in 2016 broken out by industry sector. Of note:
Finance and Insurance saw particularly large projects, as indicated by a mean more than 100 times larger than the median participant savings. This contributed to that sector’s 19.2% participant savings achieved, which was second only to Construction in 2016.

Table 6-18. Participant savings achieved by industry sector, gas – HVAC only

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>158,114</td>
<td>2,726</td>
<td>289</td>
<td>3,267,212</td>
<td>$287,738</td>
<td>4.8%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>3,890</td>
<td>648</td>
<td>179</td>
<td>164,178</td>
<td>$10,153</td>
<td>2.4%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>2,853</td>
<td>951</td>
<td>342</td>
<td>1,557,749</td>
<td>$2,757</td>
<td>0.2%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>67,455</td>
<td>2,499</td>
<td>1,082</td>
<td>697,637</td>
<td>$217,965</td>
<td>9.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>64,392</td>
<td>2,800</td>
<td>240</td>
<td>280,670</td>
<td>$151,946</td>
<td>22.9%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>883,546</td>
<td>5,890</td>
<td>2,586</td>
<td>14,191,812</td>
<td>$1,697,098</td>
<td>6.2%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>454,076</td>
<td>30,272</td>
<td>294</td>
<td>2,359,215</td>
<td>$302,112</td>
<td>19.2%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>554,699</td>
<td>8,405</td>
<td>2,485</td>
<td>19,858,052</td>
<td>$819,855</td>
<td>2.8%</td>
</tr>
<tr>
<td>Information</td>
<td>25,316</td>
<td>1,947</td>
<td>560</td>
<td>688,836</td>
<td>$64,974</td>
<td>3.7%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>147</td>
<td>147</td>
<td>147</td>
<td>2,501</td>
<td>$1,000</td>
<td>5.9%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>332,601</td>
<td>7,559</td>
<td>911</td>
<td>12,474,802</td>
<td>$479,770</td>
<td>2.7%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>79,086</td>
<td>1,296</td>
<td>177</td>
<td>1,054,625</td>
<td>$181,058</td>
<td>7.5%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>184,477</td>
<td>1,647</td>
<td>130</td>
<td>2,453,479</td>
<td>$441,812</td>
<td>7.5%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>115,483</td>
<td>2,357</td>
<td>1,267</td>
<td>1,310,282</td>
<td>$348,314</td>
<td>8.8%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>233,563</td>
<td>2,290</td>
<td>560</td>
<td>4,059,104</td>
<td>$1,127,955</td>
<td>5.8%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>242,468</td>
<td>5,639</td>
<td>132</td>
<td>3,175,802</td>
<td>$742,058</td>
<td>7.6%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>7,127</td>
<td>548</td>
<td>147</td>
<td>91,886</td>
<td>$23,202</td>
<td>7.8%</td>
</tr>
<tr>
<td>Utilities</td>
<td>33,660</td>
<td>33,660</td>
<td>33,660</td>
<td>2,196,674</td>
<td>$40,392</td>
<td>1.5%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>18,391</td>
<td>1,415</td>
<td>728</td>
<td>553,983</td>
<td>$51,588</td>
<td>3.3%</td>
</tr>
<tr>
<td>Unknown</td>
<td>239,372</td>
<td>2,955</td>
<td>280</td>
<td>4,659,729</td>
<td>$509,434</td>
<td>5.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,700,715</strong></td>
<td><strong>75,098,227</strong></td>
<td><strong>7,501,180</strong></td>
<td><strong>4.9%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6-19 shows the historic summary for detailed end uses over the past 6 years. The blue bars shading each cell show each detailed end use’s share of the total. The top 4 largest end uses contribute 90% of the total HVAC therm savings:

- Controls (29% of 6-year therm savings)
- Steam traps (20% of 6-year therm savings)
- Boilers (17% of 6-year therm savings)
- Other (16% of 6-year therm savings)

Other includes HVAC labeled measures that do not fall into the other bins shown in Table 6-19.

Table 6-19. 2011–2016 summary of gas HVAC technologies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boilers</td>
<td>2,595</td>
<td>6,296,101</td>
<td>$22,252,320</td>
</tr>
<tr>
<td>Chiller</td>
<td>165</td>
<td>2,981,995</td>
<td>$4,671,249</td>
</tr>
<tr>
<td>Combination Boiler</td>
<td>215</td>
<td>346,293</td>
<td>$750,150</td>
</tr>
<tr>
<td>Controls</td>
<td>3,484</td>
<td>10,413,853</td>
<td>$18,915,983</td>
</tr>
<tr>
<td>Equipment</td>
<td>21</td>
<td>288,390</td>
<td>$474,728</td>
</tr>
<tr>
<td>Furnace</td>
<td>613</td>
<td>216,982</td>
<td>$783,587</td>
</tr>
<tr>
<td>HVAC</td>
<td>28</td>
<td>761,188</td>
<td>$584,505</td>
</tr>
<tr>
<td>Infrared Heaters</td>
<td>159</td>
<td>373,373</td>
<td>$726,006</td>
</tr>
<tr>
<td>Insulation</td>
<td>549</td>
<td>1,181,029</td>
<td>$1,404,393</td>
</tr>
<tr>
<td>Motors/Drives</td>
<td>31</td>
<td>206,065</td>
<td>$531,948</td>
</tr>
<tr>
<td>Other</td>
<td>383</td>
<td>5,772,844</td>
<td>$9,343,339</td>
</tr>
<tr>
<td>Steam Traps₂</td>
<td>572</td>
<td>7,288,797</td>
<td>$3,761,217</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,815</strong></td>
<td><strong>36,126,910</strong></td>
<td><strong>$64,199,426</strong></td>
</tr>
</tbody>
</table>

¹ Detailed end uses associated with fewer than 15 projects have been removed from this table.

² Some of these may be process in nature as opposed to space heating.

---

56 Most of the chillers present in this table are an artifact of a PA’s tracking data.
6.2.2 Specific end uses

Table 6-20 through Table 6-23 show the percent of projects and the percent of savings within both broad and specific end uses for 2016. These tables offer insight into the importance of specific end uses in generating participation and savings. Each broad end use can encompass one or more specific end uses, labeled in these tables as “sub uses.” Conversely, each sub use can fall under one or more broad end use categories. Cell borders in these charts are designed to assist the reader in interpreting the values. Columns represent the broader end use categories, and rows represent the more specific end use categories. The first two tables illustrate the distribution of various sub uses within each end use for projects and savings. The second two tables illustrate how broad end use categories make up projects and savings for each sub use. Columns represent the broader end use categories, and rows represent the more specific sub uses. Within each cell, the presence of a number indicates at least some non-zero share of projects or savings associated with that end use-sub use combination, even if rounding has resulted in the value displaying as 0.0%.
Table 6-20. Distribution of gas measure categories by project count within end use

<table>
<thead>
<tr>
<th>Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>HVAC</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>Food Service</th>
<th>Building Systems</th>
<th>Other</th>
<th>Upstream Food Service</th>
<th>Upstream Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>67.0%</td>
<td>53.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boilers</td>
<td>0.9%</td>
<td></td>
<td>34.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Shell</td>
<td>0.4%</td>
<td></td>
<td>2.2%</td>
<td>98.9%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CDA</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>2.8%</td>
<td>0.9%</td>
<td>41.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cooking</td>
<td>0.4%</td>
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<td></td>
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<td></td>
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<tr>
<td>Dishwasher</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>26.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Water</td>
<td>6.9%</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>HVAC</td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>HVAC-Heating</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>17.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motors</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2.5%</td>
<td>17.9%</td>
<td>2.9%</td>
<td>1.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Steam Traps</td>
<td>1.9%</td>
<td></td>
<td>11.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream Hot Water</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Table 6-21. Distribution of gas measure category savings contribution within end use

<table>
<thead>
<tr>
<th>Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>HVAC</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>Food Service</th>
<th>Building Systems</th>
<th>Other</th>
<th>Upstream Food Service</th>
<th>Upstream Hot Water</th>
</tr>
</thead>
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<td>Aerators and Spray Valves</td>
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<td>0.7%</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Boilers</td>
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<td></td>
<td>13.2%</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Building Shell</td>
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<td></td>
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</tr>
<tr>
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<tr>
<td>Controls</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dishwasher</td>
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<td>99.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Furnace</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Water</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td></td>
<td>5.1%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC-Heating</td>
<td></td>
<td></td>
<td>0.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>14.3%</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Motors</td>
<td>0.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6.7%</td>
<td>51.8%</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Steam Traps</td>
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<td>24.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td></td>
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<td></td>
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<tr>
<td>Upstream Hot Water</td>
<td></td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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</tr>
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</table>

Table 6-22. Distribution of gas measure categories by project count within sub use

<table>
<thead>
<tr>
<th>Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>HVAC</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>Food Service</th>
<th>Building Systems</th>
<th>Other</th>
<th>Upstream Food Service</th>
<th>Upstream Hot Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>88.2%</td>
<td>11.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boilers</td>
<td>2.8%</td>
<td>97.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Shell</td>
<td>2.9%</td>
<td></td>
<td>13.2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDA</td>
<td></td>
<td></td>
<td>92.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>7.0%</td>
<td>0.4%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td>0.6%</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dishwasher</td>
<td></td>
<td>99.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>95.5%</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td>100%</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Water</td>
<td>100%</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC-Heating</td>
<td>100%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-Flow Showerhead</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motors</td>
<td>100%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Other</td>
<td>29.4%</td>
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<td>30.3%</td>
<td>1.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.4%</td>
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</tr>
<tr>
<td>Steam Traps</td>
<td>16.6%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td></td>
<td></td>
<td>83.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Upstream Hot Water</td>
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<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
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Table 6-23. Distribution of gas measure category savings contribution within sub use

<table>
<thead>
<tr>
<th>Category</th>
<th>Hot Water</th>
<th>Process</th>
<th>HVAC</th>
<th>Building Shell</th>
<th>Comprehensive Design</th>
<th>Food Service</th>
<th>Building Systems</th>
<th>Other</th>
<th>Upstream Food Service</th>
<th>Upstream Hot Water</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerators and Spray Valves</td>
<td>94.2%</td>
<td>5.8%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Boilers</td>
<td>18.4%</td>
<td></td>
<td></td>
<td>81.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Building Shell</td>
<td>0.1%</td>
<td></td>
<td></td>
<td>21.4%</td>
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<td>78.4%</td>
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<td></td>
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<td>100%</td>
</tr>
<tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>15.8%</td>
<td>0.6%</td>
<td></td>
<td>83.6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>100%</td>
</tr>
<tr>
<td>Cooking</td>
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<td>0.6%</td>
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<td></td>
<td></td>
<td>99.4%</td>
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</tr>
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<td>Dishwasher</td>
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<td></td>
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<td></td>
<td>100%</td>
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</tr>
<tr>
<td>Equipment</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot Water</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVAC-Heating</td>
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<td>100%</td>
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<tr>
<td>Low-Flow Showerhead</td>
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<td></td>
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<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motors</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4.5%</td>
<td>64.0%</td>
<td>16.2%</td>
<td>0.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.1%</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>25.0%</td>
<td></td>
<td></td>
<td>75.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
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<td>100%</td>
</tr>
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<td>Upstream Food Service</td>
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<td></td>
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<tr>
<td>Upstream Hot Water</td>
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<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
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</tr>
</tbody>
</table>
6.3 Industry sector

This section breaks statewide therm consumption and savings into 22 distinct industry sector bins, based on 2-digit NAICS code descriptions. Using these bins makes it possible to discern differences in outcomes at a statewide level and across PAs. It is important to remember that when comparing absolute savings achieved for a sector, a low savings value does not indicate under-engagement, as the sector may also be a low contributor to total annual therm usage. This section provides a number of different views into the different industry sectors:

- Tables summarizing the 2016 results
- Bubble plots providing a graphical view of the relative impacts and results of each industry sector
- Time series tables and figures showing key metrics from 2011-2016
- Summaries of participating accounts that could be successfully linked to the billing data

For additional details about industry sector, see section 3.4.3.

DNV GL created the industry sector field starting with the 2013 C&I Customer Profile project. We leveraged the time series data, links between billing and tracking data, and third party data to achieve a high-level of data completeness for accounts’ industry sector fields for 2011 through 2016. The improvements of our assignment efforts for gas are seen in Table 6-24. In addition, here we define again the one other DNV GL class leveraged in the tables:

- **Unknown** is used when the PA provides a code, but it is identified as 99999 or a mis-keyed code that does not have a match in the NAICS, SIC, or other crosswalk indices. “Unknown” is also used when no sector data is provided for an account.

Table 6-24. 2011–2016 gas billing data, percent of accounts with industry sector matches

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Billing Year</th>
<th>% Industry Sector Available</th>
<th>Frequency Industry Sector Available</th>
<th>Total Number of Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>2011</td>
<td>73.4%</td>
<td>96,484</td>
<td>131,500</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>81.1%</td>
<td>120,255</td>
<td>148,285</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>85.9%</td>
<td>128,091</td>
<td>149,142</td>
</tr>
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<td></td>
<td>2014</td>
<td>88.2%</td>
<td>128,426</td>
<td>145,600</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>90.3%</td>
<td>122,263</td>
<td>135,362</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>86.8%</td>
<td>138,880</td>
<td>159,996</td>
</tr>
</tbody>
</table>

Table 6-25 and Figure 6-23 present the account participation and population savings achieved by industry sector for all gas accounts in 2016. With the inclusion of the new upstream food service and hot water programs, Table 6-25 has been expanded to break out participation and savings totals by non-upstream, upstream, and dual-stream participants. Similar to the corresponding electric section (5.3), the 2016 report bundles sectors “N/A,” “No Data,” and “Unknown” into the single variable “Unknown.” For more information on the methodology used, refer to section 3.4.3. Among statewide gas customers:

- Overall, absolute participation increased within almost every industry sector—the only exceptions were Information; Professional, Scientific, and Technical Services; and Transportation and Warehousing. Due to proportionally larger increases in the number of billed accounts, several sectors saw overall decreases in participation rates compared to 2015: Arts, Entertainment, and Recreation; Finance and Insurance;
Information; Other Services (except Public Administration); Professional, Scientific, and Technical Services; and Public Administration.

- Across all sectors, statewide participation fell from 2.4% in 2015 to 1.6% in 2016 despite an increased number of participating accounts in nearly every sector. Therefore, the overall participation decrease appears to be driven primarily by the 16% increase in the statewide population of gas accounts, rather than by a decline in the number of participating accounts.

- The Accommodation and Food Services industry sector continues its 6-year trend of having the highest absolute number of participants. Yet, this sector’s share of total participants has decreased every year since 2012. In addition, with the exception of 2013,\(^\text{57}\) the share of savings for this sector achieved from hot water end uses has steadily declined, from 79% in 2012 to 39% in 2016.

- Educational Services and Manufacturing combined made up 38% of total gas savings in 2016. For Educational Services, the most frequently installed and highest saving end use was HVAC (32% of savings); in Manufacturing, HVAC also led the number of projects, but the most savings came from process measures (65% of savings). Savings for Manufacturing were derived primarily from New Construction projects (63%), while in Educational Services Retrofit accounted for 76% of savings. Savings for both sectors were almost entirely derived from custom projects – 90% of savings for Educational Services and 97% for Manufacturing.

- The Agriculture, Forestry, Fishing and Hunting sector showed a population savings achieved of 13.5%, nearly 5 times the size of the next-largest sector. As discussed in sections 6.1 and 6.2, 97% of savings for this sector were achieved by a single custom process project completed by National Grid.

- Real Estate and Rental and Leasing, Construction, and Public Administration were the sectors with the largest share of projects participating in the upstream programs. Within these three sectors, upstream hot water measures were responsible for the second-highest share of savings. For Real Estate and Rental and Leasing, comprehensive design was the largest with 31% of savings, while upstream hot water contributed 23%. For Construction and Public Administration, HVAC made up 61% and 77%, respectively, while upstream hot water accounted for 15% and 7%.

---

\(^{57}\) In 2013, process projects accounted for an unusually high share of savings in the sector.
## Table 6-25. Gas account participation and population savings summary by industry sector (includes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>551</td>
<td>162</td>
<td>15</td>
<td>728</td>
<td>16,745</td>
<td>744,472</td>
<td>106,857</td>
<td>$1,523,187</td>
<td>115,075,639</td>
<td>4.3%</td>
<td>0.6%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>19</td>
<td>2,083</td>
<td>39,689</td>
<td>1,922</td>
<td>$22,680</td>
<td>165,190,755</td>
<td>0.9%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>259</td>
<td>435,434</td>
<td>4,146</td>
<td>$447,363</td>
<td>3,234,208</td>
<td>3.1%</td>
<td>13.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>71</td>
<td>23</td>
<td>*</td>
<td>94</td>
<td>3,015</td>
<td>97,684</td>
<td>7,175</td>
<td>$270,072</td>
<td>23,229,771</td>
<td>3.1%</td>
<td>0.4%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Construction</td>
<td>39</td>
<td>22</td>
<td>*</td>
<td>63</td>
<td>5,896</td>
<td>117,977</td>
<td>17,568</td>
<td>$291,365</td>
<td>24,911,938</td>
<td>1.1%</td>
<td>0.5%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>253</td>
<td>73</td>
<td>*</td>
<td>337</td>
<td>6,662</td>
<td>2,995,759</td>
<td>94,510</td>
<td>$4,799,562</td>
<td>155,096,784</td>
<td>5.6%</td>
<td>1.9%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>25</td>
<td>*</td>
<td>*</td>
<td>35</td>
<td>4,512</td>
<td>529,668</td>
<td>6,685</td>
<td>$554,654</td>
<td>18,690,490</td>
<td>0.8%</td>
<td>2.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>203</td>
<td>59</td>
<td>*</td>
<td>267</td>
<td>8,646</td>
<td>1,066,143</td>
<td>72,265</td>
<td>$2,484,387</td>
<td>99,360,556</td>
<td>3.1%</td>
<td>1.6%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Information</td>
<td>20</td>
<td>*</td>
<td>*</td>
<td>23</td>
<td>1,320</td>
<td>44,194</td>
<td>431</td>
<td>$104,507</td>
<td>7,110,903</td>
<td>1.7%</td>
<td>0.6%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>213</td>
<td>10,999</td>
<td>445</td>
<td>$23,693</td>
<td>1,038,719</td>
<td>4.2%</td>
<td>1.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>109</td>
<td>21</td>
<td>*</td>
<td>132</td>
<td>6,876</td>
<td>2,443,682</td>
<td>17,051</td>
<td>$3,579,500</td>
<td>203,153,842</td>
<td>1.9%</td>
<td>1.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>73</td>
<td>-</td>
<td>-</td>
<td>$0</td>
<td>489,416</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>133</td>
<td>52</td>
<td>*</td>
<td>190</td>
<td>14,299</td>
<td>192,543</td>
<td>32,515</td>
<td>$501,343</td>
<td>65,101,294</td>
<td>1.3%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>234</td>
<td>89</td>
<td>*</td>
<td>332</td>
<td>21,966</td>
<td>902,985</td>
<td>150,203</td>
<td>$1,916,872</td>
<td>100,829,355</td>
<td>1.5%</td>
<td>0.9%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>89</td>
<td>42</td>
<td>*</td>
<td>135</td>
<td>4,097</td>
<td>519,972</td>
<td>38,954</td>
<td>$1,221,154</td>
<td>56,515,390</td>
<td>3.3%</td>
<td>0.9%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>164</td>
<td>117</td>
<td>*</td>
<td>295</td>
<td>14,357</td>
<td>1,186,978</td>
<td>272,709</td>
<td>$3,602,093</td>
<td>128,815,539</td>
<td>2.1%</td>
<td>0.9%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>236</td>
<td>48</td>
<td>*</td>
<td>289</td>
<td>19,826</td>
<td>495,138</td>
<td>18,382</td>
<td>$1,230,894</td>
<td>90,131,144</td>
<td>1.5%</td>
<td>0.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>17</td>
<td>*</td>
<td>*</td>
<td>23</td>
<td>2,490</td>
<td>11,838</td>
<td>1,333</td>
<td>$46,228</td>
<td>15,438,183</td>
<td>0.9%</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>412</td>
<td>38,904</td>
<td>-</td>
<td>$54,806</td>
<td>11,946,093</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>22</td>
<td>*</td>
<td>*</td>
<td>29</td>
<td>3,179</td>
<td>77,755</td>
<td>20,878</td>
<td>$266,388</td>
<td>26,637,082</td>
<td>0.9%</td>
<td>0.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>321</td>
<td>185</td>
<td>18</td>
<td>524</td>
<td>20,834</td>
<td>1,894,157</td>
<td>550,473</td>
<td>$5,340,067</td>
<td>106,732,102</td>
<td>2.5%</td>
<td>1.8%</td>
<td>0.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,487</strong></td>
<td><strong>893</strong></td>
<td><strong>33</strong></td>
<td><strong>3,515</strong></td>
<td><strong>157,260</strong></td>
<td><strong>14,385,990</strong></td>
<td><strong>1,414,503</strong></td>
<td><strong>$28,300,813</strong></td>
<td><strong>1,418,729,203</strong></td>
<td><strong>1.6%</strong></td>
<td><strong>1.0%</strong></td>
<td><strong>0.1%</strong></td>
</tr>
</tbody>
</table>
Figure 6-23. Gas account population size and savings achieved by industry sector (includes unlinked tracking data)
Figure 6-24 shows the percent contribution of each sector to the 2016 total gas participant savings, including unlinked tracking data. Consistent with findings in the 2015 report, a handful of industry sectors accounted for the majority of savings in 2016:

- **Accommodation and Food Services**, where hot water measures accounted for 38% of savings – 24% through the non-upstream program and 14% through upstream. Non-upstream projects were most heavily concentrated in aerators and spray valves (433 projects, 11% of savings) and low-flow showerheads (39 projects, 7% of savings). HVAC was also a major factor for this sector, accounting for 25% of savings, primarily through controls and steam traps (each 11% of savings).

- **Real Estate and Rental and Leasing**, where two large comprehensive design projects installed by Eversource accounted for 28% of savings. Upstream hot water played a substantial role for Columbia and National Grid in this sector, producing the largest share of total savings for both PAs.

- **Educational Services**, where HVAC projects—primarily controls and steam traps—accounted for 32% of savings.

- **Professional, Scientific, and Technical Services**, where HVAC measures produced 27% of savings, comprehensive design produced 20%, and upstream hot water produced 16%.

- **Also noteworthy is Manufacturing**, which accounted for the largest share of savings (22%) in 2015, driven by a small number of large process projects from Eversource. In 2016, Manufacturing makes up 17% of overall savings. Process projects continue to drive savings in the sector, with three projects (two from National Grid, one from Eversource) accounting for 54% of savings. By comparison, the single largest Manufacturing project in 2015 achieved approximately the same amount of savings as the top two in 2016 combined.
Figure 6-24. Distribution of participant gas savings by industry sector (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>2016 Gas Participant Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.3%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>3.0%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.8%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>3.7%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>11.2%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>11.2%</td>
</tr>
<tr>
<td>Information</td>
<td>0.3%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.1%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>17.0%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1.3%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>6.3%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>3.6%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>8.3%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>3.4%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>13.2%</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.3%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
Figure 6-25 provides an illustration of the 2016 gas account participation and population savings percentages by industry sector. Worth noting are the three sectors where percent savings exceeded percent participation: Agriculture, Forestry, Fishing and Hunting; Finance and Insurance; and Utilities.

- The major Agriculture, Forestry, Fishing and Hunting project is discussed in section 6.1. In the Finance and Insurance sector, Columbia installed a half dozen HVAC projects that accounted for 81% of savings in the sector – two building shell (57%), two steam traps (13%), and two controls (11%). Similarly, the largest Utilities project was a steam trap completed by National Grid that accounted for 87% of savings in that sector.
Figure 6-25. Gas account participation and population savings by industry sector (includes unlinked tracking data)
Table 6-26 illustrates how account participation and population savings changed across time. Figure 6-26 and Figure 6-27 show the participation information in Table 6-26 in a graphical format, while Figure 6-28 and Figure 6-29 show savings from Table 6-26. Note that each data series is spread across two-part figures. In addition, with the inclusion of upstream hot water and food service programs in 2016, these figures have been updated to distinguish between non-upstream savings and upstream savings using solid and striped fills, respectively. Sector highlights include:

- For Manufacturing, the 2015 report noted the decreasing trend in participation, the largest sector by consumption. Furthermore, it suggested that the inverse relationship between participation and savings rates indicated a continued engagement of large accounts. The 2016 data further supports this finding, with an important caveat: the upstream program appears to have contributed to a slight increase in account participation, yet savings continue to decrease.

- Accommodation and Food Services continues to decline in participation and savings each year. In 2015, the top two sub uses in this sector were low-flow showerheads, which accounted for 21% of savings, and aerators and spray valves, which accounted for another 13%. In 2016, those sub uses combined accounted for 17% of savings, and the top highest-saving end uses were upstream hot water and comprehensive design.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>8.7%</td>
<td>0.8%</td>
<td>11.0%</td>
<td>1.1%</td>
<td>9.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>1.4%</td>
<td>0.2%</td>
<td>1.8%</td>
<td>0.4%</td>
<td>1.8%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>1.8%</td>
<td>3.3%</td>
<td>2.4%</td>
<td>1.4%</td>
<td>3.9%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>2.4%</td>
<td>0.8%</td>
<td>2.3%</td>
<td>0.5%</td>
<td>3.1%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>1.2%</td>
<td>0.5%</td>
<td>0.9%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>3.8%</td>
<td>1.3%</td>
<td>3.1%</td>
<td>2.2%</td>
<td>3.7%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1.6%</td>
<td>0.4%</td>
<td>1.3%</td>
<td>1.1%</td>
<td>1.4%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>2.8%</td>
<td>2.1%</td>
<td>1.8%</td>
<td>1.0%</td>
<td>4.0%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Information</td>
<td>1.6%</td>
<td>0.3%</td>
<td>1.5%</td>
<td>0.5%</td>
<td>1.7%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>1.4%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>0.1%</td>
<td>1.4%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2.4%</td>
<td>1.1%</td>
<td>2.3%</td>
<td>2.1%</td>
<td>2.5%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>3.2%</td>
<td>1.2%</td>
<td>1.3%</td>
<td>6.5%</td>
<td>1.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>2.2%</td>
<td>0.8%</td>
<td>1.7%</td>
<td>1.0%</td>
<td>3.1%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2.6%</td>
<td>1.4%</td>
<td>1.3%</td>
<td>0.8%</td>
<td>2.2%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>2.6%</td>
<td>1.1%</td>
<td>1.6%</td>
<td>2.2%</td>
<td>1.6%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>2.2%</td>
<td>0.9%</td>
<td>1.9%</td>
<td>0.9%</td>
<td>2.2%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>1.3%</td>
<td>0.7%</td>
<td>2.9%</td>
<td>0.9%</td>
<td>2.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.5%</td>
<td>0.0%</td>
<td>0.5%</td>
<td>0.1%</td>
<td>1.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.7%</td>
<td>0.0%</td>
<td>0.8%</td>
<td>1.6%</td>
<td>0.8%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.4%</td>
<td>0.3%</td>
<td>1.6%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1.9%</td>
<td>0.6%</td>
<td>2.1%</td>
<td>1.3%</td>
<td>3.7%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Statewide</td>
<td>2.6%</td>
<td>1.0%</td>
<td>2.8%</td>
<td>1.4%</td>
<td>3.4%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>
Figure 6-26. 2011–2016 account participation rate by industry sector (gas part 1)
**Figure 6-27. 2011–2016 account participation rate by industry sector (gas part 2)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturing</th>
<th>Mining, Quarrying, and Oil and Gas</th>
<th>Other Services (including Public Administration)</th>
<th>Professional, Scientific, and Technical Services</th>
<th>Retail Trade, Restaurants, and Hotels</th>
<th>Transportation and Warehousing</th>
<th>Utilities</th>
<th>Wholesale Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>2.4%</td>
<td>1.1%</td>
<td>1.3%</td>
<td>2.1%</td>
<td>1.3%</td>
<td>0.7%</td>
<td>0.5%</td>
<td>1.4%</td>
</tr>
<tr>
<td>2012</td>
<td>2.3%</td>
<td>1.1%</td>
<td>1.2%</td>
<td>2.2%</td>
<td>1.2%</td>
<td>0.9%</td>
<td>0.6%</td>
<td>1.0%</td>
</tr>
<tr>
<td>2013</td>
<td>2.5%</td>
<td>1.3%</td>
<td>1.2%</td>
<td>1.9%</td>
<td>1.3%</td>
<td>0.9%</td>
<td>0.8%</td>
<td>1.3%</td>
</tr>
<tr>
<td>2014</td>
<td>1.9%</td>
<td>1.4%</td>
<td>1.1%</td>
<td>1.7%</td>
<td>1.5%</td>
<td>0.9%</td>
<td>0.7%</td>
<td>1.3%</td>
</tr>
<tr>
<td>2015</td>
<td>1.7%</td>
<td>1.6%</td>
<td>1.2%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>0.9%</td>
<td>0.7%</td>
<td>1.1%</td>
</tr>
<tr>
<td>2016</td>
<td>1.0%</td>
<td>1.6%</td>
<td>1.2%</td>
<td>1.3%</td>
<td>1.5%</td>
<td>0.9%</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Legend:
- Non-Upstream Participation Rate
- Upstream Participation Rate
- Dual-stream Participation Rate
Figure 6-28. 2011–2016 population savings achieved by industry sector, gas part 1
Figure 6-29. 2011–2016 population savings achieved by industry sector, gas part 2
The 2016 Customer Profile leverages tax data linked to PA billing and CIS data integration improvements made under the PAs’ ongoing Data Enhancement Project. Previous iterations of the tax data relied on locational matching only; the current iteration leverages spatial proximity (the geographic closeness of similar addresses), algorithmic text matching (similarities between business name, contact name, etc. and nearby tax information), and direct string matches (matches involving the phone number or building number). This continued refinement to the tax data matching has yielded the most robust and highest coverage of the location-level EUI maps since this analysis was first introduced. The material here is at the location level, and is the subset of accounts and locations that DNV GL was able to integrate with the tax data. As with previous years, the maps in this section are intended not to target specific accounts, but rather to identify areas of higher or lower EUI within sectors relative to the rest of the state sector population. Not all PA accounts are represented in the tax maps, and not all towns contain square footage data for their tax records. In this regard, the EUI analyses present a subset of the PA populations: namely, those accounts that can be matched with tax data. Areas in white indicate towns served by the PAs; areas in gray indicate towns not served by the PAs.

The EUI maps present the data as standard deviations from the mean EUI for the analysis grain of the map. In order to appropriately display standard deviations DNV GL must have locational EUI in a relatively normal distribution. To accomplish, we transform the actual locational EUIs using a natural log transformation. To aid with map reading, we have not included the re-transformed numbers in the map legends but rather have left the unit-less “standard deviations” so that maps from different sectors can be evaluated against one another and across fuels. Readers who are interested in the actual mean and median EUI numbers should consult the EUI tables and charts included in this section of the C&I Customer Profile report. Finally, in some instances the maps may not include the extreme ends of the standard deviations; this occurs when there are very few records in those tails, at which point they are grouped into the next closest class. DNV GL has kept the color schemes consistent across the maps so the absence of extreme tails does not impact the ability to compare maps by shifting the colors.

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58 EUI analysis was first introduced as a pilot effort within the 2013 C&I Customer Profile report.
59 EUI is the locational consumption divided by the matched tax data’s building square footage; this may not reflect the whole building’s EUI.
60 For most maps, this is a specific industry sector; e.g., the manufacturing EUI map shows areas in the state where the average grid cell has higher or lower manufacturing EUIs than the average EUI for manufacturing statewide.
Figure 6-30 presents the EUI, irrespective of industry sector, for all locations and accounts used in the gas EUI analysis.

**Figure 6-30. Gas landscape EUI – all sectors billing data that linked to tax data**
Table 6-27 presents the summary-level tables of gas EUIs by sector for the population of billing accounts that matched with tax data and are used in the maps. These are the actual averages (not log transformed), and a 1% trim has been applied to the means to remove an equal number of records from each tail of the distribution. This minimizes the influence of extremely large or small accounts on the means; however, the influence of very large or small accounts can still be seen in sectors like information and real estate leasing. In light of the skewed distribution, we have provided median values as an alternate view of the population. We offer these numbers to complement the GIS maps and lend context to the transformed values used in those maps to achieve a normal distribution. It is important to note that some sectors with small populations can be heavily impacted by even two large accounts.

Table 6-27. Summary gas EUI by industry sector for gas accounts that linked to tax data

<table>
<thead>
<tr>
<th>NAICS Sector Equivalet</th>
<th>Mean EUI (Therms / SqFt)</th>
<th>Mean EUI (kBtu / SqFt)</th>
<th>Median EUI (Therms / SqFt)</th>
<th>Median EUI (kBtu / SqFt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>1.4</td>
<td>140.5</td>
<td>0.6</td>
<td>57.4</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>1.0</td>
<td>96.6</td>
<td>0.2</td>
<td>24.0</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>2.6</td>
<td>264.5</td>
<td>0.4</td>
<td>36.9</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.7</td>
<td>69.7</td>
<td>0.3</td>
<td>30.6</td>
</tr>
<tr>
<td>Construction</td>
<td>0.5</td>
<td>50.7</td>
<td>0.2</td>
<td>21.1</td>
</tr>
<tr>
<td>Educational Services</td>
<td>1.4</td>
<td>142.2</td>
<td>0.4</td>
<td>40.3</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>0.6</td>
<td>57.0</td>
<td>0.3</td>
<td>29.4</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>0.8</td>
<td>78.5</td>
<td>0.3</td>
<td>32.9</td>
</tr>
<tr>
<td>Information</td>
<td>27.5</td>
<td>2,748.4</td>
<td>0.2</td>
<td>23.4</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.4</td>
<td>41.7</td>
<td>0.2</td>
<td>23.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.8</td>
<td>80.7</td>
<td>0.3</td>
<td>27.6</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>2.4</td>
<td>241.9</td>
<td>0.2</td>
<td>22.1</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>0.6</td>
<td>59.8</td>
<td>0.3</td>
<td>30.1</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>0.5</td>
<td>51.1</td>
<td>0.3</td>
<td>25.6</td>
</tr>
<tr>
<td>Public Administration</td>
<td>0.9</td>
<td>92.3</td>
<td>0.5</td>
<td>46.0</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>9.0</td>
<td>896.6</td>
<td>0.4</td>
<td>38.0</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.5</td>
<td>45.1</td>
<td>0.2</td>
<td>23.4</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.5</td>
<td>45.6</td>
<td>0.2</td>
<td>20.2</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.7</td>
<td>71.8</td>
<td>0.3</td>
<td>31.6</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.5</td>
<td>53.2</td>
<td>0.2</td>
<td>22.5</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.8</td>
<td>81.6</td>
<td>0.3</td>
<td>31.5</td>
</tr>
</tbody>
</table>

61 EUI values are subject to the following impacts that may skew results: 1) The analysis looks at EUIs for all accounts at a single location within the impacted fuel (gas or electric), and not both fuels across the location. 2) DNV GL does not have information on delivered fuels, so their contribution to heating is not reflected in this table. 3) Inconsistencies in 3rd party tax data pertaining to outdate square footage information or use codes.
We also provide a breakdown of the median EUI by industry sector (see Table 6-28) using the standard gas size breaks presented throughout this report. Figure 6-31 illustrates the same data in scatterplot form to facilitate easier comparisons across classes.

Table 6-28. Median gas therm EUI by industry sector and consumption bin, linked tax and billing accounts only

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Less than 8,000 Therm</th>
<th>8,000 Therm to 40,000 Therm</th>
<th>40,000 Therm to 80,000 Therm</th>
<th>80,000 Therm to 1,000,000 Therm</th>
<th>Greater than 1,000,000 Therm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>0.4</td>
<td>1.4</td>
<td>0.9</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Administrative and Support and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Management and Remediation Services</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>0.2</td>
<td>0.5</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>0.3</td>
<td>0.4</td>
<td>0.8</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>0.2</td>
<td>0.3</td>
<td>0.5</td>
<td>1.3</td>
<td>12.8</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Public Administration</td>
<td>0.3</td>
<td>0.6</td>
<td>0.5</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>0.2</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.2</td>
<td>0.2</td>
<td>0.6</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

Table 6-29. Median gas kBTU EUI by industry sector and consumption bin, linked tax and billing accounts only

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Less than 8,000 Therm</th>
<th>8,000 Therm to 40,000 Therm</th>
<th>40,000 Therm to 80,000 Therm</th>
<th>80,000 Therm to 1,000,000 Therm</th>
<th>Greater than 1,000,000 Therm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>41.6</td>
<td>143.2</td>
<td>92.1</td>
<td>67.5</td>
<td></td>
</tr>
<tr>
<td>Administrative and Support and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Management and Remediation Services</td>
<td>20.9</td>
<td>43.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>24.0</td>
<td>185.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>24.6</td>
<td>53.6</td>
<td>56.1</td>
<td>63.3</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>19.7</td>
<td>32.9</td>
<td>42.5</td>
<td>78.2</td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>30.5</td>
<td>48.3</td>
<td>46.1</td>
<td>55.6</td>
<td></td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>28.2</td>
<td>45.3</td>
<td>42.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>26.5</td>
<td>43.7</td>
<td>75.8</td>
<td>126.8</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>17.2</td>
<td>33.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>20.3</td>
<td>31.0</td>
<td>50.8</td>
<td>132.0</td>
<td>1,277.7</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>18.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>25.8</td>
<td>67.0</td>
<td>119.7</td>
<td>116.2</td>
<td></td>
</tr>
<tr>
<td>Public Administration</td>
<td>22.7</td>
<td>41.4</td>
<td>39.1</td>
<td>56.2</td>
<td></td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>34.0</td>
<td>62.3</td>
<td>53.0</td>
<td>74.0</td>
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</tr>
<tr>
<td>Retail Trade</td>
<td>25.5</td>
<td>57.3</td>
<td>60.0</td>
<td>68.8</td>
<td></td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>21.2</td>
<td>37.4</td>
<td>35.6</td>
<td>49.2</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>17.1</td>
<td>27.8</td>
<td>24.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>19.6</td>
<td>24.6</td>
<td>59.6</td>
<td>112.7</td>
<td></td>
</tr>
<tr>
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<td>25.8</td>
<td>50.3</td>
<td>60.4</td>
<td>109.2</td>
<td></td>
</tr>
</tbody>
</table>

62 The median EUI is presented for all classes where there were more than 15 records. This filter was applied to protect confidentiality.
Figure 6-31. Scatterplot of median gas EUI (Therms / SqFT) by industry sector and consumption bin, linked tax and billing accounts only\(^{63}\)

63 The manufacturing EUI for “greater than 1,000,000 therms” has been left off the graph to make all the other data points legible.
The following are a series of gas EUI maps by select industry sectors making notable contributions to 2016 usage. They consist of Educational Services, Real Estate and Rental and Leasing, and Accommodation and Food Services. As with Figure 6-30, these EUI maps present the data as standard deviations from the mean industry sector EUI for the analysis grain of the map.

**Figure 6-32. Educational Services industry sector gas EUI**
Figure 6-33. Real Estate and Rental and Leasing industry sector gas EUI

![Map of Real Estate and Rental and Leasing industry sector gas EUI](image)

**1km Grid Cell Average Consumption:**
**Standard Deviations from Statewide Mean**
- No PA Service
- PA Served Town
- < -2.5 Std. Dev.
- -2.5 - -1.5 Std. Dev.
- -1.5 - -0.50 Std. Dev.
- -0.50 - 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- > 1.5 Std. Dev.
Figure 6-34. Accommodation and Food Services industry sector gas EUI
Table 6-30 shows gas lifetime savings results by industry sector. It is important to note that lifetime savings are only calculated if the PAs provided lifetime data. When compared against proportional savings from Figure 6-24, it is evident that the Educational Services and Manufacturing sectors are the primary drivers of lifetime savings. Manufacturing decreased from 27.1% of lifetime savings in 2015 to 15.9% in 2016.

Table 6-30. Lifetime savings by industry sector 2016, gas (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>% of Lifetime Savings 2016</th>
<th>2016 Lifetime Savings (therms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5.0%</td>
<td>8,532,612</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.2%</td>
<td>281,280</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>3.3%</td>
<td>5,600,491</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.7%</td>
<td>1,249,088</td>
</tr>
<tr>
<td>Construction</td>
<td>1.1%</td>
<td>1,860,586</td>
</tr>
<tr>
<td>Educational Services</td>
<td>18.0%</td>
<td>30,930,053</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>3.8%</td>
<td>6,561,676</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>8.9%</td>
<td>15,308,056</td>
</tr>
<tr>
<td>Information</td>
<td>0.3%</td>
<td>544,567</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.1%</td>
<td>138,962</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>15.9%</td>
<td>27,259,775</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1.5%</td>
<td>2,520,631</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>7.0%</td>
<td>11,930,092</td>
</tr>
<tr>
<td>Public Administration</td>
<td>3.7%</td>
<td>6,312,088</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>9.1%</td>
<td>15,627,028</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>3.7%</td>
<td>6,302,762</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.1%</td>
<td>139,599</td>
</tr>
<tr>
<td>Unknown</td>
<td>17.0%</td>
<td>29,195,346</td>
</tr>
<tr>
<td>Utilities</td>
<td>0.1%</td>
<td>212,159</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>0.5%</td>
<td>923,917</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>171,430,769</strong></td>
</tr>
</tbody>
</table>

Gas participant savings achieved by industry sector for 2016 are presented in Table 6-31. Participant savings achieved ranged from 1.8% to over 24% of the participating sector’s consumption for classifiable industry sectors. In 2015, one third of the sectors achieved savings over 10%; in 2016, only 3 sectors met this threshold. It is important to note that for nearly all sectors, the mean participant savings is higher than the median participant savings, which means that a small number of participants are responsible for a substantial portion of the savings achieved. The exception to this pattern is Management of Companies and Enterprises, whose mean is lower than its median. This sector’s savings were derived primarily from low-flow showerheads (44%) and aerators and spray valves (19%), which tend to be smaller projects.
Table 6-31. Gas participant savings achieved by industry sector (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>570,940</td>
<td>942</td>
<td>182</td>
<td>11,139,540</td>
<td>$1,126,606</td>
<td>5.1%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>6,479</td>
<td>405</td>
<td>231</td>
<td>203,721</td>
<td>$17,713</td>
<td>3.2%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>434,674</td>
<td>72,446</td>
<td>1,863</td>
<td>1,799,147</td>
<td>$445,113</td>
<td>24.2%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>115,735</td>
<td>1,286</td>
<td>257</td>
<td>2,483,667</td>
<td>$296,878</td>
<td>4.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>96,608</td>
<td>2,147</td>
<td>409</td>
<td>1,014,946</td>
<td>$227,383</td>
<td>9.5%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>2,232,693</td>
<td>7,779</td>
<td>1,890</td>
<td>27,100,811</td>
<td>$4,105,109</td>
<td>8.2%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>532,290</td>
<td>15,656</td>
<td>363</td>
<td>3,138,957</td>
<td>$557,630</td>
<td>17.0%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>1,498,685</td>
<td>6,432</td>
<td>1,311</td>
<td>30,628,498</td>
<td>$2,355,775</td>
<td>4.9%</td>
</tr>
<tr>
<td>Information</td>
<td>26,746</td>
<td>1,573</td>
<td>524</td>
<td>740,648</td>
<td>$65,097</td>
<td>3.6%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>922</td>
<td>307</td>
<td>356</td>
<td>31,715</td>
<td>$3,253</td>
<td>2.9%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2,352,060</td>
<td>18,375</td>
<td>485</td>
<td>33,792,861</td>
<td>$3,454,885</td>
<td>7.0%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>592,478</td>
<td>3,898</td>
<td>231</td>
<td>19,003,434</td>
<td>$517,145</td>
<td>3.1%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>612,180</td>
<td>2,001</td>
<td>190</td>
<td>7,820,082</td>
<td>$1,352,542</td>
<td>7.8%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>212,258</td>
<td>2,868</td>
<td>1,259</td>
<td>2,753,892</td>
<td>$503,925</td>
<td>7.7%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>861,387</td>
<td>3,650</td>
<td>560</td>
<td>11,567,777</td>
<td>$2,859,845</td>
<td>7.4%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>366,457</td>
<td>1,502</td>
<td>186</td>
<td>6,739,606</td>
<td>$983,665</td>
<td>5.4%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>13,948</td>
<td>536</td>
<td>231</td>
<td>664,355</td>
<td>$40,049</td>
<td>2.1%</td>
</tr>
<tr>
<td>Utilities</td>
<td>38,904</td>
<td>38,904</td>
<td>38,904</td>
<td>2,196,674</td>
<td>$54,806</td>
<td>1.8%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>73,507</td>
<td>3,063</td>
<td>408</td>
<td>563,876</td>
<td>$247,140</td>
<td>13.0%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1,125,423</td>
<td>3,654</td>
<td>316</td>
<td>9,427,699</td>
<td>$2,093,619</td>
<td>11.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,764,373</strong></td>
<td><strong>172,811,904</strong></td>
<td><strong>32,447</strong></td>
<td><strong>172,811,904</strong></td>
<td><strong>21,308,178</strong></td>
<td><strong>8.1%</strong></td>
</tr>
</tbody>
</table>

Figure 6-35 shows the percent contribution of each sector to the 2016 total gas participant savings, excluding unlinked tracking data. New in 2016, this graphic has been converted from a pie chart to a bar chart, to better facilitate comparisons between sectors for the reader. As in 2015, the Manufacturing and Educational Services sectors provided substantial contributions. Health Care and Social Assistance also play a larger role in savings for accounts successfully matched to the billing data. Accommodation and Food Services continues a declining trend in this metric.
Figure 6-35. Proportion of overall participant savings, gas (excludes unlinked tracking data)

- Accommodation and Food Services: 4.9%
- Administrative and Support and Waste Management: 0.1%
- Agriculture, Forestry, Fishing and Hunting: 3.7%
- Arts, Entertainment, and Recreation: 1.0%
- Construction: 0.8%
- Educational Services: 19.0%
- Finance and Insurance: 4.5%
- Health Care and Social Assistance: 12.7%
- Information: 0.2%
- Management of Companies and Enterprises: 0.0%
- Manufacturing: 20.0%
- Mining, Quarrying, and Oil and Gas Extraction: 0.0%
- Other Services (except Public Administration): 5.0%
- Professional, Scientific, and Technical Services: 5.2%
- Public Administration: 1.8%
- Real Estate and Rental and Leasing: 7.3%
- Retail Trade: 3.1%
- Transportation and Warehousing: 0.1%
- Unknown: 9.6%
- Utilities: 0.3%
- Wholesale Trade: 0.6%
Figure 6-36. 2011–2016 proportion of overall participant savings, gas – excluding unlinked tracking data
Figure 6-37 provides historical savings achieved for gas accounts that successfully matched to the billing data. As discussed previously, Agriculture, Forestry, Fishing and Hunting saw a substantial project that resulted in a significant increase in 2016. Another strong performer was Construction, where a large custom HVAC project completed by National Grid produced 26% of the sector’s savings. Wholesale Trade also had a particularly strong performance with upstream hot water, which accounted for 18% of projects but 27% of savings in that sector.
Figure 6-37. 2011–2016 participant savings achieved by industry sector, gas (excludes unlinked tracking data)
6.4 By PA summary

This chapter presents a more detailed view of how individual PAs fit into the statewide picture. Despite most of the C&I energy efficiency programs being run at the statewide level, each PA has a unique set of variables and constraints that are likely to yield different results. PAs also have varying geographic elements in their service populations, ranging from dense development in the Boston area to seasonal use patterns in smaller buildings on the Cape and in western Massachusetts.

The majority of the sections in this chapter require that the tracking accounts be linked to billing accounts to generate the report metrics—specifically the consumption-weighted participation, participant savings achieved, proportional consumption ratio, and contribution ratio metrics as well as any industry sector, demand, or consumption sections. The match rates and supporting details for the billing and tracking data for each PA are presented in section 4.3.1 earlier in this report.
6.4.1 Participation and savings

This section breaks out gas PA participation and savings into two primary types of analysis: statewide and participant-only analysis. To perform the participant-only analysis, each account must be successfully matched to the billing data, which allows for the account-level calculations of savings achieved.

Table 6-32 shows the 2016 account participation, savings, and incentives for gas PAs. New to the 2016 report is the extraction of participation by non-upstream-only, upstream-only, and dual-stream. In addition, DNV GL incorporated incentives for each PA. The extraction of participants illustrates that most of the large gas PAs were able to engage close to a third of their populations in the upstream hot water program. In addition, some of Eversource’s upstream accounts installed food service measures.

- Statewide, the gas participation rate dropped in 2016 from 2.4% in 2015 to 2.2% in 2016, driven largely by a decrease in Columbia’s and Eversource’s number of participants compared to 2015.
- Although overall 2016 account participation decreased, there was a statewide increase in 2016 population savings achieved, from 0.9% in 2015 to 1.0% in 2016. This indicates that 2016’s participants provided more depth of savings than 2015’s. The largest saving projects in 2016 were custom process, comprehensive design, and HVAC, undertaken by National Grid, Eversource, and Columbia’s accounts.
- National Grid and Liberty experienced large increases in number of participants from 2015 to 2016.
  - Seventeen percent of National Grid’s total therm savings in 2016 was due to a few of the largest gas accounts all installing custom process equipment measures.
  - Liberty’s 2016 therm savings were driven by various accounts installing a variety of different retrofit HVAC measures.

Table 6-32. Account participation rates and population savings achieved by PA, gas (includes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>34,332</td>
<td>197,155,365</td>
<td>579</td>
<td>152</td>
<td>32</td>
<td>763</td>
<td>1,865,149</td>
<td>167,191</td>
<td>$3,138,758</td>
</tr>
<tr>
<td>Eversource</td>
<td>30,246</td>
<td>455,405,360</td>
<td>473</td>
<td>179</td>
<td>*</td>
<td>652</td>
<td>4,361,188</td>
<td>251,537</td>
<td>$7,665,836</td>
</tr>
<tr>
<td>National Grid</td>
<td>84,087</td>
<td>664,990,123</td>
<td>1,070</td>
<td>565</td>
<td>31</td>
<td>1,666</td>
<td>7,636,117</td>
<td>969,020</td>
<td>$16,357,255</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berkshire</td>
<td>5,328</td>
<td>42,688,969</td>
<td>86</td>
<td>20</td>
<td>*</td>
<td>106</td>
<td>240,995</td>
<td>15,000</td>
<td>$689,153</td>
</tr>
<tr>
<td>Liberty</td>
<td>4,216</td>
<td>41,503,792</td>
<td>284</td>
<td>*</td>
<td>19</td>
<td>303</td>
<td>198,480</td>
<td>8,487</td>
<td>$305,619</td>
</tr>
<tr>
<td>Unitil Gas</td>
<td>1,787</td>
<td>16,985,594</td>
<td>17</td>
<td>*</td>
<td>*</td>
<td>17</td>
<td>84,060</td>
<td>3,267</td>
<td>$144,194</td>
</tr>
<tr>
<td>Total</td>
<td>159,996</td>
<td>1,418,729,203</td>
<td>2,509</td>
<td>916</td>
<td>82</td>
<td>3,507</td>
<td>14,385,990</td>
<td>1,414,503</td>
<td>$28,300,813</td>
</tr>
</tbody>
</table>

*This column is the sum of non-suppressed values from non-upstream, upstream only, and dual participation columns. If any columns contain suppressed values, those values are not included in this column.
Table 6-33 shows the mean and median savings by gas PA over time. This table uses the full tracking data present in each year. In 2016, mean and median yearly savings increased for almost all gas PAs, indicating that most gas PAs engaged some of their largest customers in 2016. This is particularly interesting since 2016 saw the introduction of the gas upstream program, which for electric, has historically decreased mean and median savings.

Table 6-33. Mean and median participant savings by PA, gas (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>Mean Yearly Savings</th>
<th>Median Yearly Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire</td>
<td>1,604</td>
<td>1,269</td>
</tr>
<tr>
<td>Columbia</td>
<td>4,760</td>
<td>3,225</td>
</tr>
<tr>
<td>Eversource</td>
<td>3,769</td>
<td>7,789</td>
</tr>
<tr>
<td>Liberty</td>
<td>4,223</td>
<td>1,654</td>
</tr>
<tr>
<td>National Grid</td>
<td>2,444</td>
<td>2,666</td>
</tr>
<tr>
<td>Unitil</td>
<td>2,951</td>
<td>17,996</td>
</tr>
</tbody>
</table>

Figure 6-38 shows historical gas account participation rates and Figure 6-39 shows historical gas population savings achieved. Each of these charts includes the separation of upstream and non-upstream data seen in 2016.

- Participation for National Grid and Unitil increased in 2016 compared to 2015, and the program breakout in the bar illustrates that this is solely due to upstream participation.

- Liberty experienced a spike in participation for 2016, as seen in Figure 6-38. This is due to the fact that 82% of participants installed aerators and spray valve measures. This is a strong indication that there are still opportunities for this end use, though it has seen declines in savings year over year.

- Most gas PAs saw an increase in population savings achieved in 2016, while also seeing an overall decrease in number of participants. This indicates that most gas participants provided higher depths of savings than in 2015.

- Berkshire saw a large increase in population savings achieved in 2016, compared to 2015. This was the result of numerous Berkshire accounts installing a variety of large-savings measures such as HVAC controls, process equipment, building systems, and comprehensive design measures.

- As in 2015, the data continues to suggest that the primary cause of decreasing participation is fewer installations of spray valves and control measures, both of which have been decreasing since 2013. Aerators and spray valves made up 23% of all gas projects in 2016.
Figure 6-38. 2011–2016 account participation rates, gas (includes unlinked tracking data)
Figure 6-39. 2011–2016 population savings achieved, gas (includes unlinked tracking data)

Figure 6-40 compares the ratio of population savings achieved to the ratio of account participation for each PA from 2011 to 2016, to show any changing dynamic between participation and savings rates. The changes in this ratio can capture the impact on PAs of participation by large accounts in any given year. For the smaller PAs, this impact can be quite substantial.

This figure follows the same trends seen above, with 2016 gas participants contributing much more to savings than their proportion of participation. Most of the PAs have larger ratios than in 2015. Liberty’s decline in this ratio reflects the findings discussed above: Although Liberty had a higher volume of participants in 2016, most participants installed spray valves, which yielded a lower contribution to savings than other gas end uses installed in 2016.
Figure 6-40. 2011–2016 gas savings ratio to participation ratio statistic (includes unlinked tracking data)
Table 6-34 presents lifetime savings from the 2016 energy efficiency programs for each PA. It is important to note that DNV GL could calculate lifetime savings only for measures for which the PA provided measure life information. Nearly all gas PAs were able to provide measure life information, so results in this table are accurately presented.

- There is little difference in the proportional impact of PA savings from an annual savings compared to lifetime savings, which indicates that each of the PAs installed a measure mix with comparable annual savings and useful lives.

Table 6-34. 2015 lifetime savings distribution for measures where savings could be derived, gas (includes unlinked tracking data)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>Total Annual Savings</th>
<th>Total Lifetime Savings</th>
<th>Total Incentives</th>
<th>Proportion of Total Annual Savings</th>
<th>Proportion of Total Lifetime Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>1,865,149</td>
<td>24,224,640</td>
<td>$3,128,808</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>4,354,568</td>
<td>55,230,515</td>
<td>$7,646,506</td>
<td>30%</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>7,632,587</td>
<td>85,097,520</td>
<td>$16,224,470</td>
<td>53%</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>497,361</td>
<td>6,878,094</td>
<td>$1,118,356</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>237,145</td>
<td>4,141,602</td>
<td>$679,093</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>176,156</td>
<td>1,411,216</td>
<td>$295,069</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>Unitil Gas</td>
<td>84,060</td>
<td>1,325,276</td>
<td>$144,194</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14,349,665</td>
<td>171,430,769</td>
<td>$28,118,139</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- Table 6-35 shows the savings and consumption of 2016 participating accounts by PA. The overall average statewide savings achieved by participating accounts that could be successfully linked to the billing data is 6.8%. This is down from 7.4% in 2015 due to an increase in participant therm usage in 2016. Participant therm savings increased in 2016 from 2015, but not as much as usage increased.
- In 2016, Berkshire achieved the highest participant savings, at 10%. Berkshire’s participating accounts were the largest-savings accounts that were able to be linked to the billing data. As explained above for Figure 6-39, this resulted from a handful of accounts installing high-saving measures such as comprehensive design, HVAC controls, and building system equipment.

Table 6-35. Participant savings achieved by gas PA (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>2016 Participant Therm Savings</th>
<th>Participant Therm Usage 2015</th>
<th>2016 Participant Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia Gas</td>
<td>1,326,887</td>
<td>19,556,021</td>
<td>6.8%</td>
</tr>
<tr>
<td>Eversource</td>
<td>3,185,797</td>
<td>58,822,664</td>
<td>5.4%</td>
</tr>
<tr>
<td>National Grid</td>
<td>6,887,852</td>
<td>86,929,425</td>
<td>7.9%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>363,838</td>
<td>7,503,794</td>
<td>4.8%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>184,896</td>
<td>1,841,769</td>
<td>10.0%</td>
</tr>
<tr>
<td>Liberty</td>
<td>98,055</td>
<td>4,766,432</td>
<td>2.1%</td>
</tr>
<tr>
<td>Unitil Gas</td>
<td>80,887</td>
<td>895,593</td>
<td>9.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,764,373</strong></td>
<td><strong>172,811,904</strong></td>
<td><strong>6.8%</strong></td>
</tr>
</tbody>
</table>

The gas data contain accounts for which the annual savings from installed measures exceeds the account’s previous year’s consumption (Table 6-36). Consistent with 2015, about 6% of the matched accounts had a

---

64 Usage (consumption) numbers in this table and throughout the entire analysis have not been weather normalized. This may impact consumption comparisons across time.
percent savings achieved of over 100%. If these accounts were removed from the analysis completely, the participant savings achieved would fall from 6.8% to 6%.65

Table 6-36. Gas participant savings achieved (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PA</th>
<th>2016 Accounts</th>
<th>2016 Accounts with Achieved Savings &lt; 100%</th>
<th>% 2016 Accounts where Savings Achieved &lt; 100%</th>
<th>% 2016 Accounts where Savings Achieved &gt; 100%</th>
<th>Average Percent Savings Achieved for 2016 Accounts &lt; 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Columbia</td>
<td>461</td>
<td>451</td>
<td>98%</td>
<td>2.2%</td>
<td>6.5%</td>
</tr>
<tr>
<td></td>
<td>Eversource</td>
<td>522</td>
<td>492</td>
<td>94%</td>
<td>5.7%</td>
<td>4.5%</td>
</tr>
<tr>
<td></td>
<td>National Grid</td>
<td>1,386</td>
<td>1,294</td>
<td>93%</td>
<td>6.6%</td>
<td>7.4%</td>
</tr>
<tr>
<td></td>
<td>Small Gas PAs</td>
<td>406</td>
<td>382</td>
<td>94%</td>
<td>5.9%</td>
<td>4.2%</td>
</tr>
<tr>
<td></td>
<td>Berkshire</td>
<td>96</td>
<td>84</td>
<td>88%</td>
<td>12.5%</td>
<td>6.3%</td>
</tr>
<tr>
<td></td>
<td>Liberty</td>
<td>288</td>
<td>277</td>
<td>96%</td>
<td>3.8%</td>
<td>2.2%</td>
</tr>
<tr>
<td></td>
<td>Unitil Gas</td>
<td>22</td>
<td>21</td>
<td>95%</td>
<td>4.5%</td>
<td>9.0%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2,775</strong></td>
<td><strong>2,619</strong></td>
<td><strong>94%</strong></td>
<td><strong>5.6%</strong></td>
<td><strong>6.1%</strong></td>
</tr>
</tbody>
</table>

65 Because accounts with percent savings achieved over 100% still provide real savings, they are kept in the analysis.
Figure 6-41 compares gas participant savings achieved for each PA from 2011 to 2016. This figure shows lots of variation for 2016 participant savings achieved across the PAs. Columbia, National Grid, and Berkshire saw notable increases in participant savings achieved, indicating that these participants contributed more savings relative to their usage than they did in 2015. Unitil’s and Liberty’s participant savings achieved has been decreasing since 2014.

**Figure 6-41. 2011–2016 participant savings achieved by gas PA (excludes unlinked tracking data)**
Figure 6-42 graphs the mean and median savings by PA over time. The impact of large projects on small gas PAs appear as spikes in this figure throughout the past 6 years. While these projects substantially impact how savings goals are met, the data shows that projects of this size cannot be counted on every year. National Grid’s and Columbia’s median participant size has been increasing since 2013, indicating increasing participation for high-saving projects.

**Figure 6-42. Median participant therm savings by gas PA (excludes unlinked tracking data)**

6.4.2 Market segmentation

To identify high-level differences among the PAs that could impact comparisons between each PA, DNV GL calculated the ratio of proportional savings contribution relative to proportional consumption contribution for each decile bin of the PA accounts. This equation is:

\[
\text{Contribution Ratio} = \frac{\text{Proportion of the PAs Total Savings from the individual analysis bin}}{\text{Proportion of PAs Total Consumption from the individual analysis bin}}
\]

The contribution ratio is a unit-less number, but the magnitude of the value can aid in comparing both across and within a PA across bins:

- <1 indicates that the bin contributes less towards total savings than it does towards consumption
- =1, or close to 1, indicates that the bin contributes equally towards total savings and consumption
- >1 indicates that the bin contributes more towards total savings than it does towards consumption

Several caveats go into creating the contribution ratio metric:

1. Accounts that showed annual savings greater than total annual consumption were dropped from the analysis, on the basis that these accounts either had incomplete savings data or were undergoing a large renovation that would substantially increase consumption from the base year.
2. For PAs with smaller populations, a small absolute increase in yearly participants can potentially have a large impact in the smaller consumption bins. For example, 15 participants in a bin are much more...
This dynamic can result in a more pronounced staircase pattern in the contribution ratio.

Table 6-37 shows the number of accounts in each of the PA’s percentile bins in 2016, which is 10% of each PA’s total billed population per bin. These totals increase or decrease each year, relative to the increase or decrease in each PA’s overall populations.

**Table 6-37. Total billed accounts per percentile bin, gas**

<table>
<thead>
<tr>
<th>PA</th>
<th>Number of Billed Accounts per Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire</td>
<td>530</td>
</tr>
<tr>
<td>Columbia</td>
<td>2,390</td>
</tr>
<tr>
<td>Eversource</td>
<td>2,608</td>
</tr>
<tr>
<td>Liberty</td>
<td>409</td>
</tr>
<tr>
<td>National Grid</td>
<td>7,404</td>
</tr>
<tr>
<td>Unitil</td>
<td>178</td>
</tr>
</tbody>
</table>
Figure 6-43 shows the percentile consumption breakpoints across the gas PAs in 2016. Similar to 2015, the large gas PAs have the smallest therm breakpoint limits for every percentile bin, up to the 80th percentile bin. As seen in previous years, differences in consumption bins are quite gradual. Large consumption differences aren’t seen for most gas PAs until the 90th percentile of accounts. The primary differences in gas PA populations are created by large accounts above the 90th percentile, where the large gas PAs have more very large accounts that can be engaged over a longer time period, and are more likely to be engaged on a yearly basis.

- Unlike 2015, in 2016 Columbia’s consumption breakpoints rose for all bins. Columbia holds the largest-consuming account based on its highest breakpoint value in the 90th bin.

- In 2016, all of the gas PAs have near identical breakpoints across their populations. This is evident in the convergence of their breakpoint lines, and reflects a relatively homogenous gas market, where all gas PAs have the potential to engage the full range of gas customer sizes.

Figure 6-43. Consumption breakpoints for percentile bin, gas

Figure 6-44 presents the contribution ratio (relative savings by relative usage) analysis for the gas PAs across their respective usage percentile breakpoint bins. This figure illustrates that the contribution ratio for each decile bin can vary dramatically across PAs (i.e., not all PAs derive the same ratio of savings relative to consumption for each bin within a given year). The gas version of this chart differs considerably from the electric version, where all PAs see nearly identical relationships between decile bins and contribution ratios (Figure 5-54 in section 5.4.2)

- The 2016 chart axis has been skewed to account for the very large spike in contribution ratio for accounts in Liberty’s 20th percentile size bin, with a ratio of 5, indicating accounts in this bin contributed
5 times more in relative savings than they did in relative usage. This was the direct result of aerator and spray valve installations by nearly all accounts Liberty’s 20th percentile size bin.

- Though the axis in Figure 6-44 is skewed, it is still evident that nearly all gas PAs achieved a contribution ratio >1 for customers in their largest percentile size bin. This is consistent with large-sized customer engagement and also seen in the electric market.

- Berkshire also yielded notably large contribution ratios for customers across its middle decile bins (4-8). A few of Berkshire’s larger customers installed custom new construction HVAC and building shell measures to contribute a large relative savings for these customers in 2016.

- The data further supports the finding that there is high savings potential across the entire gas market. This is expressed through spikes in contribution ratios (all greater than 1) across all bins. This contrasts strikingly with the electric market, where smaller customers tend to engage in smaller-saving projects and their contribution to savings is less than or equal to their contribution to usage.
  - One of the leading causes for higher contribution ratios for gas’s smaller percentile bins is that gas has lower overall savings than electric across all bins for all PAs. This means that each gas percentile bin has higher relative savings (savings per bin) then each electric bin, especially for the smaller percentile bins.
  - Another cause is that gas offers more end-use participation options for small accounts than electric. As seen in 2015, electric’s sole end use for its smallest bins (bins 1-3) is lighting (upstream and non-upstream), with a few hot water and HVAC exceptions (1 or 2 participants). On the other hand, gas’s smallest bins (bins 1-3) have high participation for hot water (upstream and non-upstream) and HVAC end uses. These additional available gas measures, coupled with more numerous options for small gas accounts, achieve disproportionately large savings.
Figure 6-44. Contribution ratio distributions by PA, gas (excludes unlinked tracking data)
6.4.3 Six-year market summaries

As part of the time series universe analysis, DNV GL examined total market penetration rates of account participation through different lenses. This included calculating the consumption-weighted participation statistic to help assess how much of PA consumption is associated with the program participants.

6.4.3.1 By PA

Table 6-38 presents the 6-year gas market penetration rates. New to the table in 2016 is the breakout of upstream, non-upstream, and dual-stream participants, as well as savings attributed to the upstream program. As in 2015, this table also includes total incentives for all PAs, and the time series savings achieved metric, which illustrates savings achieved across all 6 years for each PA. Also, as in 2015, consumption-weighted market penetration rates did not vary as much in 2016 across all PAs. Overall consumption-weighted market participation rates continue to increase year after year. This is especially true in 2016 for the small gas PAs, who achieved a consumption-weighted penetration rate of 27% (compared to 22% in 2015) across the 6-year period. For a second year in a row, Unitil achieved the largest savings relative to consumption rate across the 6-year period.

Table 6-38. Gas PA six-year market summary (includes unlinked tracking data)\(^66\)

<table>
<thead>
<tr>
<th>PA</th>
<th>Total Billing Accounts</th>
<th>Total Consumption (MDth)</th>
<th>Total Participants</th>
<th>6-year Account Market Penetration Rate</th>
<th>Consumption-Weighted Market Penetration Rate</th>
<th>Longitudinal Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Billing Accounts</td>
<td>Total Consumption (MDth)</td>
<td>Total Participants</td>
<td>6-year Account Market Penetration Rate</td>
<td>Consumption-Weighted Market Penetration Rate</td>
<td>Longitudinal Savings Achieved</td>
</tr>
<tr>
<td>Columbia</td>
<td>69,872</td>
<td>147,652</td>
<td>3,952</td>
<td>4,136</td>
<td>1,185.56</td>
<td>$18,336,079</td>
</tr>
<tr>
<td>Eversource</td>
<td>39,452</td>
<td>224,606</td>
<td>3,356</td>
<td>3,546</td>
<td>2,407.42</td>
<td>$32,361,434</td>
</tr>
<tr>
<td>National Grid</td>
<td>107,362</td>
<td>354,655</td>
<td>10,334</td>
<td>10,939</td>
<td>3,814.66</td>
<td>$52,889,130</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>15,008</td>
<td>50,648</td>
<td>1,333</td>
<td>1,387</td>
<td>361.34</td>
<td>$5,479,354</td>
</tr>
<tr>
<td>Berkshire</td>
<td>6,958</td>
<td>23,542</td>
<td>684</td>
<td>704</td>
<td>129.79</td>
<td>$2,301,756</td>
</tr>
<tr>
<td>Liberty</td>
<td>5,620</td>
<td>17,827</td>
<td>513</td>
<td>533</td>
<td>89.32</td>
<td>$1,298,561</td>
</tr>
<tr>
<td>Unitil</td>
<td>2,430</td>
<td>9,279</td>
<td>136</td>
<td>150</td>
<td>142.22</td>
<td>$1,879,036</td>
</tr>
<tr>
<td>Total</td>
<td>231,694</td>
<td>777,560</td>
<td>18,975</td>
<td>259</td>
<td>7,768.97</td>
<td>$109,065,996</td>
</tr>
</tbody>
</table>

\(^66\) DNV GL is working with Unitil to improve historic participant data.
DNV GL conducted the time series geographic analysis using the full billing and tracking populations, unlinked tracking data. As in previous Customer Profiles, the use of both full populations was possible because although data could not always be linked through the account number (due to a missing number or unmatched numbers), most tracking data included an address and other associated geographic data. Each unique tracking record is counted only once, as is each unique billing record.

Figure 6-45 presents the account penetration rate for the 6-year analysis period. Urban areas, including Boston and the suburbs, had comparatively higher account-level participation than these same areas did for electric; this may be due in part to the PA mix in these regions and the measures that the PAs are prioritizing. Rural areas—particularly in Berkshire’s territory—also had a higher participation than other areas of the state.

**Figure 6-45. 2011–2016 account penetration rate by town, gas – includes unlinked tracking data**
Figure 6-46 shows gas consumption-weighted account penetration by town for the 6-year analysis period. This figure suggests that for gas, although there have been relatively high participation rates in many cities, the consumption-weighted participation is lower. This trend was observed in past years as well, and the “high participation/lower consumption-weighted participation” dynamic is different than what has been observed for electric (lower participation but high consumption weighted). This could indicate that there are larger gas accounts that have not recently participated in C&I efficiency offering during the 6-year analysis window that could potentially be targeted for new efficiency measures.

**Figure 6-46. 2011–2016 consumption-weighted account penetration rate by town, gas (excludes unlinked tracking data)**
Figure 6-47 shows the historical savings relative to consumption. These maps look at the time series gross savings, against the time series consumption for each town. Details on how this is calculated are presented in section 3.3. The gas historical savings for most gas towns was lower than electric, with most gas towns experiencing historical savings of less than 1% of consumption. Western areas had consistently lower historical savings than urban and surrounding areas. Speculatively, this may be due to different underlying C&I population dynamics and characteristics; a greater understanding of the differences between the populations in these areas might yield greater insight in this regard.

**Figure 6-47. 2011–2016 savings achieved by town, gas (includes unlinked tracking data)**

Dual fuel-served town dynamics were also assessed from 2011 to 2016, to investigate how participation and populations vary across towns with the same electric and gas PA, and across towns that have multiple or different electric and gas PAs. DNV GL updated the town index to reflect the most recent version of the DPU assignments, and then made any additional modifications as informed by the PAs’ data. As in previous years, the raw participation ratios on the gas side for “same served” PA towns were relatively consistent across the PAs.
Table 6-39 lists time-series consumption values from 2011-2015 and time-series participation values from 2012-2016. This allows for an accurate time series savings achieved metric.

Table 6-39. Town level gas savings ratio and consumption-weighted participation by electric and gas PA combination (includes unlinked tracking data)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Same PA (Electric, Gas)</td>
<td>86</td>
<td>2,637,878,071</td>
<td>64,120</td>
<td>717,587,643</td>
<td>5,031</td>
<td>29.6%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Eversource Energy; Eversource Energy</td>
<td>24</td>
<td>1,402,167,534</td>
<td>21,216</td>
<td>364,865,482</td>
<td>1,783</td>
<td>27.9%</td>
<td>6.6%</td>
</tr>
<tr>
<td>National Grid; National Grid</td>
<td>16</td>
<td>1,172,528,176</td>
<td>41,132</td>
<td>337,326,762</td>
<td>3,141</td>
<td>29.8%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Unitil; Unitil</td>
<td>3</td>
<td>63,182,361</td>
<td>1,772</td>
<td>15,393,399</td>
<td>107</td>
<td>40.0%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Different PA (Electric, Gas)</td>
<td>162</td>
<td>3,923,863,618</td>
<td>142,681</td>
<td>1,221,897,082</td>
<td>9,121</td>
<td>27.6%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Cape Light Compact; National Grid</td>
<td>12</td>
<td>165,056,407</td>
<td>12,335</td>
<td>55,355,831</td>
<td>901</td>
<td>31.4%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Eversource Energy, Municipal; Columbia Gas</td>
<td>1</td>
<td>2,258,847</td>
<td>360</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Berkshire Gas</td>
<td>1</td>
<td>770,289</td>
<td>27</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Columbia Gas</td>
<td>2</td>
<td>15,274,335</td>
<td>1,762</td>
<td>1,731,609</td>
<td>44</td>
<td>11.3%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Liberty Utilities</td>
<td>1</td>
<td>4,327,783</td>
<td>311</td>
<td>571,356</td>
<td>23</td>
<td>13.2%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Eversource Energy; Berkshire Gas</td>
<td>12</td>
<td>169,739,973</td>
<td>4,746</td>
<td>39,194,105</td>
<td>482</td>
<td>24.3%</td>
<td>11.7%</td>
</tr>
<tr>
<td>Eversource Energy; Columbia Gas</td>
<td>16</td>
<td>454,805,120</td>
<td>19,772</td>
<td>146,644,192</td>
<td>934</td>
<td>26.5%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Eversource Energy; National Grid</td>
<td>18</td>
<td>669,596,705</td>
<td>18,285</td>
<td>186,256,141</td>
<td>1,707</td>
<td>34.3%</td>
<td>10.7%</td>
</tr>
<tr>
<td>National Grid, Municipal; Columbia Gas</td>
<td>1</td>
<td>4,536,190</td>
<td>116</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>National Grid; Berkshire Gas</td>
<td>8</td>
<td>62,161,574</td>
<td>2,111</td>
<td>13,317,452</td>
<td>214</td>
<td>21.8%</td>
<td>10.0%</td>
</tr>
<tr>
<td>National Grid; Columbia Gas</td>
<td>30</td>
<td>804,831,299</td>
<td>38,903</td>
<td>223,510,089</td>
<td>1,529</td>
<td>25.6%</td>
<td>4.6%</td>
</tr>
<tr>
<td>National Grid; Columbia Gas, Eversource Energy</td>
<td>1</td>
<td>1,016,641</td>
<td>98</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>National Grid; Eversource Energy</td>
<td>16</td>
<td>698,965,060</td>
<td>12,876</td>
<td>323,028,287</td>
<td>1,170</td>
<td>39.1%</td>
<td>9.1%</td>
</tr>
<tr>
<td>National Grid; Liberty Utilities</td>
<td>4</td>
<td>146,307,171</td>
<td>4,110</td>
<td>54,662,744</td>
<td>453</td>
<td>43.1%</td>
<td>11.6%</td>
</tr>
<tr>
<td>National Grid; Unitil</td>
<td>2</td>
<td>27,840,712</td>
<td>551</td>
<td>9,625,779</td>
<td>39</td>
<td>27.4%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Not Served by PA; Columbia Gas</td>
<td>6</td>
<td>175,783,184</td>
<td>7,738</td>
<td>45,142,388</td>
<td>328</td>
<td>25.3%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Not Served by PA; Eversource Energy</td>
<td>7</td>
<td>83,784,539</td>
<td>2,556</td>
<td>11,095,924</td>
<td>180</td>
<td>15.1%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Not Served by PA; Liberty Utilities</td>
<td>1</td>
<td>15,951,071</td>
<td>1,145</td>
<td>3,365,182</td>
<td>56</td>
<td>20.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Not Served by PA; National Grid</td>
<td>23</td>
<td>495,856,717</td>
<td>14,879</td>
<td>109,547,686</td>
<td>1,028</td>
<td>25.5%</td>
<td>7.6%</td>
</tr>
<tr>
<td>Multiple PAs, Some Shared (Electric, Gas)</td>
<td>8</td>
<td>1,185,484,852</td>
<td>24,392</td>
<td>418,671,057</td>
<td>2,456</td>
<td>27.6%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Eversource Energy, National Grid; Columbia Gas, National Grid</td>
<td>1</td>
<td>10,597,315</td>
<td>492</td>
<td>1,843,788</td>
<td>31</td>
<td>17.4%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Eversource Energy; National Grid, Eversource Energy</td>
<td>4</td>
<td>1,158,145,181</td>
<td>23,186</td>
<td>414,628,482</td>
<td>2,399</td>
<td>31.5%</td>
<td>9.3%</td>
</tr>
<tr>
<td>National Grid; Columbia Gas, National Grid</td>
<td>1</td>
<td>4,021,516</td>
<td>410</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>National Grid; National Grid, Eversource Energy</td>
<td>1</td>
<td>1,598,628</td>
<td>82</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unitil; National Grid, Unitil</td>
<td>1</td>
<td>11,222,212</td>
<td>222</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Grand Total | 256 | 7,759,276,540 | 231,193 | 2,358,155,782 | 16,608 | 28.3% | 7.9% |
Figure 6-48 and Figure 6-49 present the account participation and consumption-weighted account participation for the gas PAs by year. Each figure also includes a bar representing the 6-year total of the gas PAs’ universe of accounts. Figure 6-50 shows the ratio of weighted to unweighted participation each year. As with the electric results, large ratios indicate that the majority of savings come from a small number of accounts; declining ratios indicate that more accounts are being engaged each year relative to consumption-weighted participation.

Year after year, there has been high variability in gas participation compared to electric, both by raw account numbers and consumption-weighted account participation. Unlike 2015, Liberty and the overall small gas PAs engaged the largest number of gas customers over the past 6 years. This is also the case when weighted by consumption. In addition, almost all of the gas PAs achieved higher consumption-weighted participation than in 2015. This suggests that in 2016, gas PAs engaged customers whose consumption made up a larger portion of the population.

Gas PAs continue to show starkly different weighted-to-unweighted ratio patterns than those shown by the electric PAs. In 2016 many of the electric and gas PAs experienced increases in this ratio, indicating engagement in a smaller number of accounts, but for accounts who contribute more in consumption (fewer, larger accounts). Columbia, in particular, nearly doubled their weighted-to-unweighted ratio, compared to 2015. This spike indicates a case where fewer, very large Columbia customers participated in 2016. Eversource also saw an increase in this ratio, while most other PAs saw it fall back to pre-2015 values.

Figure 6-48. Gas account participation market penetration rates by PA and year (includes unlinked tracking data)
Figure 6-49. Gas account consumption-weighted participation market penetration rates by PA and year (excludes unlinked tracking data)

Figure 6-50. Ratio of weighted market penetration / unweighted market penetration – gas (includes unlinked tracking data)
6.4.3.2 Industry sector

The gas account market penetration rates and consumption-weighted penetration rates by industry sector are presented in Table 6-40 and Table 6-41.

- As in the past 2 years, the Accommodation and Food Services industry sector had the highest percentage of participating accounts (23.7%). This increased from 21.6% in 2015, possibly due to the upstream food service program starting in 2016. This sector’s consumption-weighted participation also increased from 44% to 48.7% between 2015 and 2016.
- As shown in Table 6-40, Educational Services, and Arts, Entertainment, and Recreation sectors also had high market penetration rates for 2016, at greater than 10% of total gas accounts.
- As shown in Table 6-41, Agriculture, Forestry, Fishing, and Hunting continues to provide the highest consumption-weighted participation rate, at 70%. This rate decreased from 76% in 2015 and 81% in 2014, indicating increased participation of smaller accounts in this sector year after year.
- The Utilities and Health Care sectors saw increases in consumption-weighted participation across the 6-year period, indicating increased engagement from larger accounts in these sectors. These increases were both 10% greater than their 2015 values.

Table 6-40. Market penetration rate by industry sector 2011-2016, gas (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Total Matched Participants 2011-2016</th>
<th>Total Billed Accounts 2011-2016</th>
<th>Market Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>5,394</td>
<td>22,693</td>
<td>23.77%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>132</td>
<td>2,560</td>
<td>5.16%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>24</td>
<td>289</td>
<td>8.30%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>369</td>
<td>3,548</td>
<td>10.40%</td>
</tr>
<tr>
<td>Construction</td>
<td>254</td>
<td>7,056</td>
<td>3.60%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>1,108</td>
<td>6,693</td>
<td>16.55%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>248</td>
<td>5,174</td>
<td>4.79%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>967</td>
<td>9,898</td>
<td>9.77%</td>
</tr>
<tr>
<td>Information</td>
<td>100</td>
<td>1,628</td>
<td>6.14%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>29</td>
<td>502</td>
<td>5.78%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>672</td>
<td>9,209</td>
<td>7.30%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td>97</td>
<td>4.12%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>1,092</td>
<td>16,659</td>
<td>6.56%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>1,881</td>
<td>27,192</td>
<td>6.92%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>437</td>
<td>4,418</td>
<td>9.89%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>1,170</td>
<td>16,324</td>
<td>7.17%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>1,665</td>
<td>25,434</td>
<td>6.55%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>102</td>
<td>3,842</td>
<td>2.65%</td>
</tr>
<tr>
<td>Utilities</td>
<td>16</td>
<td>457</td>
<td>3.50%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>187</td>
<td>3,857</td>
<td>4.85%</td>
</tr>
<tr>
<td>Unknown</td>
<td>2,061</td>
<td>61,428</td>
<td>3.36%</td>
</tr>
<tr>
<td>Total</td>
<td>17,908</td>
<td>228,958</td>
<td>7.8%</td>
</tr>
</tbody>
</table>
Table 6-41. Consumption-weighted market penetration rate by industry sector 2011-2016, gas (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Total Participant Consumption 2011-2016</th>
<th>Total Billed Consumption 2011-2016</th>
<th>Market Penetration Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>301,797,205</td>
<td>619,550,400</td>
<td>48.71%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>9,343,935</td>
<td>535,578,725</td>
<td>1.74%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>12,500,250</td>
<td>17,828,147</td>
<td>70.12%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>36,756,162</td>
<td>114,863,820</td>
<td>32.00%</td>
</tr>
<tr>
<td>Construction</td>
<td>14,273,239</td>
<td>120,376,459</td>
<td>11.86%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>325,482,177</td>
<td>879,913,265</td>
<td>36.99%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>26,075,746</td>
<td>91,141,957</td>
<td>28.61%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>337,965,479</td>
<td>542,412,714</td>
<td>62.31%</td>
</tr>
<tr>
<td>Information</td>
<td>9,124,672</td>
<td>42,582,499</td>
<td>21.43%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>6,183,624</td>
<td>14,855,444</td>
<td>41.63%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>505,613,158</td>
<td>1,150,157,606</td>
<td>43.96%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>619,029</td>
<td>2,831,479</td>
<td>21.86%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>115,329,953</td>
<td>322,811,419</td>
<td>35.73%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>140,041,535</td>
<td>544,697,477</td>
<td>25.71%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>62,177,957</td>
<td>373,863,035</td>
<td>16.63%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>165,931,230</td>
<td>683,404,077</td>
<td>24.28%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>128,119,201</td>
<td>462,451,444</td>
<td>27.70%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>5,863,356</td>
<td>81,396,363</td>
<td>7.20%</td>
</tr>
<tr>
<td>Utilities</td>
<td>128,177,115</td>
<td>195,413,186</td>
<td>65.59%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>35,977,170</td>
<td>152,816,815</td>
<td>23.54%</td>
</tr>
<tr>
<td>Unknown</td>
<td>196,712,318</td>
<td>812,180,798</td>
<td>24.22%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,564,064,512</strong></td>
<td><strong>7,761,127,131</strong></td>
<td><strong>33.0%</strong></td>
</tr>
</tbody>
</table>

Introduced in the 2015 report was Table 6-42, which provides gas savings, usage, and market penetration rates for industry sectors from 2011–2016. This table shows how much an industry sector has contributed to total savings over the past 6 years, and how much it has contributed to total usage over the same period. We also provide market penetration rates to illustrate where potential large accounts appear in certain sectors.

- Manufacturing has provided the largest proportion of savings since 2011. Its proportion of savings declined since 2015 (from 25% to 22.4% in 2016). Its proportional usage across time also decreased with the inclusion of 2016 data. Its proportional usage is less than its proportional savings, creating a contribution ratio greater than 1.
- As seen in 2015, Manufacturing’s consumption-weighted market penetration rate points to remaining opportunities to engage a little under 60% of the manufacturing population.
- As seen in 2015, Educational Services retains its role as a strong energy saving sector in the gas market. Similar to Manufacturing, it makes up a higher proportion of total savings than it does total usage. In addition, its consumption-weighted market penetration rate just below 40% indicates the presence of opportunities for gas to engage more of its population.
- Also, as in 2015, Agriculture, Forestry, Fishing, and Hunting has not provided much of total proportional savings over the past 5 years, but its consumption-weighted market penetration rate indicates that most of its population has been engaged over the past 6 years.
New to 2016, Health Care and Social Assistance, and Utilities, presented much larger consumption-weighted market penetration rates compared to 2015. This reflects engagement by high-consuming accounts in these sectors in 2016. Three very large National Grid accounts installed custom HVAC and building shell measures that contributed to the large increase in this ratio for Health Care and Social Assistance. For the Utilities sector, one of National Grid’s largest accounts undertook multiple HVAC and process projects in 2016, making this ratio increase from 55.6% in 2015 to 65.6% in 2016.

Table 6-42. 2011–2016 analysis summary by industry sector - gas, 2011-2015

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Longitudinal proportion of total savings</th>
<th>Longitudinal proportion of total usage</th>
<th>Market penetration rate</th>
<th>Consumption-weighted market penetration rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>6.6%</td>
<td>8.0%</td>
<td>23.8%</td>
<td>48.7%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>0.6%</td>
<td>6.9%</td>
<td>5.2%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>1.0%</td>
<td>0.2%</td>
<td>8.3%</td>
<td>70.1%</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>0.9%</td>
<td>1.5%</td>
<td>10.4%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Construction</td>
<td>0.6%</td>
<td>1.5%</td>
<td>3.6%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>17.3%</td>
<td>11.3%</td>
<td>16.6%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>1.5%</td>
<td>1.2%</td>
<td>4.8%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>10.1%</td>
<td>7.0%</td>
<td>9.8%</td>
<td>62.3%</td>
</tr>
<tr>
<td>Information</td>
<td>0.3%</td>
<td>0.5%</td>
<td>6.1%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>0.1%</td>
<td>0.2%</td>
<td>5.8%</td>
<td>41.6%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>22.4%</td>
<td>14.8%</td>
<td>7.3%</td>
<td>44.0%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>0.1%</td>
<td>0.0%</td>
<td>4.1%</td>
<td>21.9%</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>3.0%</td>
<td>4.2%</td>
<td>6.6%</td>
<td>35.7%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>6.7%</td>
<td>7.0%</td>
<td>6.9%</td>
<td>25.7%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>4.4%</td>
<td>4.8%</td>
<td>9.9%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>7.3%</td>
<td>8.8%</td>
<td>7.2%</td>
<td>24.3%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>3.4%</td>
<td>5.9%</td>
<td>6.5%</td>
<td>27.7%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>0.1%</td>
<td>1.0%</td>
<td>2.7%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Utilities</td>
<td>4.3%</td>
<td>2.5%</td>
<td>3.5%</td>
<td>65.6%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1.2%</td>
<td>2.0%</td>
<td>4.8%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Unknown</td>
<td>8.1%</td>
<td>10.4%</td>
<td>3.4%</td>
<td>24.2%</td>
</tr>
</tbody>
</table>
6.4.3.3 Multi-year participation

Figure 6-51 presents the yearly distribution of savings for multi-year participants, ranging from 2-year to 6-year participants.

- Similar to electric, 2-year participants appear to yield the highest overall savings of any multi-year participants, as most multi-year participants fall in the 2-year category, regardless of the year. In addition, other than 4-year participants, most multi-year participants obtain their largest savings in their first year of participation.
- This chart differs greatly from the electric equivalent (Figure 5-62) in that gas shows a sharp decline in total savings as years of participation increase. By contrast, electric’s chart shows increases in total savings from 6 years of participation.
- Savings from 6-year gas participants are barely visible. This is mainly due to having so few participants across this timespan for gas. There was a slight increase in savings from 5 years of participation.

Figure 6-51. Yearly savings distribution for multi-year participants, gas – including unlinked tracking data
DNV GL investigated whether there was any difference between accounts experiencing large annual savings in the first year and smaller savings in the second year (and vice versa). Each account’s savings were binned into one of three possible categories (low, medium, and high savers) for each participating year. These fields were determined in each year by rank ordering account savings and binning them into quartiles. Table 6-45 shows the basic logic used on each year’s savings numbers.

Table 6-43. Savings size bin relative breakpoint logic

<table>
<thead>
<tr>
<th>Savings Size Bin</th>
<th>Breakpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Total Savings &lt;= 25th Percentile</td>
</tr>
<tr>
<td>Medium</td>
<td>25th Percentile &lt; Total Savings &lt; 75th Percentile</td>
</tr>
<tr>
<td>High</td>
<td>Total Savings &gt;= 75th Percentile</td>
</tr>
</tbody>
</table>

Table 6-44 presents breakdowns for gas accounts that participated in 2 years of energy efficiency programs. Unlike the electric data, the majority of savings for multi-year participants come from accounts that complete high-savings projects in each of the 2 years, with over 75% of total savings coming from this one category in 2016. This declined from 80% in 2015.

Table 6-44. Proportion of total savings for multi-year participants by savings category - two-year gas, including unlinked tracking

<table>
<thead>
<tr>
<th>Year 1 Class</th>
<th>Year 2 Class</th>
<th>Year 1 Savings as a Percent of Total Savings</th>
<th>Year 2 Savings as a Percent of Total Savings</th>
<th>Number of Participants</th>
<th>Total 2 Year Savings</th>
<th>Proportion of Total Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>55.6%</td>
<td>44.9%</td>
<td>190</td>
<td>41,123</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>29.1%</td>
<td>70.9%</td>
<td>264</td>
<td>181,887</td>
<td>0.8%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>3.6%</td>
<td>96.6%</td>
<td>69</td>
<td>1,019,695</td>
<td>4.2%</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td>80.9%</td>
<td>19.1%</td>
<td>260</td>
<td>161,586</td>
<td>0.7%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>55.3%</td>
<td>44.7%</td>
<td>514</td>
<td>592,723</td>
<td>2.5%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>15.1%</td>
<td>84.9%</td>
<td>140</td>
<td>935,608</td>
<td>3.9%</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>97.6%</td>
<td>2.4%</td>
<td>36</td>
<td>276,412</td>
<td>1.1%</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>85.6%</td>
<td>14.4%</td>
<td>173</td>
<td>2,693,208</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>52.2%</td>
<td>47.8%</td>
<td>270</td>
<td>18,277,249</td>
<td>75.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>1,916</td>
<td>24,179,491</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Table 6-45 presents the percentage of the 6-year universe of accounts that participated in multiple program years. Overall, gas PAs continue to have less multi-year participation than electric PAs. In addition, National Grid continues to have the highest proportion of its billing population participating in multiple program years. With the exception of National Grid, in 2016 most small gas PAs presented the largest total multi-year participation. Most gas PAs continue to see overall participation rates increase year after year.

Table 6-45. Multi-year participation by PA, gas excluding unlinked tracking data

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>0.48%</td>
<td>0.06%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.55%</td>
</tr>
<tr>
<td>Eversource</td>
<td>0.86%</td>
<td>0.09%</td>
<td>0.03%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.99%</td>
</tr>
<tr>
<td>National Grid</td>
<td>1.06%</td>
<td>0.13%</td>
<td>0.02%</td>
<td>0.02%</td>
<td>0.00%</td>
<td>1.23%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>0.65%</td>
<td>0.09%</td>
<td>0.03%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.77%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>0.88%</td>
<td>0.10%</td>
<td>0.03%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.01%</td>
</tr>
<tr>
<td>Liberty</td>
<td>0.96%</td>
<td>0.09%</td>
<td>0.04%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.09%</td>
</tr>
<tr>
<td>Unitil</td>
<td>0.49%</td>
<td>0.08%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.58%</td>
</tr>
<tr>
<td>Total</td>
<td>0.82%</td>
<td>0.10%</td>
<td>0.02%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.96%</td>
</tr>
</tbody>
</table>

The consumption-weighted multi-year population analyses presented in Table 6-46 and Table 6-47 illustrate the continuing trend where several PAs are successfully engaging their largest customers as repeat participants. Though Eversource continuously provides the highest proportion of multi-year participants among gas PAs, nearly all of the gas PAs saw substantial increases in multi-year, consumption-weighted participation.

Table 6-46. Multi-year participation by PA - consumption weighted, gas (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>8.83%</td>
<td>3.14%</td>
<td>1.17%</td>
<td>0.56%</td>
<td>0.00%</td>
<td>13.70%</td>
</tr>
<tr>
<td>Eversource</td>
<td>6.22%</td>
<td>4.28%</td>
<td>1.86%</td>
<td>3.34%</td>
<td>0.00%</td>
<td>15.70%</td>
</tr>
<tr>
<td>National Grid</td>
<td>7.24%</td>
<td>2.25%</td>
<td>1.22%</td>
<td>1.62%</td>
<td>0.32%</td>
<td>12.66%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>4.53%</td>
<td>1.50%</td>
<td>1.89%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>7.93%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>2.73%</td>
<td>0.39%</td>
<td>0.16%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>3.28%</td>
</tr>
<tr>
<td>Liberty</td>
<td>4.39%</td>
<td>3.55%</td>
<td>5.17%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>13.11%</td>
</tr>
<tr>
<td>Unitil</td>
<td>9.38%</td>
<td>0.37%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>9.74%</td>
</tr>
<tr>
<td>Total</td>
<td>7.07%</td>
<td>2.96%</td>
<td>1.44%</td>
<td>1.81%</td>
<td>0.15%</td>
<td>13.43%</td>
</tr>
</tbody>
</table>
Table 6-47. 2011–2016 percent savings achieved by PA - consumption weighted, gas (excludes unlinked tracking data)

<table>
<thead>
<tr>
<th>PA</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
<th>5 year</th>
<th>All 6 years</th>
<th>Total Multi-Year Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>0.23%</td>
<td>0.08%</td>
<td>0.03%</td>
<td>0.02%</td>
<td>0.00%</td>
<td>0.36%</td>
</tr>
<tr>
<td>Eversource</td>
<td>0.38%</td>
<td>0.10%</td>
<td>0.05%</td>
<td>0.07%</td>
<td>0.00%</td>
<td>0.60%</td>
</tr>
<tr>
<td>National Grid</td>
<td>0.32%</td>
<td>0.11%</td>
<td>0.04%</td>
<td>0.07%</td>
<td>0.00%</td>
<td>0.54%</td>
</tr>
<tr>
<td>Small Gas PAs</td>
<td>0.21%</td>
<td>0.04%</td>
<td>0.03%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.28%</td>
</tr>
<tr>
<td>Berkshire</td>
<td>0.08%</td>
<td>0.02%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Liberty</td>
<td>0.04%</td>
<td>0.06%</td>
<td>0.07%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.17%</td>
</tr>
<tr>
<td>Unitil</td>
<td>0.84%</td>
<td>0.05%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.89%</td>
</tr>
<tr>
<td>Total</td>
<td>0.31%</td>
<td>0.10%</td>
<td>0.04%</td>
<td>0.06%</td>
<td>0.00%</td>
<td>0.50%</td>
</tr>
</tbody>
</table>

Table 6-48 presents multi-year account market penetration and consumption-weighted market penetration for the gas PAs, statewide, across industry sectors. Gas multi-year participation continues to center around fewer industry sectors than electric.

- As in 2015, the largest multi-year consumption-weighted participation appears in Agriculture, Forestry, Fishing, and Hunting, where accounts representing nearly 60% of the industry sector consumption have participated in multiple years since 2011. This percentage continues to decline (down from 74% in 2014 to 66% in 2015).
- Other industry sectors where multi-year consumption-weighted gas participation is higher than the overall average include Health Care and Social Assistance, Manufacturing, and Mining. The largest increase in consumption-weighted penetration for multi-year participants was seen in Mining, Quarrying, and Oil and Gas Extraction, increasing from 6.4% in 2015 to 21.3% in 2016. This is driven by a few 2-year gas participants.
Table 6-48. Multi-year account and consumption-weighted penetration rates, gas – excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Account Penetration</th>
<th>Consumption Weighted Penetration</th>
</tr>
</thead>
<tbody>
<tr>
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<td><strong>Total</strong></td>
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7 CONCLUSIONS

This section presents the key findings, recommendations, and observations presented in the executive summary.

- **Key findings** from the 2016 C&I Comprehensive Customer Profile highlight interesting trends and findings from the body of the report. **The key findings are presented in descending order of granularity, starting with the broadest, state-wide findings.**
- **Recommendations** are provided directly in response to key findings and their implications, along with more process-related recommendations, to continue to improve the value of the report. They include supporting context to the PAs and EEAC Consultants.
- **Considerations** are included to inform future reports and capture insight that may not have risen to the level of a key finding or recommendation for 2016, but may in future cycles.

7.1 Key findings

7.1.1 2016 is the first year that statewide electric participation and savings rates have decreased since the C&I Customer Profile report began in 2011.

In 2016, both electric participation rates and savings rates decreased compared to the 2015. This is the first time the C&I Customer Profile report has seen this trend for the statewide electric market. This report details various changes in 2016 electric participation that factor into this outcome. Some notable examples include:

- There were more custom projects undertaken in 2016 than in 2015, but these projects provided less in total electric savings than in 2015. Key Finding 6 (section 7.1.6) presents further details on custom projects over time.
- In 2015, 3 large CHP and process projects provided substantial electric savings—over twice the savings provided by the 3 largest saving projects in 2016 (upstream lighting, non-upstream lighting, and HVAC). In 2015, the largest CHP projects were in the education and manufacturing sectors; in 2016, the largest CHP projects were in health care. In 2016, 41% of accounts installing CHP measures consume < 0.47 GWh. In 2015, 33% of accounts installing CHP consumed < 0.47 GWh.
- Participation by customers in electric’s largest consumption bin did not vary substantially from 2015 to 2016. Savings achieved from large customer participation did decrease considerably from 2015 to 2016. The largest consuming 2016 electric participants installed many lighting measures (upstream and non-upstream), with an average savings per lighting project of 0.27 GWh. The largest consuming 2015 electric participants installed primarily CHP, motors, and equipment, with average savings of 1.04 GWh, 0.26 GWh, and 1.17 GWh, respectively.

If electric savings decrease again in future years, it may impact the PAs’ ability to meet annual savings goals.
7.1.2 Across PAs, there are notable differences in the mix of measures installed, representing possible opportunities for statewide energy efficiency gains through more robust segmentation analysis.

In addition to Liberty’s aerator and spray valve impact (Key Finding 7.1.5), other notable measure observations include:

- Eversource had nearly twice as many accounts who installed motors and drives, compared to National Grid. In contrast, National Grid had double the number of CHP projects as Eversource in 2016, yet these projects provided 68% of savings compared to the Eversource CHP projects.
- Both National Grid and Eversource gas had substantially more programable thermostat installations than Columbia in 2016 (Columbia had a large number of programable thermostats in 2015). Eversource had a slightly larger number of programable thermostat installs than National Grid in 2016 despite a smaller gas population.

While the significance of any individual year and measure should not be overestimated, it is important to uncover the deeper stories behind key trends. The potential exists to leverage the integrated PA tax data in segmentation analyses to determine whether analogous populations exist across PA territories (e.g., populations with a combination of same business type and same building vintage, or same business type and same community demographics), and at what scale. Such analyses could allow the PAs to fine-tune their marketing outreach efforts, including identifying local leads who might effectively help target specific population segments.

7.1.3 For both gas and electric PAs, upstream programs have resulted in increased participation of small customers, likely due to the accessible nature of the measures offered.

The data in this report, including new data from gas upstream programs, suggests that all upstream programs successfully reach small customers, which are typically more difficult and costlier to engage for both electric and gas PAs. Upstream programs typically use energy efficiency measures that can be self-installed, that are largely interchangeable with the measures they replace, and that have low technical barriers (i.e., they do not require extensive engineering analysis or technical support.) Additional measures could also be successful via the upstream channel if they are similar in accessibility for customers.

Small customers make up a substantial portion of electric and gas upstream accounts. While only 48% of upstream lighting accounts match to billing data, 83% of those consume < 1.5 million kWh, and 53% of those consume < 110,000 kWh\(^{67}\) (see section 3.4.7.1). As with lighting, 41% of 2016 upstream HVAC accounts match to billing data, 91% of those consume < 1.5 million kWh. For gas, 76% of upstream hot water records and 100% of food service records that match to billing data consume < 40,000 therms.

The data in this report shows that a considerable proportion of upstream sales are to end users that also qualify for the direct install program, with annual consumption < 1.5 million kWh for electric, and < 40,000 therms for gas.

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\(^{67}\) These two breakpoints represent the two smallest electric size bins.
7.1.4 The upstream hot water program experienced a successful first year for the gas market. It delivered 1.4 million therms in gas savings, primarily to small and first-time gas participants.

The gas upstream hot water program delivered 1.4 million therms of gross savings in 2016. Non-upstream hot water savings contributed an additional 1.6 million therms. The combined savings from these two hot water programs represented a 68% increase in hot water savings from 2015, and an even more substantial increase over historical values. This indicates gas upstream hot water is providing additional savings that were not previously being captured.

Incentives towards the upstream hot water program were higher than non-upstream hot water ($0.27 per therm vs. $1.64 per therm). However, in addition to the savings this program provided in its first year, the majority of 2016 upstream hot water participants were small accounts: 78% consume < 40,000 therms, and 42% consume < 8,000 therms. Furthermore, based on the data, 81% of 2016 upstream hot water participants were first-time gas efficiency program participants.

The success of the upstream hot water program, particularly for small gas customers, illustrates that these customers can effectively engaged, and that they will, when offered a channel paired with accessible energy efficiency measures, install these measures. Accordingly, there might be additional measure types that these previously under-participating customers would be willing to install via the upstream program. Measures that can be installed with minimal technical barriers, such as thermostat replacements, may represent an attractive offering for such customers.

7.1.5 Upstream lighting continues to provide substantial savings and participation for the electric market. Shifts in lamp types purchased have caused year-over-year savings fluctuations.

The data shows an increase in upstream lighting sales in 2014 and 2015, with lower sales in 2016. Despite the decline in 2016, upstream lighting contributed 22% of the electric PA savings. Lamp types purchased through upstream lighting vary from year to year. Screw-based lamps make up most upstream lighting measures sold each year, but have been steadily declining since a spike in 2014. All upstream screw-based lamps installed in 2016 were LEDs, almost evenly split between A-lamps, downlights, and reflectors. In 2016, linear and other LEDs increased by 230% over 2015 and 2014 values. This increase was not sufficient to compensate for the decline of screw-based lamps, and overall, upstream lighting savings decreased to pre-2014 levels.

The data on individual lighting technologies reinforces the notion of a rapidly shifting lighting market, likely to change bulb types purchased through upstream in the future. The upstream lighting program has faced challenges, including the low installation rates discovered through early field evaluation in 2016. Continued monitoring of the upstream program mix and installation rates will help ensure that the upstream program delivers reliable, cost-effective savings.

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68 These two breakpoints represent the two smallest gas size bins.

69 DNV GL. Impact Evaluation of Massachusetts Commercial and Industrial Upstream Lighting Program. Massachusetts Energy Efficiency Programs Commercial and Industrial Evaluation Contractor, 2017. These low installation rates may have been at least a partial driver in the overall decline in lighting savings (11.5% lower than in 2015) for the first time since 2013.
7.1.6 Custom projects continue to provide substantial savings for both gas and electric accounts. These projects play an important role in meeting PAs’ savings goals.

Custom projects continue to provide the most savings statewide for both electric and gas. Although savings from custom projects in 2016 compared to 2015 and 2014, custom electric projects increased in 2016. Drivers for these trends include:

- Eversource and National Grid completed a number of large CHP projects in 2015
- It appears that 4 times more custom electric projects were flagged as direct installs in 2016 than in 2015 and 2014.

In 2016, 50% of kWh savings came from custom projects, rather than prescriptive or upstream. 2016 custom electric projects consisted of retrofit lighting (62%), process (11%), refrigeration (8%), and HVAC (7%). The projects that provided the highest savings for 2016 were process projects done in Health Care and Manufacturing from Eversource and National Grid. These projects contributed 57% of kWh savings for Eversource and 44% for National Grid. Custom electric savings for Eversource were driven largely by retrofit CHP, HVAC, and process projects. In contrast, custom electric savings for National Grid were driven largely by accounts installing retrofit lighting measures.

Custom projects are extremely important for the gas PAs. In 2016, savings from custom projects were 16% higher than in 2015, and close to the peak seen in 2014 (> 11 million therms). Savings from 2016 custom gas projects (as opposed to prescriptive and upstream) made up 76% of total 2016 gas savings. This percentage does not vary much between gas PAs. HVAC controls and steam traps made up the most custom gas projects (45%) in 2016; process measures made up 15%. Many of these process measure projects provided among the highest therm savings of all custom projects. Accounts that installed these measures were mostly in Educational Services and Manufacturing from Eversource and National Grid.

The data reinforces the finding that custom projects continue to support electric and gas PA savings goals. While certain high-saving custom measures, such as CHP, contribute substantially to these goals, other custom projects can help the PAs continue to meet them even in the absence of such a large project in a given year.

7.1.7 For both electric and gas, savings from HVAC projects continue to decline, even with the inclusion of the electric upstream HVAC offerings.

The 2016 data reinforces the finding that savings from HVAC projects (including upstream HVAC) are continually declining for both the gas and electric market. In 2016, there was an increase in total electric HVAC projects, but a decrease in savings, compared to 2015. Electric HVAC has been trending downward since 2013, which coincides with the introduction of upstream to the HVAC program.

Of electric participants who installed either upstream or non-upstream HVAC measures, 52% were from Eversource, and 42% were from National Grid. These measures were largely undertaken by accounts in Retail Trade, Professional Services, and Accommodation and Food Services. The highest kWh HVAC savings provided in 2016 were from custom projects by a few large Manufacturing accounts from Eversource.

70 Some portion of the custom lighting data may be due to artifacts of the PAs’ tracking systems, since new lamps and fixtures are sometimes classified as “custom” in their first year.
For gas, HVAC projects and savings decreased from 2011 to 2016. Most HVAC participants installed controls and boilers in 2016. As mentioned in Key Finding 7.1.4, savings provided by controls were higher in 2016 than in 2015 and 2014. Eversource, National Grid, and Columbia all had increased HVAC control measures in 2016. In addition, 53% of gas HVAC participants were from National Grid, 23% were from Columbia, and 16% were from Eversource. Most gas HVAC projects undertaken this year were in Educational Services, Real Estate, and Professional Services.

Statewide market penetration for HVAC is low for both electric and gas. This provides evidence there are opportunities for future HVAC engagement. Further analysis into successful HVAC electric and gas projects may reveal future opportunities to increase HVAC projects and savings for both fuels.

7.1.8 Control measures provided substantial savings for lighting and HVAC (electric and gas) projects in 2016.

At the annual C&I planning summit, the PAs and EEAC Consultants observed that lighting controls held the potential for savings beyond what has been achieved through energy efficient bulbs and fixtures. The substantial increase in lighting controls in 2016 indicates that the PAs have begun capturing these opportunities. In 2016, lighting control measures provided 15.8 million kWh in gross savings, more than doubling their savings from 2015 and 2014 (7.8 million kWh in savings each year). National Grid installed over half of the 2016 lighting control measures (56%). Eversource provided the highest-saving lighting controls projects, which made up 6% of total electric savings for lighting control measures. Most 2016 lighting control projects were seen in the Professional Services and Retail Trade industry sectors (15% and 14%, respectively).

Controls also continue to be an important part of electric HVAC solutions. Controls account for 27% of electric HVAC measures installed from 2011-2016, and represent 28% of the 6-year electric savings. In 2016, controls provided 21.4 million kWh in savings. Over half of the electric HVAC control measures installed in 2016 were from Eversource, with a few large accounts in Manufacturing and Educational Services installing the highest-savings electric HVAC control measures. Accommodation and Food Services installed more electric HVAC control measures (22%) in 2016 than any other sector.

On the gas side, controls account for 29% of HVAC gas savings over the 6-year period. For 2016, gas HVAC control measures made up of over 11% of total 2016 gas savings (contributing 1.6 million therms—more than 2015 or 2014). In addition, the largest saving custom gas HVAC measure in 2016 was controls. Educational Services contributed 33% of gas HVAC control savings. Within Accommodation and Food Services, controls account for nearly half of the savings derived from HVAC measures.

7.1.9 Aerators and spray valves remain a key driver of gas participation and savings despite the continued statewide decline in these numbers.

While aerators and spray valve installations declined again in 2016 statewide, for the 4th year since 2013, they accounted for 23% of projects installed in 2016, indicating that this offering is an important way for all PAs to encourage gas participation.

The 2016 data indicates that individual PAs may have large opportunities with this measures, like Liberty, which had 80% of its 2016 participants (most of them in the bottom 20th percentile consumption bin) install aerators and spray valves in 2016. This data, coupled with the success of the upstream hot water program
(Key Finding 7.1.3), suggests that aerators and spray valves, could be incorporated into the upstream hot water program to continue encouraging statewide engagement in the future.

Gas PAs have opportunities for high savings across the entire market.

The 2016 data further supports the finding that there are opportunities for high savings across the entire gas market. This is expressed through year-over-year variations in contribution ratios for all gas PAs. This has two likely explanations: 1) The size of gas accounts remain consistent up to the 90th percentile bin, and 2) Similar gas measures can be installed by accounts in from the 20th to the 90th percentile size bins. Smaller accounts have the ability to provide higher contributions to savings than they do to consumption. If participation and savings decrease for any range of gas account sizes, PAs may be able to refocus their efforts to achieve savings elsewhere in the market, due to the widespread applicability of gas measure offerings. This contrasts strikingly with the electric market, where smaller accounts have contribution ratios <1, as these accounts primarily install small lighting measures.

7.2 Recommendations

The scope of the MA C&I Customer Profile project focuses on the collection of PA data, the construction and maintenance of the MA C&I Evaluation Database, and data analysis and summarization using attribute filters. Additional value and insight can be gained by using this project’s high-level findings to identify critical research questions for deeper analysis or opportunities to improve collected data. For the 2016 C&I Customer Profile report, we present the following recommendations:

7.2.1 Increase communication and improve data intake processes to enhance the quality of ongoing and future evaluation efforts.

DNV GL recommends that future data intake and updates consist of more frequent communication touchpoints between PAs, evaluators, and EEAC Consultants. As each PA provides its own unique and intricate data, regular communication between all MA C&I Evaluation Database stakeholders would facilitate faster data intake and data authentication processes, and would help prevent future discrepancies during report writing. Increased communication touchpoints would increase the efficiency and improve the quality of all evaluation efforts, including more realistic timelines and better project planning. Specifically, these actions could include:

- An annual kick-off meeting to discuss data intake and management goals for the upcoming year
- Meetings with each PA to determine a feasible level of data quality and realistic timelines for data delivery
- Revising current documentation practices to deliver faster and more impactful information for the PAs
- Exploring the use of web portals and digital dashboards to increase communication and shorten reports

In addition to improving communication between stakeholders, we recommend several changes to the annual data intake process, to help ensure more timely delivery of data:

- Bifurcating billing and tracking data in the annual delivery process:
  - Billing data is generally available before tracking data each year. We recommend sending the billing data as it become available. Earlier access to the billing data will help support ongoing and future projects, and will decrease the interval between the time data is provided and the time it gets included in the MA C&I Evaluation database.
• Assess the feasibility of more regular and standardized data deliveries:
  - Moving from annual to more frequent updates will help support many project efforts. Each PA will need to determine the form of its own data deliveries, to accommodate each PA’s different needs and processes around data security and quality control.

• Modify the annual Summary of Data Completeness process to contain two separate elements.
  - Individual PA reporting to verify PA data as it finishes the data intake process.
  - A statewide summary of the complete data once all PAs are fully processed.

7.2.2 Consider leveraging the upstream tracking data to further engage small and mid-size participants that might offer opportunities for increased depth of savings.

The data presented in this report indicates that upstream programs increase participation among small and mid-size customers. By nature, this channel provides efficiency measures to customers without assurance (through comprehensive engineering assessments, etc.) that these measures are being optimally used. Accordingly, upstream customers may be leaving additional savings on the table.

Utilizing the upstream tracking data, PAs could assess whether these customers share commonalities that could be leveraged to increase savings and repeat participation. For instance, identifying similarities in purchasing patterns or geography could help PAs further hone their target marketing to these customers.

Finding small and mid-size customers to begin or continue participating in energy efficiency can be costly. Fortunately, participating in the upstream program demonstrates customers’ willingness improve on energy efficiency, making them valued prospects. The PAs should investigate the feasibility of leveraging the upstream tracking data to help identify customers with a need for deeper energy saving solutions.

7.2.3 Investigate the feasibility of a premise-level analysis grain in future Customer Profile reports.

Currently, the C&I Customer Profile report focuses on account-level analysis. This analysis grain provides a clean link to each year’s billing data and is useful in summarizing individual year savings and participation, relative to the customer landscape for each PA. However, account numbers change though time as accounts open and close, and many larger energy efficiency measures, such as some HVAC or building shell installations, have long measure lives that are tied to their installation location. As more years of data are added to the analysis, it becomes increasingly likely that there are locations where an account has closed, but energy efficiency measures remain in place. This may cause an under-representation of the portion of the building population that has already participated in energy efficiency. Moreover, new accounts entering these buildings would not be candidates for new measures, even though they themselves have not participated in energy efficiency.

Beyond the time series challenge, an account-level analysis does not facilitate assessments across fuels for some PAs, or across customers that have different PAs providing each fuel type. This can complicate some analyses, such as the EUI maps, where understanding a building’s overall energy usage may be a more appropriate way of understanding opportunity and participation. The incorporation of premise-level analysis would provide the C&I Customer Profile report with a new analysis grain that could offer more holistic findings, over time and across PAs and fuels. An HVAC building-level analysis, for instance, would identify
which buildings have both gas and electric service, and would shed light on cross-fuel participation opportunities.

**7.3 Considerations and potential future research**

The following considerations recognize opportunities of interest that may not have a clear recommendable action or outcome, but nevertheless merit acknowledgment. The considerations also offer up the more speculative findings in this report. These include instances where non-data insights into program design and implementation, customer behaviors, and other non-data elements mean that the PA data in isolation is unlikely to capture the full landscape of underlying drivers. As a result, considerations do not have the same level of certainty or clear actions that recommendations have.

**7.3.1 Consider additional research into critical items identified in this report’s Key Findings.**

Many of the Key Findings identified in the 2016 Comprehensive C&I Customer Profile report present potential topics for future research. Of note are the various differences in outcomes across PAs. For example, Key Finding 2 (section 7.1.2) states, “Across PAs, there are notable differences in the mix of measures installed, representing possible opportunities for statewide energy efficiency gains through more robust segmentation analysis.” Further research, such as a segmentation study, into drivers of project and customer differences could provide valuable knowledge for replicable successful engagement.

Additionally, Key Finding 3 (section 7.1.3) states, “For both gas and electric PAs, upstream programs have resulted in increased participation of small customers, likely due to the accessible nature of the measures offered.” Deeper investigations into these programs and their engagement with small customers may uncover specific measure or program characteristics that encourage engagement from this subset of customers. Research into the upstream hot water market could answer valuable questions regarding the program’s future growth and success.

**7.3.2 Leverage the combination of location-level analyses, energy use, and American Community Survey block group data to identify and quantify where opportunities for strategic electrification or fuel switching may exist.**

The PAs have cultivated geographic data capabilities over the years through the MA C&I Evaluation Database. They could leverage these capabilities to identify areas where, for example, it might be desirable to switch from delivered fuels to a regulated fuel.

For both the electric and gas PAs, the integration of the locational analysis capabilities makes it possible to identify individual buildings where the total energy consumption is substantially different from peer buildings of comparable vintage, size, and industry sector. The American Community Survey data on fuel availability can also be used to understand the likelihood that the customers are using a delivered fuel, and potentially even generate a probability of how much of that delivered fuel they use. With this information, PAs could get an idea of the savings that a delivered customer could obtain by switching to more efficient equipment in regulated fuel.
7.3.3 Create new end use classifications that are more detailed, to support deeper investigations across analysis grains within the C&I Customer Profile report, and to support ongoing and future studies.

PAs provide DNV GL with many different measure end use names and descriptions in their tracking systems. Each year, DNV GL scrutinizes all measure information provided and creates the standardized end use fields found in each fuel’s end use section of the report (Sections 5.2 and 6.2). For end use descriptions such as HVAC or building shell, more detailed measure descriptions would help identify trends that are currently not visible in broader end use classification. Providing BCR measure IDs, if applicable, would also support this effort. Developing end use classifications at this level of detail for strategically important end uses can allow the MA C&I Evaluation Database to further support reporting, customer segmentation, and program planning efforts. The level of classification available in the MA C&I Evaluation Database is highly dependent on the granularity of data provided by each PA. It may be worthwhile for the PAs to consider whether opportunities exist to incorporate additional details into their tracking systems.

7.3.4 PAs should determine whether any measures currently offered through the residential products program may also be appropriate for smaller C&I customers.

Measures like air purifiers, computer and kitchen equipment, and smart strips may represent effective ways to engage smaller customers via a C&I upstream or online products channel. While the combination of these customers and the measures in question are not likely to return large savings, they may provide easy and cost-effective opportunities for introducing and increasing participation among smaller C&I customers.

7.3.5 PAs should consider leveraging updated tax data along with their tracking data to improve customer segmentation and better identify potential future participants.

Through the C&I Enhanced Customer Database project (MA66), DNV GL has appended statewide tax data to the PAs’ billing and tracking data. This newly available information will allow the PAs to use tax parcel characteristics, such as land use, building square footage, vintage, and value to identify similar groups of customers who may share similar needs or have similar barriers to participating in energy efficiency initiatives.

Leveraging this data could provide the PAs with more quantitative analysis on how the demand for different end uses is evolving, in order to offer increasingly attractive programs, further increase participation and savings, and continue to meet annual savings targets.

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71 An example of this is the new lighting classification added to section 5 of this report.
8 APPENDICES

8.1 Appendix A: Methodology addendum

8.1.1 End use combinations, broad and specific.

DNV GL provides end use data in various granularities of detail to analyze programs in more detail, through various lenses. Similar to the 2015 C&I Comprehensive Customer Profile Report, end use tables and charts are presented as either “broad” or “specific,” depending upon the level of granularity. Many broad end use categories correspond to various specific end use categories. Some specific end use categories also connect to more than one broad end use.

- In electric, “controls,” for example, can be used with hot water, HVAC, lighting, motors/drives and refrigeration broad end uses, as seen in Figure 8-1. The check marks running vertically reflect the various specific end use options corresponding to that particular broad end use. Similarly, check marks running horizontally reflect the various broad end use options that correspond to that particular specific end use. Figure 8-2 provides the same end use analysis across its broad and specific possibilities.
Figure 8-1. Electric end use combination crosstabs

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<thead>
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<th>Electric Specific End Use</th>
<th>Electric Broad End Use</th>
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</thead>
<tbody>
<tr>
<td>Low-Floor Showerhead</td>
<td>HOT WATER</td>
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<tr>
<td>Motors</td>
<td>PROCESS</td>
</tr>
<tr>
<td>Other</td>
<td>BUILDING SHELL</td>
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<tr>
<td>Process</td>
<td>HVAC</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>COMPREHENSIVE DESIGN</td>
</tr>
<tr>
<td>Refrigeration-Lighting</td>
<td>CHP</td>
</tr>
<tr>
<td>Steam Traps</td>
<td>COMPRESSED AIR</td>
</tr>
<tr>
<td>Unitary</td>
<td>LIGHTING</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>MOTORS/ROVES</td>
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<tr>
<td>Upstream Other</td>
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<td></td>
<td>Upstream Lighting</td>
</tr>
<tr>
<td></td>
<td>Upstream Other</td>
</tr>
</tbody>
</table>

- HOT WATER, PROCESS, BUILDING SHELL, HVAC, COMPREHENSIVE DESIGN, CHP, COMPRESSED AIR, LIGHTING, MOTORS/ROVES, REFRIGERATION, FOOD SERVICE, N/A, OTHER, Upstream Lighting, Upstream Other

Checkmarks indicate the presence of specific end uses in the broad end use categories.
Table 8-2. Gas end use crosstab combinations

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<th>GAS BROAD END USE</th>
<th>HOT WATER</th>
<th>PROCESS</th>
<th>HVAC</th>
<th>BUILDING SHELL</th>
<th>COMPREHENSIVE DESIGN</th>
<th>CHP</th>
<th>FOOD SERVICE</th>
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<tr>
<td>BOILERS</td>
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<td>CDA</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>✗</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>CHP</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>CONTROLS</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>COOKING</td>
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<td></td>
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<td></td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>DEEC</td>
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<td></td>
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<tr>
<td>EQUIPMENT</td>
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<td>✔</td>
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<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>FURNACE</td>
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<td>✔</td>
<td></td>
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<tr>
<td>HOT WATER</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>HVAC</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>HVAC-CHILLER</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>HVAC-HEATING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>LOW-FLOW SHOWERHEAD</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>MOTORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>OTHER</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>PROCESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>STEAM TRAPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>
8.1.2 Industry sector and building use

Previous Customer Profile reports used a “building type” classification in the reporting. This field was a derivative of the Energy Information Administration’s Commercial Building Energy Consumption Survey (CBECS) categories.

At the 2013 C&I summit and in the 2012 Customer Profile report, there was significant discussion about the need to further clarify how a customer account was classified into the “building type” categories. Two distinct factors were identified as the key components for classification: the building’s use (e.g., retail), and the actual industry sector in which the building operated (e.g., dry cleaning). The following is an example, recalled from the 2013 summit, of why this distinction is important:

What if we wanted to target steam traps in commercial dry cleaners? Historically in this example, the dry cleaners would be grouped into the CBECS class “service,” which in the 2011 and 2012 reports was treated as a sub class of “retail.” This overarching broad building use could include anything from coffee shops, garages, and tanning salons through Wal-Mart’s Office Max, and even “dry cleaners.”

This would make pulling out a specific, detailed, industry sector (dry cleaners) very difficult and reduce the usefulness of the building classification since PAs would not be interested in trying to market steam traps to an Office Max. To compound the issue, many PAs expressed an interest in the building use, but the data they had corresponded to the building sector (NAICS or SIC codes) – which CBECS explicitly notes does not crosswalk with CBECS classes.

It became clear that a new attribute was required to capture the industry sector of customer buildings. To better reflect the raw data and the differences between use and sector, the 2014 study included both “building use” and “industry sector” fields; the bulk of the analysis is presented at the sector-level, as this was consistently more populated in the data.

Information on each account’s building use and sector was obtained from PAs via one of three raw data classes: North American Industry Classification System (NAICS) code, Standard Industry Code (SIC), or verbal description/PA code (see Table 8-1).\(^\text{72}\)

Given the large number of NAICS codes already captured in the data, the increased granularity of the NAICS structure, the clear definition of what each NAICS industry class captures, and the types of raw data provided, DNV GL integrated the industry sector data and summarized it for reporting at the two-digit level. Under this system, it is possible to distinguish from NAICS code 812320—which falls in the NAICS sector 82, “Other Services (except Public Administration)”—that we have a dry-cleaning establishment. As an added bonus, at this level of granularity it is possible to start assigning building uses for some NAICS codes where there was only one logical CBECS class.

This approach negated the issue of trying to assign a building use to datasets where the sector was provided (NAICS or SIC) for something like a college, but the specific building use was not specified (e.g., classroom [public assembly], office [office], or a dorm [lodging]).

---

\(^{72}\) NAICS codes of varying levels are most common, followed by SIC codes and then verbal descriptions.
Table 8-1. Business data classes and differences using a data center as an example

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Degrees of detail: data center example</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAICS Code</td>
<td>Standardized code with increasing levels of detail starting at two digits and increasing to six digits. Periodically updated by the U.S. Office of Management and Budget; last update was in 2012. Intent is to &quot;allow for a high level of comparability in business statistics.&quot;</td>
<td>51-&gt; 518-&gt; 5182-&gt; <strong>518210</strong></td>
</tr>
<tr>
<td>SIC Code</td>
<td>Standardized code with increasing levels of detail starting at two digits and increasing to four digits. Phased out in the late 1990s, no longer actively maintained.</td>
<td>73-&gt; 737-&gt; <strong>7374</strong></td>
</tr>
<tr>
<td>Verbal Description or PA Code</td>
<td>PA supplied names or codes describing the account. Non-standard across PAs.</td>
<td>Data Center, Server Farm, Information Technology</td>
</tr>
</tbody>
</table>

The following is a more detailed description of each of the building use and industry sector data sources that can be leveraged as part of the Customer Profile dataset.

**NAICS Codes**

DNV GL uses the two-digit NAICS level to assign a verbal industry sector from one of the 2002 NAICS classes. Additionally, the most detailed level of NAICS code provided by the PAs is loaded in order to allow analysts to investigate sectors. NAICS codes have the added benefit of forming a direct link to the EIA's Manufacturing Energy Consumption Survey, allowing the incorporation of their third-party data into the analysis.

NAICS codes replaced SIC codes in 1997 as the primary business type identifier for the U.S. Government. There have been multiple generations of these codes since the initial 1997 release (currently 1997, 2002, 2007, and 2012). DNV GL assumed that the NAICS codes provided were from the 1997 release unless directed otherwise. NAICS code groupings are related to the type of production occurring at a business for goods and services; in other words, the primary economic activity of a business is the NAICS code. Table 8-2 shows the NAICS codes used in the MA C&I Evaluation Database.
Table 8-2. 2012 NAICS codes used in the MA C&I Evaluation Database

<table>
<thead>
<tr>
<th>Sector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Agriculture, Forestry, Fishing and Hunting</td>
</tr>
<tr>
<td>21</td>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
</tr>
<tr>
<td>22</td>
<td>Utilities</td>
</tr>
<tr>
<td>23</td>
<td>Construction</td>
</tr>
<tr>
<td>31-33</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>42</td>
<td>Wholesale Trade</td>
</tr>
<tr>
<td>44-45</td>
<td>Retail Trade</td>
</tr>
<tr>
<td>45-49</td>
<td>Transportation and Warehousing</td>
</tr>
<tr>
<td>51</td>
<td>Information</td>
</tr>
<tr>
<td>52</td>
<td>Finance and Insurance</td>
</tr>
<tr>
<td>53</td>
<td>Real Estate and Rental and Leasing</td>
</tr>
<tr>
<td>54</td>
<td>Professional, Scientific, and Technical Services</td>
</tr>
<tr>
<td>55</td>
<td>Management of Companies and Enterprises</td>
</tr>
<tr>
<td>56</td>
<td>Administrative and Support and Waste Management and Remediation Services</td>
</tr>
<tr>
<td>61</td>
<td>Educational Services</td>
</tr>
<tr>
<td>62</td>
<td>Health Care and Social Assistance</td>
</tr>
<tr>
<td>71</td>
<td>Arts, Entertainment, and Recreation</td>
</tr>
<tr>
<td>72</td>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>81</td>
<td>Other Services (except Public Administration)</td>
</tr>
<tr>
<td>92</td>
<td>Public Administration</td>
</tr>
</tbody>
</table>

Source: [http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012](http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012)

In addition to the NAICS codes, DNV GL has one additional industry sector code, “Unknown,” which contains accounts for which either no sector data is available or the data provided is not classifiable into a sector (such as a NAICS code of “999999”). This is an update from the 2014 C&I Customer Profile report, in which there were three additional industry sector classifications: “No Data,” “N/A,” and “Unknown.” In the 2014 C&I Customer Profile report, “No Data” consisted of records for which the PA did not provide any information, and for which tax data was unable to match with the record. “N/A” was a code coming exclusively from the MA Level 3 tax database, indicating that the record matched successfully to the tax data, but the tax code was unable to provide it with a NAICS match. In the 2016 report, all three variations of absent industry sector data are binned into the single code “Unknown.”

Starting in the 2016 Comprehensive C&I Customer Profile analysis, DNV GL utilized the efforts of Project 66, “Enhanced Database,” to fill any industry sector fields that were still missing in the data (marked as “Unknown”). Specifically, DNV GL utilized Massachusetts’ tax data and data from infoUSA®, attempted to link them to accounts within our database, and where successful, utilized their 2-digit NAICS code information to provide industry sector information where it was previously missing. This process did not fill in missing industry sector information for all accounts, but for some of the PAs, it provided a much higher presence of industry sector information that was previously “Unknown.”

**SIC Codes**

SIC codes were developed in the 1930s to classify businesses by their primary economic activity. The last revision to SIC codes was made in 1987 by the U.S. Office of Management and Budget. While SIC codes have been phased out of maintenance in favor of the more detailed NAICS codes, many establishments still use SIC codes, which explains their presence in the analysis.
Although DNV GL loaded the SIC codes provided by PAs, we converted these into the most detailed equivalent NAICS code, and assigned a two-digit NAICS code to the verbal industry sector descriptions. It was not always possible to achieve a one-to-one match for SIC and NAICS codes; in these cases, we used the SIC major class to identify a verbose match to a NAICS two-digit code.

**Level 3 Tax Codes / Department of Revenue Codes**

DNV GL used the Massachusetts Level 3 Department of Revenue (DOR) Tax Codes to assign building use and industry sectors in instances where the PA provided address information, but no distinguishing building use or sector codes in the raw data. As a state-level standardized dataset, the DOR codes follow the same type of assembly hierarchy as NAICS and SIC codes. They are updated periodically by the individual town tax assessors.

In order to align these codes with the CBECS use and NAICS sector classes, DNV GL generated a crosswalk for each DOR code in the Level 3 system, as well as a separate crosswalk for the Boston codes that are maintained in a similar but distinct dataset. A sample of the cross-walked dataset is provided below; the full set of several hundred rows is available to the PAs and EEAC Consultants upon request.

**Table 8-3. Sample of tax codes classes used in the MA C&I Evaluation Database**

<table>
<thead>
<tr>
<th>PK_Tax_Use</th>
<th>Code_3</th>
<th>CBECS_Use</th>
<th>NAICS_Sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1001013</td>
<td>013</td>
<td>Lodging</td>
<td>NA</td>
</tr>
<tr>
<td>V1002023</td>
<td>023</td>
<td>Other</td>
<td>NA</td>
</tr>
<tr>
<td>V1003030</td>
<td>030</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003031</td>
<td>031</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003032</td>
<td>032</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003033</td>
<td>033</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003034</td>
<td>034</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003035</td>
<td>035</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003036</td>
<td>036</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003037</td>
<td>037</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003038</td>
<td>038</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1003039</td>
<td>039</td>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>V1004043</td>
<td>043</td>
<td>Manufacturing</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>V1005053</td>
<td>053</td>
<td>Office</td>
<td>Professional, Scientific, and Technical Services</td>
</tr>
<tr>
<td>V1005063</td>
<td>063</td>
<td>Other</td>
<td>Agriculture, Forestry, Fishing and Hunting</td>
</tr>
<tr>
<td>V1007073</td>
<td>073</td>
<td>Other</td>
<td>Agriculture, Forestry, Fishing and Hunting</td>
</tr>
<tr>
<td>V1008083</td>
<td>083</td>
<td>Public Assembly</td>
<td>Professional, Scientific, and Technical Services</td>
</tr>
<tr>
<td>V1009093</td>
<td>093</td>
<td>Other</td>
<td>Professional, Scientific, and Technical Services</td>
</tr>
<tr>
<td>V1110103</td>
<td>103</td>
<td>Lodging</td>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>V2111111</td>
<td>113</td>
<td>Lodging</td>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>V1112123</td>
<td>123</td>
<td>Lodging</td>
<td>Accommodation and Food Services</td>
</tr>
<tr>
<td>V1113130</td>
<td>130</td>
<td>Vacant</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: [www.mass.gov/dor/docs/dls/bla/classificationcodebook.pdf](http://www.mass.gov/dor/docs/dls/bla/classificationcodebook.pdf)

**Verbose fields**

Verbose fields were treated differently in billing and tracking data. When the industry description field was in the tracking data, it was assumed to be describing the building that received the efficiency measure.

In billing data, it was assumed that an industry description field was indicating the industry type for a business, and this field was linked to the appropriate DNV GL standardized industry sector field.

**Year-over-year variability**

As more years of data have become available, it has become clear that the NAICS code, SIC code, and industry description fields for accounts can show considerable variation. If left in their original state, this would result in substantial variability in industry sector tables when using these fields in a time series. In
order to decrease this exogenous\textsuperscript{73} variability and create meaningful year-over-year comparisons, DNV GL established the following methodology:

1. Most current data override previous data. Exceptions are:
   a. If current data are missing and previous data are not missing
   b. If current data are unclassifiable and previous data were classed
2. When multiple assignments exist for a single account, all records for that account are populated with the most frequent values. Exceptions are:
   a. Missing values do not override non-missing values.
   b. Unclassifiable values do not override meaningful values.

### 8.1.3 Methodology of overall market contribution analysis

In response to the PA and EEAC Consultant requests for additional insight into potential differences in each PA's billing customer base, DNV GL included a new analysis that normalizes the PA billing populations for comparisons between PA populations. The intent of this new analysis is to answer questions like, " Does Eversource engage its largest customers at a different rate than National Grid engages its largest customers?" The methodology to calculate this metric is as follows:

First, instead of defining "large" or "very large" customers as a single usage value across the PAs, DNV GL normalized the data into 10 percentile groups based on rank ordered account usage. This allowed each of the PAs to have a "very large" bin all the way to a "very small" bin of customers, regardless of the overall number of customers or customer usage. Once accounts were assigned to each bin, the proportion of energy used by that bin, relative to the total PA usage was calculated. This is the "proportion of total usage."

\[
Proportion\ of\ Total\ Usage_{PA,Bin} = \frac{Total\ Bin\ Usage}{Total\ PA\ Usage}
\]

Next, DNV GL assigned the accounts in the tracking data to their corresponding bin in the billing data by merging the tracking data onto the billing data. This allowed the savings for each bin to be calculated. Then the savings of the bin relative to the total savings for the PA was calculated. This is the "proportion of total savings."

\[
Proportion\ of\ Total\ Savings_{PA,Bin} = \frac{Total\ Bin\ Savings}{Total\ PA\ Savings}
\]

Finally, DNV GL calculated the unit-less ratio of proportional savings from the bin relative to proportional usage from the bin. This is the "contribution ratio."

\[
Contribution\ Ratio_{PA,Bin} = \frac{Proportion\ of\ Total\ Savings_{PA,Bin}}{Proportion\ of\ Total\ Usage_{PA,Bin}}
\]

This contribution ratio provides a normalized view of the customers and savings across PAs, irrespective of size or raw number of accounts, and helps overcome potential differences between PAs as to what constitutes a "large" customer for them by making "large" a PA-relative rather than absolute term.

\textsuperscript{73} This data is exogenous because DNV GL is completely dependent on the PAs for classification of these variables for each account. It is not feasible to check the accuracy of over 400,000 individual accounts and each of the NAICS or SIC code classification assigned by the PAs. It is possible for one year to have a correct assignment but the most current year to have an incorrect one.
8.1.4 Level 3 tax database attributes

As seen in the 2013 Customer Profile, DNV GL is including a list of the attributes from the Level 3 Tax Database in the 2016 C&I Customer Profile report. We use attributes from the Level 3 Tax Database to fill missing industry sector information when possible across the PAs. Note that not all of these attributes are required by every town, nor are they fully populated in every town.
Table 8-4. Level 3 tax database attributes

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object ID</td>
<td>Internal feature number.</td>
</tr>
<tr>
<td>Property ID</td>
<td>Unlike most other attributes, this attribute may not come directly from the assessor’s database. It may sometimes be constructed from information typically found in multiple columns in the assessor’s database. It must be unique within the city or town (character, 18), cannot be null.</td>
</tr>
<tr>
<td>Location ID</td>
<td>This identifier is specific to the MassGIS parcel mapping standard. It appears in three places as an attribute of the parcel file, in the intersection table at Level II and in a field in the assessor list extract. The LOC_ID is a unique identifier for parcels.</td>
</tr>
<tr>
<td>Building Value</td>
<td>Current assessed value for the main building(s) on the property (number, 7)</td>
</tr>
<tr>
<td>Land Value</td>
<td>Current assessed value for land (number, 9)</td>
</tr>
<tr>
<td>Other Improvements Value</td>
<td>Other structures or physical improvements that are separately valued (number, 9)</td>
</tr>
<tr>
<td>Total Value</td>
<td>Current total assessed value for land and structures. Because some databases include other categories of valuation not included above, this may not represent the total of the fields above (number, 9).</td>
</tr>
<tr>
<td>Fiscal Year Assessed</td>
<td>Fiscal year of assessed value formatted as YYYY (number, 4), cannot null.</td>
</tr>
<tr>
<td>Size of Lot</td>
<td>Dued area in EITHER square feet OR acres, but not both (number, 11, 2)</td>
</tr>
<tr>
<td>Last Sales Date</td>
<td>Last sale date formatted as YYYYMMDD (number, 8)</td>
</tr>
<tr>
<td>Last Sales Price</td>
<td>Last sale price</td>
</tr>
<tr>
<td>Land Use Code</td>
<td>State three digit code with optional extension digit to accommodate the four-digit codes commonly used by assessors (character, 6). If the code contains a four digit code, because the meaning of the fourth digit varies from community-to-community, the standard requires a lookup table called MassPC_LUT.</td>
</tr>
<tr>
<td>Site Address</td>
<td>This field will contain the complete original site address as listed in the tax record (character, 80).</td>
</tr>
<tr>
<td>Address Number</td>
<td>– this field will contain address number information, either a single house number with suffix (e.g., 25, 103 ½ or 12A) or a range of numbers (e.g., 12-16 or 12A-12B).</td>
</tr>
<tr>
<td>Full Street Name</td>
<td>This field will contain the full street name, which may be stored in separate fields in the assessor database. Note that additional, secondary location information should not be stored in this field, but the standard does not require parsing and eliminating such content (character, 60).</td>
</tr>
<tr>
<td>Secondary Location Information</td>
<td>this is the place to put secondary location information. Frequently, descriptors such as “Side”, “South Side”, “Rear”, “Basement” as well as building and unit descriptors such as “#1” or “Unit A” are found in assessor data.</td>
</tr>
<tr>
<td>City</td>
<td>City or town where the property is located</td>
</tr>
<tr>
<td>Zip Code</td>
<td>Zip code where the property is located, if available</td>
</tr>
<tr>
<td>Name of Owner of Record</td>
<td>Name of first owner of record.</td>
</tr>
<tr>
<td>Owners Tax Address</td>
<td>– the complete owner mailing address, including the street number, name, etc. This is not the site address, rather it is the address to which the tax bill is sent, thus it may include P.O. Boxes. It may also include other addresses that would not be allowed in the site address field.</td>
</tr>
<tr>
<td>Owners Tax Address City</td>
<td>the city for the property owner’s address</td>
</tr>
<tr>
<td>Owners Tax Address State</td>
<td>for US addresses, the state where the property owner lives, using the postal service abbreviations for state</td>
</tr>
<tr>
<td>Owners Tax Address Zip Code</td>
<td>the zip code of the owner's address</td>
</tr>
<tr>
<td>Owner Tax Address Country</td>
<td>the country where the owner lives</td>
</tr>
<tr>
<td>Deed Book</td>
<td>Last sale Registry of Deeds book</td>
</tr>
<tr>
<td>Deed Page</td>
<td>Last sale Registry of Deeds page</td>
</tr>
<tr>
<td>Deed ID</td>
<td>This is the equivalent to Registry of Deeds book and page information but for registered or probate land</td>
</tr>
<tr>
<td>Town Zoning</td>
<td>This is the code to indicate the zoning district within which the property lies not including overlay zoning districts</td>
</tr>
<tr>
<td>Year Structure Built</td>
<td>format YYYY; this is an extremely important attribute for any kind of planning analysis of growth trends or for change detection</td>
</tr>
<tr>
<td>Area of Building</td>
<td>Building area (square feet) for commercial/industrial properties as defined by the</td>
</tr>
<tr>
<td>Units in Building</td>
<td>Number of living dwelling units</td>
</tr>
<tr>
<td>Total Residential Area</td>
<td>Total residential living area in square feet (not gross building area) as defined by the assessor (e.g., this may or may not include only heated space). This is a useful attribute when evaluating development proposals relative to surrounding residences, but a difficult one to create because it may require adding areas from multiple fields in the assessor’s database.</td>
</tr>
<tr>
<td>Building Style</td>
<td>Code indicating style of structure (“colonial”, “ranch” etc.)</td>
</tr>
<tr>
<td>Number of Stories in Building</td>
<td>the number of stories assigned by the assessor to each structure</td>
</tr>
<tr>
<td>Number of Rooms in Building</td>
<td>the number of rooms identified by the assessor</td>
</tr>
<tr>
<td>Lot Area Units</td>
<td>This identifies the deed area units in the LOT_SIZE field: “S” for square feet and “A” for acres. This field will typically have to be added to comply with the standard.</td>
</tr>
<tr>
<td>CAMA ID</td>
<td></td>
</tr>
<tr>
<td>Town ID</td>
<td>MassGIS unique town ID. Alpha 1-315 excluding Aquinnah which has been inserted in the sequence (184) as its old name, Gay Head</td>
</tr>
<tr>
<td>Use Description</td>
<td>(linked via use code), verbose field detailing what the numeric code stands for. Standardized code scheme (except for Boston)</td>
</tr>
</tbody>
</table>
8.1.5 EUI by industry sector

The MA C&I Evaluation Database has allowed DNV GL to refine the preliminary EUI analysis looking at the EUI for different accounts and locations by industry sector.

Based on feedback from the 2014 C&I Customer Profile, DNV GL modified the math and display behind the EUI maps with the intent of generating a more detailed and mathematically intuitive map that would help identify areas of higher average EUI within a sector relative to the statewide population for that sector. Specifically:

1. DNV GL used a 1 kilometer grid network to calculate the average EUI of all accounts with linked tax data that fell within the grid cell. This replaced the interpolated surface of the 2013 and 2014 profiles by providing more detailed and area specific EUI numbers, but at the expense of less visual coverage. This change is intended to improve on the C&I Customer Profile guiding principal of presenting data “as detailed as possible without compromising individual account level data.”

2. The gridded network displays only the average values from the accounts within the grid cell. Unlike 2013’s and 2014’s interpolated EUI maps, accounts only impact the grid cell they fall within rather than neighboring grid cells. This change in effect removed both the “search radius” and the influence “decay ratio” in the interpolated maps.

As with previous years, the intended value of the maps included in this section is not to target specific accounts, but rather to identify areas of higher or lower EUI within sectors relative to the rest of the state sector population. Not all PA accounts are represented in the tax maps, nor do all towns contain square footage data for their tax records. In this regard the EUI analyses present a subset of the PA populations: those accounts that can be matched with tax data. Areas in white indicate towns served by the PAs; areas in gray indicate towns not served by the PAs.

There are several data processing steps, and resulting caveats, that accompany these maps:

1. **Only accounts that DNV GL was able to geocode at the tax parcel level were used** as the starting point in this analysis. 74 This was done to ensure that when DNV GL overlays the matched accounts with the tax parcels and conducts a spatial intersect to append the data from the tax parcel polygon layer to the billing point layers the matches will be as accurate as possible.75,76

2. **Not all tax data had building square footage.** There were instances in the tax database where the geocoded match appeared to be accurate, but the square footage was missing. In these instances, the EUI could not be calculated. Additionally, locations with a square footage of “1” were dropped, as a review of the tax data suggested that this was a classification code rather than actual building square footage.

3. **To accurately capture large accounts, DNV GL used a natural log transformation when mapping EUI intensity.** This created a relatively normal distribution curve of EUIs for industry sectors and allowed the standard deviations to be accurately displayed. All EUI maps report the

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74 Geocoding is the technical process of converting a street address to a physical point in space. The tools used by DNV GL are covered in greater depth in the methodology section of this report, as are the resulting match levels for each PA and fuel.

75 A spatial intersect is the technical term for how the data is shared between the two datasets since they do not share any indexes or keys like an account number. It means that any points (accounts) that have a tax parcel under them will, after the intersect is preformed, have all the data attributes from the tax data attached to the account attribute table.

76 Even with the application of minimum scores there are likely to be some incomplete records and/or false positives in the resulting dataset.
standardized deviations from the natural log-transformed industry sector mean rather than raw EUI numbers. Although standard deviations from a log-transformed number are conceptually more complicated, they allow for better visual consistency of data across sectors and fuel maps and provide a conceptually more intuitive picture of the landscape. These maps are supported by the analysis tables and charts presented with the specific detailed numbers.

4. In instances where multiple tax parcels overlapped, DNV GL assigned a primary industry sector based on the use code that accounted for the largest square footage and aggregated the total square footage from all parcels into a single record. This primary use was then assigned to any accounts that did not already have an industry sector from the PAs. In all instances where the PA and tax data assignments conflicted, the PA industry sector overrode the tax data.

5. In instances where multiple account records occurred at the same location, DNV GL aggregated the consumption of the records to get the location-level consumption. This was done to avoid understating the EUI of the location by only capturing account-level energy use rather than location-level energy use.

   a. When locations had multiple industry sectors, the sector with the largest consumption was taken to be the most representative one for the location. A spot check of the EUI records indicated that the majority of locations had a single account.

   b. PA-supplied industry sectors overrode tax use industry sectors; locations were always classified based on the sector amounting to the largest consumption.

Since the EUI does not take into account density of records, which may be a proxy for total potential, these maps do not provide a sense of the quantity of locations that may be present in geographic areas. It is possible that some cells represent only a few accounts, while other cells represent a large number.

The key takeaway of this is that maps represent the data available at the time they are made, and in this context, can offer guidance on sub-territories areas that may merit a deeper dive into the data though either cluster / outlier analyses or though programmatic approaches that explicitly focus on discrete geographic sub regions within an industry sector. This type of information may be particularly useful in reaching smaller and mid-size customers if certain technologies are particularly attractive to certain industry sector.

DNV GL has included the industry sector that we anticipate will be of the greatest interest to the PAs and EEAC based on the body of material in this report. Industry sector with few records (such as Mining) have not been included in the maps, but are presented in tabular format later in this section. Additional maps can be generated for the PAs upon request.

8.1.6 Upstream lighting data 2012 – 2014 analysis

With the complete inclusion of the more granular upstream lighting data, a number of initiatives were undertaken in order to make the upstream lighting data as accurate as possible across the 2012, 2013, and 2014 tracking data and to link the data to individual accounts. The new data provided in 2014 allowed for DNV GL to take a number of different steps in an attempt to improve the links to the billing data and project counts for tables in the report. These steps are as follows:

77 This is the same allocation method used by the Energy Information Administration in their Commercial Buildings Energy Consumption survey.
• DNV GL used Geographic Information System (GIS) to match address in the upstream tracking data with address for accounts in the billing data
  - If accounts were a direct 1 to 1 match between the two datasets, the account ID in the billing data was used to fill in the upstream lighting data
• If the upstream address had a 1 too many matches in the billing data, DNV GL assigned a surrogate ID key that corresponded to the address in the tracking data.

Table 8-5. Example of upstream surrogate key assignment

<table>
<thead>
<tr>
<th>ID</th>
<th>Address</th>
<th>Standardized Address</th>
<th>Measure</th>
<th>Project ID</th>
<th>Surrogate ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Blank)</td>
<td>1 Main St</td>
<td>1 Main St</td>
<td>LEDs</td>
<td>ABC123</td>
<td>UP-ID-1</td>
</tr>
<tr>
<td>(Blank)</td>
<td>1 Main Street</td>
<td>1 Main St</td>
<td>T8</td>
<td>ABC123</td>
<td>UP-ID-1</td>
</tr>
<tr>
<td>(Blank)</td>
<td>1 Main St Suite</td>
<td>1 Main St</td>
<td>LEDs</td>
<td>ABC124</td>
<td>UP-ID-1</td>
</tr>
</tbody>
</table>

This same logic was applied to all previous data, and will have impacted historical charts and figures. DNV GL has rerun all previous analyses in order to provide methodologically consistent results between the years. We took the detailed steps below.

8.1.6.1 Upstream lighting data background

The 2016 MA C&I Evaluation Database building and maintenance included the integration of sales-level upstream lighting data for 2011 through 2016. This integration provides a more accurate estimate of account-level savings and participation, and leverages the geographic information in the upstream data to attempt to link sales level data to individual PA accounts.

Multiple datasets were provided to DNV GL, with one PA providing a crosswalk of upstream savings to participating accounts. DNV GL assessed the different datasets and determined that the individual PA sets appeared to be identical to the full dataset provided by National Grid. As an outcome of these checks, DNV GL used the full raw dataset provided by National Grid to populate each PA’s point of sales data for all years.

We identified several potential data items in the preliminary assessment, and addressed them as follows:

8.1.6.2 Missing savings records

DNV GL encountered a data cleaning consideration in both the National Grid and Eversource data. We identified 146 lines of data accounting for 29 unique product descriptions that did not have any gross annual unit savings or any gross annual total savings. We populated the gross annual savings for these measures using the following logic:

1. If there is an exact match to a product description with a savings number, use that savings number (resolved 23 of the 29 measures).
2. If there is not an exact match, use a similar size and type of lighting measure to estimate the likely savings number, and note the logic in the source field of the lookup table (resolved the remaining six measures).
The measures and savings imputed are reported at the end of this memo in Table 8-8, and the result of the imputed values on the individual PA totals is detailed below in Table 8-6.

Table 8-6. Result of DNV GL filling in missing savings records for February – December, 2014

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Initial Gross Annual kWh</th>
<th>Imputed Gross Annual kWh</th>
<th>kWh Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light</td>
<td>12,520,941.46</td>
<td>12,550,766.85</td>
<td>29,825.39</td>
</tr>
<tr>
<td>Eversource</td>
<td>83,298,796.98</td>
<td>83,409,131.60</td>
<td>110,334.62</td>
</tr>
<tr>
<td>National Grid</td>
<td>68,839,248.27</td>
<td>72,648,734.75</td>
<td>3,809,486.48</td>
</tr>
<tr>
<td>Unitil</td>
<td>1,119,559.73</td>
<td>1,119,559.73</td>
<td>-</td>
</tr>
</tbody>
</table>

| Total       | 165,778,546.44          | 169,728,192.93          | 3,949,646.49 |

8.1.6.3 Differences between ECOVA data and PA tracking totals

DNV GL noted that even after the corrections to the missing values were applied, the upstream point of sales data did not match perfectly with the PA-provided rolled up totals at the annual or monthly level that DNV GL could identify from the tracking data. The overall difference was a decrease of approximately 5.5.

Table 8-7. Difference between imputed upstream savings and rolled up PA totals

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>Imputed Gross Annual</th>
<th>Rolled Up PA Totals</th>
<th>Change from Rolled Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light</td>
<td>12,550,766.85</td>
<td>14,377,182.00</td>
<td>-1,826,415.15</td>
</tr>
<tr>
<td>Eversource</td>
<td>83,409,131.60</td>
<td>92,739,878.00</td>
<td>-9,330,746.40</td>
</tr>
<tr>
<td>National Grid</td>
<td>72,648,734.75</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Unitil</td>
<td>1,119,559.73</td>
<td>1,011,119.45</td>
<td>108,440.28</td>
</tr>
</tbody>
</table>

| Total       | 169,728,192.93       | 177,856,314.19      | -8,128,121.26         |

We identified two potential drivers of this difference. First, evaluations undertaken during the year that result in a change in deemed savings could be retroactively applied to the data at the PA level, and this would not be reflected in the raw ECOVA data. To accommodate this item, DNV GL took whatever the final

---

78 National Grid did not include a rolled up, so initial Sales Recorded data was included.
79 Due to the structure of the rolled-up data, DNV GL must use the measure description to identify upstream records – e.g. “July 2014 – LED PAR30 Upstream” and so our ability to identify these records is directly impacted by the level of detail provide in the data.
80 National Grid did not include a rolled up, so initial Sales Recorded data was included.
month’s savings were for each reported measure type and retroactively applied these savings to the raw data, by multiplying measure quantity by the per measure savings value. In instances where there was no quantity data to be leveraged, the original savings from the raw data were kept (even though they would be a potential underestimation) instead of losing the raw data. Once this cleaning was applied, the difference in values was smaller but the monthly totals still did not align perfectly with the PA-provided totals.

Through the C&I Profile working group meetings the PAs identified a second potential source of the differences. The raw data undergoes additional adjustments once it is delivered to each PA, and it is likely that this adjusted data is what generates the monthly roll-up totals. To ensure that no PA lost savings based on this adjustment process, DNV GL creates a single catchall record for each PA’s upstream data and populates savings and incentives to adjust for the differences. This ensures that the upstream data is made as granular as possible for account-level analysis while also ensuring that at the population level, the total upstream savings and incentives are consistent with the PA-provided totals.

8.1.6.4 Potential duplicates and misalignment in the raw ECOVA data – 2014 specific

There appeared to potential instances of both duplicate records and of misaligned data in the raw ECOVA file. DNV GL did not resolve these issues in this base report, but reported them out to the PAs for further investigation and guidance as they appear to derive from a potential source data issue. Examples of the duplication included lines where all material, including installed address, was identical but there was a record for “National Grid” and a second one for “Eversource.” Misalignment examples included savings with addresses in municipal served towns have PA in the “PA” field, as well as non-municipal towns having an apparently inaccurate PA name based on the location of the account.
Table 8-8. Verbatim upstream product descriptions that were missing gross annual savings

<table>
<thead>
<tr>
<th>Product Name</th>
<th>DNV_GL_kWh</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 11W A-Line</td>
<td>108.16</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 8W PAR20</td>
<td>133.99</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 10.5W R30</td>
<td>182.97</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 17W BR40</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 8W PAR20</td>
<td>133.99</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 9W PAR20</td>
<td>133.99</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 8W BR20</td>
<td>133.99</td>
<td>Imputed- estimated from mix of BR30 and 8W LED</td>
</tr>
<tr>
<td>LED 12W BR30</td>
<td>181.69</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 2.3W Decorative</td>
<td>84.27</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 2.4W Candle</td>
<td>84.27</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 11W BR30</td>
<td>181.69</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 9.5W PAR20</td>
<td>133.99</td>
<td>Imputed from 9W PAR20</td>
</tr>
<tr>
<td>LED 13W BR30</td>
<td>181.69</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LFL 28W T8</td>
<td>11.9</td>
<td>Imputed from 28W Linear LED</td>
</tr>
<tr>
<td>LED 7W PAR20</td>
<td>133.99</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 12W PAR30</td>
<td>181.69</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 10W PAR30</td>
<td>181.69</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 20W PAR38</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 12W PAR38</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 2W Candle</td>
<td>84.27</td>
<td>Imputed from LED 2.2W Candle</td>
</tr>
<tr>
<td>LED 18W PAR38</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 4W MR16</td>
<td>105.3</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 7W MR16</td>
<td>105.3</td>
<td>Imputed from LED 7W MR 16</td>
</tr>
<tr>
<td>LED 2.2W Candle</td>
<td>84.27</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 7W MR16</td>
<td>105.3</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 14W PAR38</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 17W PAR38</td>
<td>210.71</td>
<td>Vlookup off populated measures</td>
</tr>
<tr>
<td>LED 2.4W Decorative</td>
<td>84.27</td>
<td>Imputed from LED 2.3W Deco</td>
</tr>
<tr>
<td>LED 2W Decorative</td>
<td>84.27</td>
<td>Vlookup off populated measures</td>
</tr>
</tbody>
</table>
8.1.7 Upstream data effects on participation and savings rates

As mentioned throughout the report, the absence of account IDs for upstream lighting data leads to highly probable over- or underestimating of participation and savings rates. This is discussed in further detail in Section 3.4.5. Inaccurate rates occur due to the inability to link non-upstream and upstream data, as a high percentage of upstream data requires assigning a temporary account ID. Because customer names and other potential linking variables are inconsistent across data sources, the assignment of account IDs is currently done using 1 to 1 matches between the billing data and the upstream data using standardized street level address information. Below we use hypothetical data to show how this mismatch in account ID information can impact a three-year analysis of participation rates.

• Table 8-9 is an example PA-supplied billing dataset. The table shows 5 accounts, all at the same address, with 5 different account IDs.

• Table 8-10 - Table 8-12 provide example PA-supplied tracking data sets for three separate years using the accounts listed in Table 8-9. Each year demonstrates unique potential issues affecting participation numbers when combining upstream and non-upstream participation using account IDs.

  - In each year’s tracking data table, upstream customer names do not match the billing data, which is why DNV GL can only assign account IDs using unique addresses.
  - Year 1 provides an example of participation being underestimated, due to two accounts in upstream that are combined as one account because they share the same location.
  - Year 2 provides an example of participation being overestimated because the same account, Dynamic Designs, is counted for participation twice, as we cannot link it to an account ID in the billing data at the address level.
  - Year 3 presents a unique situation in which participation numbers are calculated accurately, but only by coincidence.

• Table 8-13 provides participation rate calculations for each year and across all three years. This table compares the over- and underestimated participation rates yielded by the current process, to the correct rates that could be calculated if upstream data did provide account IDs, or could otherwise be linked by location and customer name. The time series outcome of an overestimated participation rate is a likely result of the current process.

• Overall, although it is possible to underestimate participation and savings rates, it is more likely to overestimate them when no account IDs are provided for upstream data, due to the inability to link non-upstream and upstream accounts within a year and across years.

Table 8-9. Example billing data

<table>
<thead>
<tr>
<th>Address</th>
<th>Customer Name</th>
<th>Account ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>123 Main St.</td>
<td>AAA Appliances</td>
<td>112233</td>
</tr>
<tr>
<td>123 Main St.</td>
<td>Bob's Brokerage</td>
<td>112234</td>
</tr>
<tr>
<td>123 Main St.</td>
<td>Custom Coins</td>
<td>112235</td>
</tr>
<tr>
<td>123 Main St.</td>
<td>Dynamic Designs</td>
<td>112236</td>
</tr>
<tr>
<td>123 Main St.</td>
<td>Energy Evaluators Inc.</td>
<td>112237</td>
</tr>
</tbody>
</table>
### Table 8-10. Year 1 tracking data, participation is underestimated

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Address</th>
<th>Customer Name</th>
<th>Account ID Provided</th>
<th>Account ID for Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>123 Main St.</td>
<td>AAA Appl.</td>
<td>(missing)</td>
<td>123Main-2015</td>
</tr>
<tr>
<td></td>
<td>123 Main St.</td>
<td>Bob’s</td>
<td>(missing)</td>
<td>123Main-2015</td>
</tr>
<tr>
<td>Downstream</td>
<td>123 Main St.</td>
<td>Dynamic Designs</td>
<td>112236</td>
<td>N/A</td>
</tr>
</tbody>
</table>

** Year 1 unique account IDs generate 2 participants this year.
* The correct number of participants is 3

### Table 8-11. Year 2 tracking data, participation is overestimated

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Address</th>
<th>Customer Name</th>
<th>Account ID Provided</th>
<th>Account ID for Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>123 Main St.</td>
<td>D. Designs</td>
<td>(missing)</td>
<td>123Main-2014</td>
</tr>
<tr>
<td>Downstream</td>
<td>123 Main St.</td>
<td>Energy Evaluators Inc.</td>
<td>112237</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>123 Main St.</td>
<td>Bob’s Brokerage</td>
<td>112234</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>123 Main St.</td>
<td>Dynamic Designs</td>
<td>112236</td>
<td>N/A</td>
</tr>
</tbody>
</table>

** Year 2 unique account IDs generate 4 participants this year.
* The correct number of participants is 3

### Table 8-12. Year 3 tracking data, participation is correct by coincidence

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Address</th>
<th>Customer Name</th>
<th>Account ID Provided</th>
<th>Account ID for Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream</td>
<td>123 Main St.</td>
<td>AAA Appliances</td>
<td>(missing)</td>
<td>123Main-2013</td>
</tr>
<tr>
<td></td>
<td>123 Main St.</td>
<td>Energy Evaluators</td>
<td>(missing)</td>
<td>123Main-2013</td>
</tr>
<tr>
<td>Downstream</td>
<td>123 Main St.</td>
<td>Dynamic Designs</td>
<td>112233</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>123 Main St.</td>
<td>Dynamic Designs</td>
<td>112236</td>
<td>N/A</td>
</tr>
</tbody>
</table>

** Year 3 unique account IDs generate 3 participants this year.
* The correct number of participants is 3

### Table 8-13. Participation rate comparisons with upstream and non-upstream data

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Longitudinal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participation Rate</strong> (current situation)</td>
<td>2/5 = 40%</td>
<td>4/5 = 80%</td>
<td>3/5 = 60%</td>
<td>7/5 = 140%</td>
</tr>
<tr>
<td><strong>Participation Rate</strong> (if upstream account ID’s provided)</td>
<td>3/5 = 60%</td>
<td>3/5 = 60%</td>
<td>3/5 = 60%</td>
<td>4/5 = 80%</td>
</tr>
</tbody>
</table>
8.2 Appendix B: Data requests

8.2.1 Billing data request

memo to: Riley Hastings, Eversource
          Kim Crossman, Whitney Brougher and Steve Menges, National Grid
          Monica Cohen, Columbia Gas of MA
          Trish Walker and Laurie Pereira, Liberty Utilities
          Andrea Matthews and Audrey Penna, Berkshire Gas
          Gail Azulay and Brianna Kane, Cape Light Compact
          Mary Downes and Alex Vavladellis, Unitil

from: Rich Crowley, DNV GL

date: March 22, 2017

copied to: Bob Wirtshafter, EEAC Consultant
          Ralph Prahl, EEAC Consultant
          Jennifer Chiodo, EEAC Consultant
          Ryan Barry, DNV GL
          Randall Monger, DNV GL
          Tony Davis, DNV GL

DATA REQUEST: 2016 Commercial and Industrial Program Billing Data

DNV GL requests that the Massachusetts Program Administrators (PA) provide the 2016 Residential and C&I billing consumption data for integration into their respective Evaluation Databases. A separate request for Residential tracking data and one for C&I tracking data will be directed to each PA’s respective lead; DNV GL is only issuing a joint data request for billing data.

Based on guidance from the PA Data Management lead and lessons learned managing both the C&I and Residential Evaluation Databases over the last year, DNV GL understands that it may be more efficient for the PAs to respond to a single billing consumption data request for their entire population, and then have DNV GL split the data into the respective Residential and C&I populations by using the PAs rate code. DNV GL anticipates that a single request will also reduce the likelihood of accounts appearing in both the Residential and C&I deliveries as they have done in past years and will enhance the data integrity in the Evaluation Database by avoiding duplicate records as well as omitted records.

The following sections provide the most critical data fields requested, but your PA is welcome to provide a direct database extraction and DNV GL will load the requested field from the larger file.

DNV GL kindly requests the following steps from each PA lead:

1. Provide the requested billing consumption data for all Residential and C&I customers at your earliest convenience, with a goal of all data submitted by Friday, May 17, 2017. Billing and tracking data do not need to be submitted at the same time.

2. Notify DNV GL’s data management email account (MADataManagement@dnvgl.com) when your billing data is ready to transmit and we will provide you with a Secure File Transfer hyperlink. Based on previous years, DNV GL understands that it may be more convenient for PAs to provide a single zip file containing the billing tables rather than load each one individually, the “request hyperlink” approach should facilitate this for your PA.

---

81 If it is more convenient for your PA to just send DNV GL the database extract directly from your database systems rather than to select out specific fields, the data management team will map and process the needed fields from your full population and report back to your PA.
3. Provide a data dictionary with explanations for each field (when possible).

Please direct any questions or technical issue to the MA Data Management team at our coordination email account (MADataManagement@dnvgl.com) and copy Rich Crowley (Richard.Crowley@dnvgl.com; 207.773.0110 x45104), Randall Monger (Randall.Monger@dnvgl.com; 207.773.0110 x45110), and Tony Davis (Anothony.Davis@dnvgl.com 207.773.0110 x45108)

Billing consumption data

Please provide individual billing consumption data with the start and end date at the most granular level of detail available from December 2015 through January 2017 for all accounts served. These data are requested for all accounts that were open at any time during the period specified, even if they were active for only a fraction of the target period, and whether they had any energy use or not.

New to the 2016 data request, DNV GL requests:

1) Please include any net metering accounts in your billing population, and

2) Please include any special accounts such as steam plants, lighting, or other special accounts as appropriate from the C&I population and a field to indicate if they should be considered EE Eligible. DNV GL is requesting these special accounts based on the substantial impact that special accounts can have on population level savings ratios when they appear in tracking data without a corresponding billing account.

In the event the special account is ineligible for the energy efficiency program population and has not participated in an energy efficiency program DNV GL will flag them as "excluded" accounts in the billing database.

Data format: DNV GL will take the data in whatever compatible format is most efficient for your PA. Our preference is to receive the data in either SAS (sas7bdat) or MS Excel (.xlsx or .xls) formats; MS Access (.mdb or .accdb), Comma Separated Value (.csv) or other delineated text files (e.g. pipe delineation) are all also fine though we have found these files may cause truncation issues when extracted from source systems.

Customer Information: The ID fields are used to link billing consumption data to the tracking data and to link same-premise accounts over time. The other fields are used for survey purposes and identification of accounts across fuel type. Please provide any additional fields that your PA believes may be helpful in reaching these goals.

- Account Number
- Customer Number
- Facility ID (for multi-family buildings)
- Premise ID
- Meter ID
- Meter socket or service point ID (identifies the location in case of meter change outs)
- Lat/Long of Meter or Service Location (if available)
- Corporate Account Number (or other aggregation keys; C&I only)

82 We anticipate for most PAs that this will be a start day and an end day with no detail in between. If your PA has detailed interval level data (e.g. hourly, 15 minute, etc.) DNV GL can process that data and aggregate it to the same level as the rest of the PA billing consumption data.

83 If you are sending a fix field-length text file, please be sure to include the field length guide.
- Customer Name
- Business Name (C&I only)
- Service Address
- Service City
- Service Zip Code
- Industry Sector (NAICS, SIC, or internal code with crosswalk; C&I only)
- Building Use (CBECS, RECS, Verbose description or internal code with crosswalk)
- Customer phone number(s). If more than one provided, please add fields to indicate if the phones are for residence or work, land line or mobile, resident 1 or resident 2, etc.
  - Do Not Contact Flag (if applicable)
- E-mail address(es). If more than one provided, please add fields to indicate if the e-mail address is personal or for work, resident 1 or resident 2, etc.
  - Do Not Contact Flag (if applicable)
- Mailing Address
- Mailing City
- Mailing State
- Mailing Zip Code
- Dwelling type (single family, multi family, mobile home, common areas, etc.)
- Individually metered/Master metered indicator
- Meter set date (the date that the meter was last changed out)
- Premise establishment date
- Account service start date
- Account service end date (if applicable)
- C&I Program Exclusion Flag (if account has been exempt from participating in programs)
- Account Manager Name (if applicable; C&I only)
- EE Exempt flag or identification code (C&I only)

**Energy Consumption Information:**

For each billing period, please provide:

- Fuel Type
- Account Number
- Customer Number
- Premise ID
- Meter ID
- Meter socket or service point ID (identifies the location in case of meter change outs)
- Rate Code
  - PA Revenue Code
  - PA Tariff Code
- Total billing period usage (therms or kWh)
- Start Date of Billing Period
- End Date of Billing Period
- Maximum Demand (kW for electric only, if available)
- Billing Status Code (estimated bill, no bill, etc.)
- Net Metering indicator
- Low Income indicator

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84 Please do not adjust consumption for levelized payment accounts.
8.2.2 Tracking data request

Memo to:  
Bill Blake and Whitney Brougher, National Grid  
Erik Mellen and Riley Hastings, Eversource  
Monica Cohen, Columbia Gas of MA  
Trish Walker and Laurie Pereira, Liberty Utilities  
Audrey Penna, Berkshire Gas  
Gail Azulay and Brian Kane, Cape Light Compact  
Mary Downes and Alex Vavladellis, Unitil

From:  
Tony Davis, DNV GL

Date:  
April 11, 2016

Copied to:  
Jen Chiodo and Ralph Prahl, EEAC Consultants  
Wendy Todd, Ryan Barry, and Rich Crowley DNV GL

DATA REQUEST: 2016 Commercial and Industrial Program Tracking Data

DNV GL requests that the Massachusetts Program Administrators (PA) provide their 2016 Commercial and Industrial (C&I) program tracking data for integration into the MA C&I Evaluation Database. The program tracking data are critical components of continuing and upcoming evaluations and research studies.

The following sections provide the most critical data fields requested, but your PA is welcome to provide a direct database extraction and DNV GL will load the requested field from the larger file. DNV GL kindly requests the following steps from each PA lead:

1. Provide the requested program tracking data for all C&I participating customers at your earliest convenience, with a goal of all data submitted by Friday, May 19, 2017. DNV GL is happy to accept multiple deliverables of tracking data rather than all at once if that is more convenient for your PA.

2. Notify DNV GL’s data management email account (MADataManagement@dnvgl.com) when your tracking data is ready to transmit and we will provide you with a Secure File Transfer hyperlink. Based on previous years, DNV GL understands that it may be more convenient for PAs to provide a single zip file containing the tracking data rather than load each one individually, the “request hyperlink” approach should facilitate this for your PA.

3. Provide a data dictionary with explanations for each field (when possible) and any relational keys between tables if your PA leverages relational datasets.

4. Provide a link from your measure data to the appropriate BCR ID or other roll up to facilitate data QC and summary checks for your provided tracking data.

Data format: DNV GL will take the data in whatever compatible format is most efficient for your PA. Our preference is to receive the data in either SAS (.sas7bdat) or MS Excel (.xlsx or .xls) or Access (.mdb or .accdb) formats. Comma Separated Value (.csv) or other delineated text files (e.g. pipe delineation) are all also fine though we have found these files may cause truncation issues when extracted from source systems.

85 If it is more convenient for your PA to just send DNV GL the database extract directly from your database systems rather than to select out specific fields, the data management team will map and process the needed fields from your full population and report back to your PA.

86 If you are sending a fix field-length text file, please be sure to include the field length guide.
Please direct any questions or technical issue to the MA C&I Data Management team at our coordination email account (MADataManagement@dnvgl.com) and copy Tony Davis (Anthony.Davis@dnvgl.com; 207.773.0110 x45108) and Rich Crowley (Richard.Crowley@dnvgl.com; 207.773.0110 x45104).

Program tracking data

DNV GL requests all C&I program tracking data for 2016 as captured by your PA. This request includes participants from all projects (including Direct Install and all C&I upstream programs).

If your PA captures upstream data in your tracking data delivery, please alert DNV GL so we can ensure we accurately separate this from data provided by the third-party upstream vendors (ECOVA, EFI).

Customer Information:

Identification fields (e.g. account, customer, premise, meter) are used to link the tracking information to the billing consumption data. The other fields are used for survey purposes, and general identification of who is participating in the programs. Please provide any additional fields that your PA believe may be helpful in achieving these goals.

- Account Number
- Customer Number
- Premise ID
- Meter ID
- Customer/Business Name
- Service Address (location where equipment was installed)
- Service City
- Service Zip Code
- Mailing Address
- Mailing City
- Mailing State
- Mailing Zip Code
- Industry Sector (e.g. NAICS, SIC, verbose)
- Building Use (e.g. CBECS, verbose)
- Facility Size (square footage)
- Contact Person (1st)
- Phone Number for 1st contact person
- Email Address for 1st contact person
- Contact person (2nd, if available)
- Phone Number for 2nd contact person
- Email Address for 2nd contact person
- Gas Company Name
- Electric Company Name
- "Other Fuel" PA Account Number

87 If it is more convenient for your PA to just send DNV GL the database extract directly from your database systems rather than to select out specific fields, the data management team will map and process the needed fields from your full population and report back to your PA.
Measure and Project Information\(^{88}\): Data that is as disaggregated as possible is preferable (for example, a project that includes three measures is preferred at the measure level with all three records.) These data are used in the estimation of energy efficiency savings and other studies pertaining to energy efficiency programs in Massachusetts. Please provide any additional fields that your PA believes may be helpful in achieving these goals.

DNV GL also requests the final BCR inputs for 2016 for your PA. These models will be used to crosscheck the data against the Mass Saves Data website, and are used to validate the raw data, and identify any inconsistencies that need resolution.

- Project or Application Number
- Date Project Completion
- Date Payment Issued
- Funding Year (for example, a project completed in 2015 may have been funded in 2014)
- Program /Initiative\(^{89}\)
- Installation type (e.g. custom / prescriptive)
- Project Fuel Type (gas, electric, both, other)
- End Use (i.e., lighting, HVAC, building shell, etc.)
- Detailed Measure Characteristics (i.e., bulb type, bulb shape, bulb specialty characteristics)
- Measure Lifetime
- Quantity Installed (e.g., 1, 10, 100, etc.)
- Units for Quantity (e.g., “lamps”, “square feet”)
- Gross Savings Estimate by fuel (Annual kWh, Annual therms)
- Gross Summer kW Savings Estimate (Electric)
- Gross Winter kW Savings Estimate (Electric)
- Percent On-Peak Energy Savings (% On-Peak kWh, Electric)
- Gross Lifetime Savings Estimate (Lifetime kWh, Lifetime therms)
- Unit of Savings measurement (i.e. kWh, therms, MMBtu)
- Overall Project Cost
- Total cost of project Paid by PA
- Total cost of each project measures installed (by measure)
- Incentive Paid by PA for each measure installed (by measure)
- Technical Assessment Study (indicator of whether or not a customer received a technical assessment study by measure)
- Technical Assessment Study total cost by measure

Equipment Information: These fields help improve engineering based analyses and classification of end uses in the MA C&I Evaluation Database. DNV GL requests you provide any additional fields that your PA believes may be helpful in reaching these goals.

- Measure Manufacturer
- Measure Model Number
- Measure Capacity or Size Category
- Measure Efficiency Rating
- Measure Efficiency Units

\(^{88}\) Provide information at the measure level whenever possible.
\(^{89}\) Any additional information that can help define if measures are new construction or retrofits.
Contractor / Vendor Information: These fields are used in survey and impact analyses and can help improve deeper insight into the differences in savings being achieved. DNV GL understands that multiple vendors may have worked on a project or measure; if possible please provide any information you have on the contractors that participated in the project. **DNV GL requests you provide any additional fields that your PA believes may be helpful in reaching these goals.**

- Vendor ID
- Vendor Company
- Vendor Contact Name
- Vendor Address
- Vendor City
- Vendor Zip code
- Vendor State
- Vendor Phone Number
- Vendor Email
- Vendor Role (auditor, weatherization contractor, etc.)
8.3 Within PA electric summary

The Customer Profile study generates a large number of analysis products, many of which are discussed in greater depth in explicit sections of this report. This within-PA analysis includes more detailed versions of the tables for readers who are interested in additional granularity.

The majority of the sections in this appendix require that the tracking accounts be linked to billing accounts to generate the report metrics and tables, specifically the Consumption-Weighted Participation, Participant Savings Achieved, Proportional Consumption Ratio, and Contribution Ratio metrics as well as any industry sector or consumption sections. Since tracking data needs to be linked to billing data to place the material in the appropriate analysis bin, individual table’s “TOTAL” row represents the total for all data that could be linked in the data. To minimize the risk of inaccurate conclusion, tracking data that could not be linked to billing data has not been included in the summary tables; this can cause the “TOTAL” row to be lower than it would be for the full unlinked tracking population.\textsuperscript{90} The match rates and supporting detail for the billing and tracking data for each PA are presented in section 3.4.1.

DNV GL has also included the individual PA-level summaries in this section. For instances where there were fewer than 15 records in an analysis class, that class was combined with the next closest one(s) until a class with at least 15 records was created. This level of analysis is intended to provide as granular a view of the data as possible while also preserving individual customer confidentiality.

For the summary tables of specific end uses, sector participation, and average savings, DNV GL masked any bins where there were fewer than 15 records, including zeroes.

Finally, given the large population of industry sector data that was available for the 2016 Customer Profile, DNV GL has updated and included time series charts by industry sector to facilitate year-over-year comparisons with the full population of improved data.

Since the purpose of this chapter is to provide granular detail for readers who want to interpret the data themselves, no narrative interpretation of the results is provided.

8.3.1 Population summary

This section presents a summary of key variables for each PA, in alphabetical order by PA. The tables and figures in this section correspond to the tables and figures in Section 5.1.

\textsuperscript{90} In the ideal world, all tracking data would link and be allocable in the tables; for reasons detailed in section 3.4.1, no PA has 100% linking between tracking and billing data.
Figure 8-3. 2016 Cape Light Compact customer population summary by broad consumption bin, excluding unlinked tracking data

Figure 8-4. 6-year Cape Light Compact customer population summary by broad consumption bin, excluding unlinked tracking data
Figure 8-5. 2016 Eversource customer population summary by broad consumption bin, excluding unlinked tracking data

Figure 8-6. 6-year Eversource customer population summary by broad consumption bin, excluding unlinked tracking data
Figure 8-7. 2016 National Grid customer population summary by broad consumption bin, excluding unlinked tracking data

Figure 8-8. 6-year National Grid customer population summary by broad consumption bin, excluding unlinked tracking data
Figure 8-9. 2016 Unitil customer population summary by broad consumption bin, excluding unlinked tracking data

![Diagram showing 2016 Unitil customer population summary by broad consumption bin, excluding unlinked tracking data.](image)
8.3.2 Consumption breakdowns

Table 8-14. Field name descriptions for tables in Section 5, electric market analysis

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td># Accounts (2015)</td>
<td>Count of the unique accounts identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>2016 Usage (kWh)</td>
<td>Sum of the kWh usage for the unique accounts for the identified year</td>
</tr>
<tr>
<td># Accounts (2016)</td>
<td>Count of the unique accounts identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>2015 Participant Usage (kWh)</td>
<td>Sum of the kWh usage for match participant accounts only</td>
</tr>
<tr>
<td>2016 Annual Savings (kWh)</td>
<td>Sum of gross annual kWh savings for the matched tracking accounts</td>
</tr>
<tr>
<td>2016 Lifetime Savings (MWh)</td>
<td>Sum of gross annual lifetime kWh savings for the matched tracking accounts either as directly reported by the PAs or derived from the gross annual savings multiplied by the measure lifetime.</td>
</tr>
<tr>
<td># Participants (2016)</td>
<td>Count of the unique number of matched tracking accounts that participated in an efficiency program as identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td># Applications / Projects (2016)</td>
<td>Count of the unique number of project applications numbers for the matched tracking accounts from the efficiency program as identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>Incentive $ (2016)</td>
<td>Sum of the incentive dollars for the matched tracking accounts as identified in the C&amp;I database</td>
</tr>
</tbody>
</table>
Table 8-15 and Table 8-16 show key variable breakouts statewide, separated by broad GWh size range and narrow GWh size range. PA-specific versions of this table can be found in Section 5.4.2. These charts contain only tracking data that can be successfully matched to billing data; this decreases total overall savings from what is seen in other sections of the report.

Lifetime savings are presented using the following logic:

- The savings are as reported by the PA—this is particularly important for custom projects.

If there were no savings reported, but the PA provided a measure life and annual savings, DNV GL used this information to derive the gross lifetime savings.

When no savings were provided, or could be derived, the savings information was left blank. This is reflected in the phase 2 variable level documentation provided to each individual PA.
Table 8-15. All PAs’ kWh broad breakouts, excluding unlinked tracking data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>299,050</td>
<td>4,514,967,103</td>
<td>341,259</td>
<td>265,118,053</td>
<td>103,075,075</td>
<td>896,169</td>
<td>7,775</td>
<td>8,410</td>
<td>$ 34,217,963</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>20,718</td>
<td>4,487,900,211</td>
<td>22,588</td>
<td>626,320,497</td>
<td>82,838,524</td>
<td>885,465</td>
<td>2,682</td>
<td>3,127</td>
<td>$ 28,775,702</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>5,342</td>
<td>4,324,476,635</td>
<td>5,883</td>
<td>1,064,660,249</td>
<td>98,624,318</td>
<td>1,100,380</td>
<td>1,250</td>
<td>1,626</td>
<td>$ 29,857,288</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>2,141</td>
<td>5,293,075,897</td>
<td>2,266</td>
<td>1,813,937,600</td>
<td>98,624,318</td>
<td>1,100,380</td>
<td>1,250</td>
<td>1,626</td>
<td>$ 26,682,746</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>758</td>
<td>9,270,054,628</td>
<td>787</td>
<td>6,070,876,358</td>
<td>204,262,349</td>
<td>2,758,114</td>
<td>429</td>
<td>970</td>
<td>$ 40,759,183</td>
</tr>
<tr>
<td>Missing/Zero</td>
<td>7,946</td>
<td>(592,025,505)</td>
<td>9,533</td>
<td>(6,201,509)</td>
<td>6,156,698</td>
<td>75,556</td>
<td>102</td>
<td>123</td>
<td>$ 2,212,792</td>
</tr>
<tr>
<td>TOTAL</td>
<td>335,955</td>
<td>27,298,448,968</td>
<td>382,316</td>
<td>9,834,711,248</td>
<td>610,813,921</td>
<td>7,044,981</td>
<td>12,943</td>
<td>15,288</td>
<td>$ 162,505,674</td>
</tr>
</tbody>
</table>

Table 8-16. All PAs’ kWh narrow breakouts, excluding unlinked tracking data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unassigned (inc. zero, blanks, etc.)</td>
<td>7,946</td>
<td>592,162,802</td>
<td>9,533</td>
<td>6,201,509</td>
<td>6,156,698</td>
<td>75,556</td>
<td>102</td>
<td>123</td>
<td>$ 2,212,792</td>
</tr>
<tr>
<td>&lt; 0.01 GWh</td>
<td>186,871</td>
<td>592,162,802</td>
<td>217,536</td>
<td>8,884,372</td>
<td>22,186,100</td>
<td>165,004</td>
<td>1,934</td>
<td>2,051</td>
<td>$ 6,259,397</td>
</tr>
<tr>
<td>0.01 – 0.025 GWh</td>
<td>54,452</td>
<td>873,982,783</td>
<td>60,415</td>
<td>32,470,218</td>
<td>18,973,181</td>
<td>141,522</td>
<td>1,936</td>
<td>2,069</td>
<td>$ 6,008,948</td>
</tr>
<tr>
<td>0.025 – 0.05 GWh</td>
<td>31,609</td>
<td>1,125,896,464</td>
<td>35,339</td>
<td>65,402,939</td>
<td>25,037,798</td>
<td>231,863</td>
<td>1,801</td>
<td>1,966</td>
<td>$ 9,046,720</td>
</tr>
<tr>
<td>0.05 – 0.1 GWh</td>
<td>23,704</td>
<td>1,670,088,300</td>
<td>25,358</td>
<td>135,542,986</td>
<td>32,986,649</td>
<td>320,230</td>
<td>1,886</td>
<td>2,087</td>
<td>$ 11,578,149</td>
</tr>
<tr>
<td>0.1 – 0.25 GWh</td>
<td>16,797</td>
<td>2,607,003,140</td>
<td>18,306</td>
<td>297,951,581</td>
<td>48,279,210</td>
<td>503,224</td>
<td>1,872</td>
<td>2,163</td>
<td>$ 17,206,062</td>
</tr>
<tr>
<td>0.25 – 0.5 GWh</td>
<td>6,787</td>
<td>2,352,617,956</td>
<td>7,405</td>
<td>393,283,715</td>
<td>41,006,370</td>
<td>444,609</td>
<td>1,115</td>
<td>1,301</td>
<td>$ 13,751,050</td>
</tr>
<tr>
<td>0.5 – 1 GWh</td>
<td>23,704</td>
<td>2,502,738,799</td>
<td>25,358</td>
<td>135,542,986</td>
<td>32,986,649</td>
<td>320,230</td>
<td>1,886</td>
<td>2,087</td>
<td>$ 11,578,149</td>
</tr>
<tr>
<td>1 – 2.5 GWh</td>
<td>2,559</td>
<td>4,026,847,895</td>
<td>28,244</td>
<td>1,192,728,054</td>
<td>93,310,217</td>
<td>1,040,408</td>
<td>750</td>
<td>1,081</td>
<td>$ 24,563,177</td>
</tr>
<tr>
<td>2.5 – 5 GWh</td>
<td>982</td>
<td>3,310,270,080</td>
<td>1,015</td>
<td>1,278,446,054</td>
<td>74,518,345</td>
<td>845,029</td>
<td>376</td>
<td>554</td>
<td>$ 15,703,781</td>
</tr>
<tr>
<td>5 – 10 GWh</td>
<td>378</td>
<td>2,605,911,126</td>
<td>392</td>
<td>1,327,792,245</td>
<td>38,198,038</td>
<td>457,701</td>
<td>191</td>
<td>335</td>
<td>$ 9,630,307</td>
</tr>
<tr>
<td>10 – 25 GWh</td>
<td>218</td>
<td>3,236,646,311</td>
<td>223</td>
<td>2,224,673,081</td>
<td>99,304,014</td>
<td>1,494,603</td>
<td>146</td>
<td>320</td>
<td>$ 17,540,847</td>
</tr>
<tr>
<td>25 – 50 GWh</td>
<td>69</td>
<td>2,986,308,683</td>
<td>49</td>
<td>2,332,716,590</td>
<td>57,865,689</td>
<td>737,994</td>
<td>53</td>
<td>252</td>
<td>$ 11,867,827</td>
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<tr>
<td>&gt; 50 GWh</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>TOTAL</td>
<td>335,955</td>
<td>27,990,474,474</td>
<td>382,316</td>
<td>9,840,912,757</td>
<td>604,657,223</td>
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<td>12,841</td>
<td>15,165</td>
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### Table 8-17. Cape Light Compact kWh broad breakouts, excluding unlinked tracking data

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</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>24,077</td>
<td>303,652,610</td>
<td>23,877</td>
<td>16,520,463</td>
<td>4,126,826</td>
<td>-</td>
<td>586</td>
<td>853</td>
<td>1,664,469</td>
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<tr>
<td>0.11 - 0.47 GWh</td>
<td>1,021</td>
<td>208,680,185</td>
<td>1,088</td>
<td>30,400,364</td>
<td>2,361,886</td>
<td>-</td>
<td>133</td>
<td>199</td>
<td>963,854</td>
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<tr>
<td>0.47 - 1.5 GWh</td>
<td>185</td>
<td>135,303,286</td>
<td>185</td>
<td>40,117,408</td>
<td>1,512,913</td>
<td>-</td>
<td>50</td>
<td>103</td>
<td>910,018</td>
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<td>1.5 - 4.5 GWh</td>
<td>51</td>
<td>206,474,657</td>
<td>60</td>
<td>76,165,717</td>
<td>3,821,695</td>
<td>-</td>
<td>22</td>
<td>71</td>
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<td>735</td>
<td>(78,138,603)</td>
<td>632</td>
<td>(2,321,552)</td>
<td>72,590</td>
<td>-</td>
<td>7</td>
<td>10</td>
<td>21,711</td>
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<td>TOTAL</td>
<td>26,069</td>
<td>775,972,136</td>
<td>25,842</td>
<td>160,882,399</td>
<td>11,895,910</td>
<td>-</td>
<td>798</td>
<td>1,236</td>
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### Table 8-18. Cape Light Compact kWh narrow breakouts, excluding unlinked tracking data

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<td>Unassigned (inc. zero, blanks, etc.)</td>
<td>735</td>
<td>16,240</td>
<td>54,218,603</td>
<td>16,106</td>
<td>838,665</td>
<td>1,010,349</td>
<td>-</td>
<td>181</td>
<td>220</td>
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<tr>
<td>0.01 - 0.025 GWh</td>
<td>4,343</td>
<td>68,656,679</td>
<td>4,248</td>
<td>2,717,940</td>
<td>830,841</td>
<td>-</td>
<td>171</td>
<td>233</td>
<td>318,313</td>
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<tr>
<td>0.025 - 0.05 GWh</td>
<td>1,955</td>
<td>69,930,220</td>
<td>2,038</td>
<td>3,830,473</td>
<td>758,614</td>
<td>-</td>
<td>107</td>
<td>190</td>
<td>392,902</td>
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<td>0.05 - 0.1 GWh</td>
<td>1,376</td>
<td>96,977,764</td>
<td>1,324</td>
<td>8,306,138</td>
<td>1,441,131</td>
<td>-</td>
<td>117</td>
<td>197</td>
<td>651,324</td>
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<td>0.1 - 0.25 GWh</td>
<td>896</td>
<td>137,443,070</td>
<td>935</td>
<td>15,189,757</td>
<td>1,257,439</td>
<td>-</td>
<td>95</td>
<td>151</td>
<td>658,494</td>
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<td>0.25 - 0.5 GWh</td>
<td>291</td>
<td>100,014,090</td>
<td>316</td>
<td>18,913,480</td>
<td>1,199,159</td>
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<td>52</td>
<td>69</td>
<td>353,807</td>
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<td>0.5 - 1 GWh</td>
<td>124</td>
<td>85,676,337</td>
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<td>946,944</td>
<td>-</td>
<td>34</td>
<td>59</td>
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<td>1 - 2.5 GWh</td>
<td>62</td>
<td>100,014,090</td>
<td>66</td>
<td>-</td>
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<tr>
<td>2.5 - 5 GWh</td>
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<td>140,212,063</td>
<td>26</td>
<td>88,868,647</td>
<td>4,378,843</td>
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<td>32</td>
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<td>5 - 10 GWh</td>
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<tr>
<td>10 - 25 GWh</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>25 - 50 GWh</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>&gt; 50 GWh</td>
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<td>-</td>
<td>791</td>
<td>1,226</td>
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Table 8-19. 2011-2016 composition of gross lighting savings, Cape Light Compact

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<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tbody>
<tr>
<td></td>
<td>Non-Stream</td>
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<td>Non-Stream</td>
<td>Non-Stream</td>
<td>Non-Stream</td>
<td>Non-Stream</td>
</tr>
<tr>
<td></td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
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<tr>
<td>Advanced Lighting Design</td>
<td>151,791</td>
<td>128,378</td>
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<td></td>
<td>17,147</td>
<td>3,573</td>
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<tr>
<td>Controls</td>
<td>155,828</td>
<td>335,598</td>
<td>440,399</td>
<td>189,563</td>
<td>65,250</td>
<td>50,946</td>
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<td>Linear and Other Fluorescent (not screw-based)</td>
<td>1,653,022</td>
<td>762,585</td>
<td>10,471</td>
<td>764,704</td>
<td>31,617</td>
<td>636,684</td>
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<tr>
<td>Linear and Other LED (not screw-based)</td>
<td>534,458</td>
<td>1,471,048</td>
<td>1,721,071</td>
<td>32,240</td>
<td>3,399,604</td>
<td>101,616</td>
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<tr>
<td>Other / Custom</td>
<td>1,537,492</td>
<td>1,984,756</td>
<td>931,255</td>
<td>1,518,576</td>
<td>4,015,223</td>
<td>1,737,699</td>
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<tr>
<td>Screw-Based Lamps</td>
<td>2,382,056</td>
<td>1,153,727</td>
<td>55,985</td>
<td>982,178</td>
<td>4,440,301</td>
<td>11,570,686</td>
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<tr>
<td>Upstream Data Adjustment</td>
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<tr>
<td></td>
<td>1,963,095</td>
<td>1,966,956</td>
<td>979,509</td>
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<td>759,034</td>
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<td><strong>Grand Total</strong></td>
<td>6,414,647</td>
<td>5,836,091</td>
<td>2,029,531</td>
<td>4,840,207</td>
<td>5,483,667</td>
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Table 8-20. 2011-2016 composition of gross lighting savings within Screw-Based Lamps, Cape Light Compact

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<tr>
<th>Lighting (Specific)</th>
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<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tr>
<td></td>
<td>Non-Stream</td>
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<td>Non-Stream</td>
<td>Non-Stream</td>
<td>Non-Stream</td>
<td>Non-Stream</td>
</tr>
<tr>
<td></td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
<td>(kWh)</td>
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<tr>
<td>LED Troffer (2x4, 2x2)</td>
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</tr>
<tr>
<td></td>
<td>113,805</td>
<td></td>
<td>26,647</td>
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<td>197,918</td>
<td>23,542</td>
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<tr>
<td>Retrofit Kit</td>
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<tr>
<td>TLED (2', 4')</td>
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</tr>
<tr>
<td>U-Bend Replacement Wall Lighting</td>
<td></td>
<td>6,395</td>
<td></td>
<td></td>
<td></td>
<td>820,702</td>
</tr>
<tr>
<td>Other</td>
<td>33,527</td>
<td>188,474</td>
<td>853,313</td>
<td>532,821</td>
<td>2,379,849</td>
<td>47,837</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>33,527</td>
<td>308,674</td>
<td>853,313</td>
<td>532,821</td>
<td>2,379,849</td>
<td>214,111</td>
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### Table 8-21. Eversource kWh broad breakouts, excluding unlinked tracking data

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</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>128,709</td>
<td>2,081,946,707</td>
<td>150,870</td>
<td>120,051,633</td>
<td>53,952,499</td>
<td>507,396</td>
<td>3,583</td>
<td>3,665</td>
<td>$ 18,740,374</td>
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<tr>
<td>0.11 – 0.47 GWh</td>
<td>9,872</td>
<td>2,132,650,477</td>
<td>11,104</td>
<td>253,688,152</td>
<td>35,386,029</td>
<td>392,094</td>
<td>1,106</td>
<td>1,171</td>
<td>$ 13,281,877</td>
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<tr>
<td>0.47 – 1.5 GWh</td>
<td>2,563</td>
<td>2,075,273,382</td>
<td>3,027</td>
<td>463,628,490</td>
<td>44,790,011</td>
<td>518,569</td>
<td>547</td>
<td>641</td>
<td>$ 13,176,220</td>
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<tr>
<td>1.5 – 4.5 GWh</td>
<td>1,085</td>
<td>2,698,065,776</td>
<td>1,188</td>
<td>823,713,858</td>
<td>41,264,382</td>
<td>459,055</td>
<td>315</td>
<td>394</td>
<td>$ 9,194,062</td>
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<tr>
<td>&gt; 4.5 GWh</td>
<td>441</td>
<td>5,574,735,259</td>
<td>467</td>
<td>3,465,605,338</td>
<td>1,859,122</td>
<td>9,176,220</td>
<td>234</td>
<td>508</td>
<td>$ 22,705,109</td>
</tr>
<tr>
<td>Missing/Zero</td>
<td>3,239</td>
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<td>4,139</td>
<td>(784,669)</td>
<td>1,802,942</td>
<td>15,663</td>
<td>51</td>
<td>55</td>
<td>$ 544,823</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>145,909</strong></td>
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<td><strong>170,795</strong></td>
<td><strong>308,940,295</strong></td>
<td><strong>6,434</strong></td>
<td><strong>77,642,464</strong></td>
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### Table 8-22. Eversource kWh narrow breakouts, excluding unlinked tracking data

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<td>Unassigned (inc. zero, blanks, etc.)</td>
<td>3,239</td>
<td>4,139</td>
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<td></td>
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<tr>
<td>&lt; 0.01 GWh</td>
<td>77,074</td>
<td>250,926,580</td>
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<td>4,300,794</td>
<td>12,334,253</td>
<td>105,294</td>
<td>927</td>
<td>949</td>
<td>$ 3,291,108</td>
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<tr>
<td>0.01 – 0.025 GWh</td>
<td>24,534</td>
<td>395,466,184</td>
<td>27,557</td>
<td>15,131,513</td>
<td>15,072,031</td>
<td>160,164</td>
<td>811</td>
<td>830</td>
<td>$ 5,803,601</td>
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<tr>
<td>0.025 – 0.05 GWh</td>
<td>8,068</td>
<td>525,358,727</td>
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<td>139,143</td>
<td>855</td>
<td>882</td>
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<td>11,170</td>
<td>788,023,106</td>
<td>12,184</td>
<td>58,824,204</td>
<td>160,164</td>
<td>811</td>
<td>830</td>
<td>5,803,601</td>
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<td>0.1 – 0.25 GWh</td>
<td>8,669</td>
<td>1,253,175,234</td>
<td>8,997</td>
<td>20,735,101</td>
<td>214,742</td>
<td>804</td>
<td>838</td>
<td>8,163,981</td>
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<tr>
<td>0.25 – 0.5 GWh</td>
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<td>1,098,464,236</td>
<td>3,665</td>
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<td>207,313</td>
<td>441</td>
<td>477</td>
<td>6,224,939</td>
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<td>0.5 – 1 GWh</td>
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<td>25,673,838</td>
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<td>1 – 2.5 GWh</td>
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<td>402,526</td>
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<td>386</td>
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<td>2.5 – 5 GWh</td>
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<td>31,642,149</td>
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<td>5 – 10 GWh</td>
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<td>237</td>
<td>17,685,180</td>
<td>218,581</td>
<td>105</td>
<td>164</td>
<td>3,693,472</td>
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<td>10 – 25 GWh</td>
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<td>1,190,026</td>
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<td>153</td>
<td>10,677,993</td>
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<tr>
<td>25 – 50 GWh</td>
<td>42</td>
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<td>42</td>
<td>32,765,547</td>
<td>399,503</td>
<td>29</td>
<td>169</td>
<td>7,122,264</td>
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<tr>
<td>&gt; 50 GWh</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>145,909</strong></td>
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<td><strong>170,795</strong></td>
<td><strong>307,137,353</strong></td>
<td><strong>3,736,236</strong></td>
<td><strong>5,785</strong></td>
<td><strong>6,379</strong></td>
<td><strong>77,097,642</strong></td>
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### Table 8-23. 2011-2016 composition of gross lighting savings, Eversource

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<th>Lighting (Broad)</th>
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<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tr>
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<td>Non-Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
</tr>
<tr>
<td>Advanced Lighting Design</td>
<td>2,071,052</td>
<td>4,669,936</td>
<td>2,433,565</td>
<td>5,590,080</td>
<td>4,570,705</td>
<td>6,021,246</td>
</tr>
<tr>
<td>Controls</td>
<td>10,714,839</td>
<td>7,887,393</td>
<td>5,302,435</td>
<td>4,506,497</td>
<td>3,526,021</td>
<td>4,581,392</td>
</tr>
<tr>
<td>Linear and Other Fluorescent</td>
<td>51,174,717</td>
<td>44,252,593</td>
<td>181,790</td>
<td>29,042,608</td>
<td>15,431,280</td>
<td>9,945,457</td>
</tr>
<tr>
<td>(not screw-based)</td>
<td>1,630,606</td>
<td>3,515,118</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear and Other LED (not screw-based)</td>
<td>2,108,638</td>
<td>4,693,374</td>
<td>12,329,274</td>
<td>143,424</td>
<td>16,910,766</td>
<td>3,945,609</td>
</tr>
<tr>
<td>Other / Custom</td>
<td>43,178,740</td>
<td>61,559,980</td>
<td>71,430,330</td>
<td>29,042,608</td>
<td>15,431,280</td>
<td>9,945,457</td>
</tr>
<tr>
<td>Screw-Based Lamps</td>
<td>16,081,997</td>
<td>23,822,503</td>
<td>21,047,665</td>
<td>24,757,008</td>
<td>24,659,734</td>
<td>25,695,930</td>
</tr>
<tr>
<td>Upstream Data Adjustment</td>
<td>53,517,154</td>
<td>8,642,218</td>
<td>78,816,036</td>
<td>6,527,135</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>125,329,983</td>
<td>146,914,779</td>
<td>55,637,678</td>
<td>142,087,877</td>
<td>60,208,750</td>
<td>96,517,658</td>
</tr>
</tbody>
</table>

### Table 8-24. 2011 – 2016 composition of gross lighting savings within screw-based lamps, Eversource

<table>
<thead>
<tr>
<th>Lighting (Specific)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
</tr>
<tr>
<td>A-Lamp</td>
<td>292,951</td>
<td>321,860</td>
<td>321,406</td>
<td>1,476,374</td>
<td>9,432,832</td>
<td>1,147,896</td>
</tr>
<tr>
<td>Down-lights</td>
<td>4,081,302</td>
<td>6,479,214</td>
<td>10,370,220</td>
<td>13,689,072</td>
<td>3,879,996</td>
<td>11,691,534</td>
</tr>
<tr>
<td>Globe</td>
<td>517,154</td>
<td>8,642,218</td>
<td>78,816,036</td>
<td>6,527,135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HID</td>
<td>1,303,178</td>
<td>709,574</td>
<td>403,301</td>
<td>78,255</td>
<td>5,014</td>
<td>15,313,465</td>
</tr>
<tr>
<td>Pin</td>
<td>112,633</td>
<td>72,049</td>
<td>259,880</td>
<td>105,248</td>
<td>2,032,334</td>
<td>16,386,231</td>
</tr>
<tr>
<td>Reflectors</td>
<td>7,285,588</td>
<td>9,073,203</td>
<td>9,432,832</td>
<td>1,147,896</td>
<td>32,578,131</td>
<td>1,222,936</td>
</tr>
<tr>
<td>Street Lights</td>
<td>2,108,638</td>
<td>4,693,374</td>
<td>12,329,274</td>
<td>143,424</td>
<td>16,910,766</td>
<td>3,945,609</td>
</tr>
<tr>
<td>Other / Specialty</td>
<td>2,296,455</td>
<td>4,669,314</td>
<td>21,600</td>
<td>53,517,154</td>
<td>8,642,218</td>
<td>14,539,497</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>16,081,997</td>
<td>23,822,503</td>
<td>21,047,665</td>
<td>24,757,008</td>
<td>24,659,734</td>
<td>25,695,930</td>
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### Table 8-25. National Grid kWh broad breakouts, excluding unlinked tracking data

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td>142,535</td>
<td>2,083,373,890</td>
<td>162,932</td>
<td>125,513,177</td>
<td>44,157,605</td>
<td>378,982</td>
<td>3,518</td>
<td>3,801</td>
<td>13,259,797</td>
</tr>
<tr>
<td>0.11 – 0.47 GWh</td>
<td>9,630</td>
<td>2,104,911,240</td>
<td>10,215</td>
<td>333,136,537</td>
<td>44,081,799</td>
<td>481,548</td>
<td>1,400</td>
<td>1,701</td>
<td>13,882,311</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td>2,559</td>
<td>2,084,246,414</td>
<td>2,644</td>
<td>553,198,366</td>
<td>52,066,651</td>
<td>580,795</td>
<td>646</td>
<td>876</td>
<td>15,671,701</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
<td>997</td>
<td>2,457,797,777</td>
<td>1,009</td>
<td>940,398,761</td>
<td>69,929,618</td>
<td>855,347</td>
<td>368</td>
<td>581</td>
<td>16,351,383</td>
</tr>
<tr>
<td>&gt; 4.5 GWh</td>
<td>301</td>
<td>3,428,738,403</td>
<td>308</td>
<td>2,453,134,491</td>
<td>71,292,762</td>
<td>886,828</td>
<td>186</td>
<td>429</td>
<td>17,879,217</td>
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<tr>
<td>Missing/Zero</td>
<td>3,971</td>
<td>(342,946,925)</td>
<td>4,761</td>
<td>(3,095,287)</td>
<td>4,281,166</td>
<td>59,893</td>
<td>44</td>
<td>58</td>
<td>1,646,199</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>159,993</strong></td>
<td><strong>11,816,120,800</strong></td>
<td><strong>181,869</strong></td>
<td><strong>4,402,284,944</strong></td>
<td><strong>285,809,601</strong></td>
<td><strong>3,243,393</strong></td>
<td><strong>6,162</strong></td>
<td><strong>7,445</strong></td>
<td><strong>78,690,607</strong></td>
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### Table 8-26. National Grid kWh narrow breakouts, excluding unlinked tracking data

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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unassigned (inc. zero, blanks, etc.)</td>
<td>3,971</td>
<td>4,761</td>
<td>5,023</td>
<td>6,289</td>
<td>7,555</td>
<td>8,821</td>
<td>9,087</td>
<td>10,353</td>
<td>11,620</td>
</tr>
<tr>
<td>&lt; 0.01 GWh</td>
<td>90,945</td>
<td>279,774,103</td>
<td>105,748</td>
<td>3,682,561</td>
<td>8,763,845</td>
<td>59,049</td>
<td>812</td>
<td>870</td>
<td>2,662,677</td>
</tr>
<tr>
<td>0.01 – 0.025 GWh</td>
<td>25,042</td>
<td>401,396,311</td>
<td>28,071</td>
<td>14,120,593</td>
<td>29,402,410</td>
<td>10,079,940</td>
<td>88,788</td>
<td>809</td>
<td>1,043</td>
</tr>
<tr>
<td>0.025 – 0.05 GWh</td>
<td>14,522</td>
<td>518,586,703</td>
<td>16,342</td>
<td>29,402,410</td>
<td>16,258,211</td>
<td>157,475</td>
<td>941</td>
<td>1,043</td>
<td>3,072,913</td>
</tr>
<tr>
<td>0.05 – 0.1 GWh</td>
<td>10,226</td>
<td>768,372,723</td>
<td>11,630</td>
<td>67,126,339</td>
<td>67,126,339</td>
<td>280,970,947</td>
<td>941</td>
<td>1,043</td>
<td>4,987,930</td>
</tr>
<tr>
<td>0.1 – 0.25 GWh</td>
<td>7,680</td>
<td>1,192,418,266</td>
<td>8,202</td>
<td>151,635,243</td>
<td>25,514,603</td>
<td>278,963</td>
<td>941</td>
<td>1,132</td>
<td>7,870,581</td>
</tr>
<tr>
<td>0.25 – 0.5 GWh</td>
<td>3,264</td>
<td>1,131,546,286</td>
<td>3,376</td>
<td>214,504,887</td>
<td>214,504,887</td>
<td>235,175</td>
<td>611</td>
<td>741</td>
<td>7,037,648</td>
</tr>
<tr>
<td>0.5 – 1 GWh</td>
<td>1,694</td>
<td>1,179,563,965</td>
<td>1,743</td>
<td>280,070,947</td>
<td>280,070,947</td>
<td>276,123</td>
<td>399</td>
<td>533</td>
<td>8,477,354</td>
</tr>
<tr>
<td>1 – 2.5 GWh</td>
<td>1,247</td>
<td>1,956,092,895</td>
<td>1,296</td>
<td>647,988,923</td>
<td>54,150,123</td>
<td>636,826</td>
<td>405</td>
<td>600</td>
<td>13,948,553</td>
</tr>
<tr>
<td>2.5 – 5 GWh</td>
<td>449</td>
<td>1,521,314,866</td>
<td>442</td>
<td>642,912,999</td>
<td>41,778,416</td>
<td>523,999</td>
<td>186</td>
<td>307</td>
<td>9,375,117</td>
</tr>
<tr>
<td>5 – 10 GWh</td>
<td>142</td>
<td>979,014,021</td>
<td>150</td>
<td>571,448,453</td>
<td>20,103,421</td>
<td>234,745</td>
<td>82</td>
<td>157</td>
<td>5,833,669</td>
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<tr>
<td>10 – 25 GWh</td>
<td>87</td>
<td>1,304,100,425</td>
<td>87</td>
<td>930,374,652</td>
<td>24,955,110</td>
<td>304,577</td>
<td>61</td>
<td>162</td>
<td>6,847,612</td>
</tr>
<tr>
<td>25 – 50 GWh</td>
<td>24</td>
<td>916,887,150</td>
<td>21</td>
<td>851,212,224</td>
<td>24,423,181</td>
<td>330,702</td>
<td>22</td>
<td>73</td>
<td>4,697,845</td>
</tr>
<tr>
<td>&gt; 50 GWh</td>
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<td></td>
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<td></td>
<td>24</td>
<td></td>
<td>24</td>
<td>73</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>159,993</strong></td>
<td><strong>12,159,067,724</strong></td>
<td><strong>181,869</strong></td>
<td><strong>4,405,380,231</strong></td>
<td><strong>281,528,435</strong></td>
<td><strong>3,183,500</strong></td>
<td><strong>6,118</strong></td>
<td><strong>7,387</strong></td>
<td><strong>77,044,409</strong></td>
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</table>
Table 8-27. 2011-2016 composition of gross lighting savings, 2011 – 2016, National Grid

<table>
<thead>
<tr>
<th>Lighting (Broad)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
</tr>
<tr>
<td>Advanced Lighting Design</td>
<td>446,859</td>
<td>1,750,283</td>
<td>3,202,995</td>
<td>1,765,042</td>
<td>1,594,536</td>
<td>1,504,536</td>
</tr>
<tr>
<td>Controls</td>
<td>5,717,688</td>
<td>7,019,461</td>
<td>4,552,053</td>
<td>2,950,931</td>
<td>5,322,942</td>
<td>12,777,896</td>
</tr>
<tr>
<td>Linear and Other Fluorescent (not screw-based)</td>
<td>35,250,891</td>
<td>4,375,857</td>
<td>653,310</td>
<td>31,977,829</td>
<td>4,844,246</td>
<td>64,661,284</td>
</tr>
<tr>
<td>Linear and Other LED (not screw-based)</td>
<td>2,628,319</td>
<td>7,455,670</td>
<td>13,614,809</td>
<td>34,967,997</td>
<td>3,940,619</td>
<td>46,786,501</td>
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<tr>
<td>Other / Custom</td>
<td>18,444,817</td>
<td>25,707,287</td>
<td>15,156,505</td>
<td>17,653,543</td>
<td>34,683,815</td>
<td>77,017,186</td>
</tr>
<tr>
<td>Screw-Based Lamps</td>
<td>9,388,113</td>
<td>9,853,914</td>
<td>1,529,024</td>
<td>8,990,940</td>
<td>56,621,803</td>
<td>14,839,933</td>
</tr>
<tr>
<td><strong>Upstream Data Adjustment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>71,876,685</td>
<td>89,312,472</td>
<td>2,182,334</td>
<td>77,398,929</td>
<td>39,115,378</td>
<td>89,854,068</td>
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</tbody>
</table>

Table 8-28. 2011-2016 composition of gross lighting savings within Screw-Based Lamps, 2011 – 2016, National Grid

<table>
<thead>
<tr>
<th>Lighting (Specific)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
</tr>
<tr>
<td>Down-lights</td>
<td>3,501,980</td>
<td>2,471,077</td>
<td>3,185,558</td>
<td>2,920,102</td>
<td>3,737,089</td>
<td>327,248</td>
</tr>
<tr>
<td>Globe</td>
<td>42,918</td>
<td>7,939</td>
<td>8,333</td>
<td>376,355</td>
<td>3,388,030</td>
<td>10,700,419</td>
</tr>
<tr>
<td>HID</td>
<td>1,662,295</td>
<td>2,945,952</td>
<td>44,582</td>
<td>2,209,608</td>
<td>2,216,089</td>
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<tr>
<td>Pin</td>
<td>312,688</td>
<td>173,490</td>
<td>151,172</td>
<td>30,461</td>
<td>19,172,036</td>
<td>1,766,613</td>
</tr>
<tr>
<td>Street Lights</td>
<td>263,084</td>
<td>722,361</td>
<td>2,064,515</td>
<td>8,651,705</td>
<td>9,671,924</td>
<td>71,353</td>
</tr>
<tr>
<td>Other / Specialty</td>
<td>702,737</td>
<td>1,032,576</td>
<td>5,716</td>
<td>506,858</td>
<td>1,021,942</td>
<td>48,303</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>9,388,113</td>
<td>9,853,914</td>
<td>1,529,024</td>
<td>8,990,940</td>
<td>56,621,803</td>
<td>14,839,933</td>
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Table 8-29. Unitil kWh broad breakouts, excluding unlinked tracking data

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.11 GWh</td>
<td></td>
<td>3,729</td>
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<td>3,032,779</td>
<td>838,144</td>
<td>9,790</td>
<td>88</td>
<td>91</td>
<td>$ 553,322</td>
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<tr>
<td>0.11 – 0.47 GWh</td>
<td></td>
<td>195</td>
<td>41,658,309</td>
<td>181</td>
<td>9,095,444</td>
<td>1,008,810</td>
<td>11,823</td>
<td>43</td>
<td>56</td>
<td>$ 647,661</td>
</tr>
<tr>
<td>0.47 – 1.5 GWh</td>
<td></td>
<td>35</td>
<td>29,653,553</td>
<td>27</td>
<td>7,715,986</td>
<td>254,743</td>
<td>1,016</td>
<td></td>
<td></td>
<td>$ 99,350</td>
</tr>
<tr>
<td>1.5 – 4.5 GWh</td>
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<td>24</td>
<td>197,318,653</td>
<td>21</td>
<td>125,796,894</td>
<td>2,066,418</td>
<td>27,059</td>
<td>16</td>
<td>26</td>
<td>$ 261,695</td>
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<tr>
<td>&gt; 4.5 GWh</td>
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<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Missing/Zero</td>
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<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>3,984</td>
<td>314,624,410</td>
<td>3,810</td>
<td>145,641,103</td>
<td>4,168,115</td>
<td>49,689</td>
<td>147</td>
<td>173</td>
<td>$ 1,562,028</td>
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Table 8-30. Unitil kWh narrow breakouts, excluding unlinked tracking data

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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unassigned (inc. zero, blanks, etc.)</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 0.01 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>0.01 – 0.025 GWh</td>
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<td></td>
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<td>0.025 – 0.05 GWh</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>$ 135,285</td>
</tr>
<tr>
<td>0.05 – 0.1 GWh</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>$ 513,006</td>
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<tr>
<td>0.1 – 0.25 GWh</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>0.25 – 0.5 GWh</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>0.5 – 1 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>1 – 2.5 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>2.5 – 5 GWh</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>5 – 10 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>10 – 25 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>25 – 50 GWh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>&gt; 50 GWh</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$ 495,700</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>3,984</td>
<td>314,624,410</td>
<td>3,810</td>
<td>145,641,103</td>
<td>4,168,115</td>
<td>49,689</td>
<td>147</td>
<td>173</td>
<td>$ 1,562,028</td>
</tr>
</tbody>
</table>
### Table 8-31. 2011-2016 composition of gross lighting savings, 2011 – 2016, Unitil

<table>
<thead>
<tr>
<th>Lighting (Broad)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
<td>Upstream (kWh)</td>
<td>Non-Upstream (kWh)</td>
</tr>
<tr>
<td>Advanced Lighting Design Controls</td>
<td>194,468</td>
<td>1,439</td>
<td>39,074</td>
<td>61,407</td>
<td>47,837</td>
<td>47,837</td>
</tr>
<tr>
<td>Linear and Other Fluorescent (not screw-based)</td>
<td>224,222</td>
<td>857,456</td>
<td>1,126,661</td>
<td>559,573</td>
<td>99,663</td>
<td>23,542</td>
</tr>
<tr>
<td>Linear and Other LED (not screw-based)</td>
<td>33,527</td>
<td>308,674</td>
<td>853,313</td>
<td>532,821</td>
<td>26,647</td>
<td>2,014,721</td>
</tr>
<tr>
<td>Other / Custom</td>
<td>787,517</td>
<td>892,668</td>
<td>501,716</td>
<td>109,018</td>
<td>95,795</td>
<td>558,536</td>
</tr>
<tr>
<td>Screw-Based Lamps</td>
<td>111,248</td>
<td>33,976</td>
<td>45,396</td>
<td>584,500</td>
<td>987,073</td>
<td>1,680,276</td>
</tr>
<tr>
<td></td>
<td>283,109</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>1,156,514</td>
<td>2,287,243</td>
<td>45,802</td>
<td>2,483,129</td>
<td>891,296</td>
<td>2,729,512</td>
</tr>
<tr>
<td><strong>Lighting (Specific)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 8-32. 2011-2016 composition of gross lighting savings within Screw-Based Lamps, 2011 – 2016, Unitil

<table>
<thead>
<tr>
<th>Lighting (Specific)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Lamp</td>
<td>10,518</td>
<td>649,925</td>
<td>658,354</td>
<td>2,840</td>
<td>34,683</td>
<td></td>
</tr>
<tr>
<td>Down-lights</td>
<td>16,464</td>
<td>61,803</td>
<td>182,959</td>
<td>12,627</td>
<td>258,299</td>
<td></td>
</tr>
<tr>
<td>Globe</td>
<td>5,366</td>
<td>45,396</td>
<td>237,035</td>
<td>712,538</td>
<td>37,061</td>
<td>37,061</td>
</tr>
<tr>
<td>HID</td>
<td>111,248</td>
<td>13,746</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pin</td>
<td>26,427</td>
<td>12,152</td>
<td>37,061</td>
<td>37,061</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflectors</td>
<td>45,396</td>
<td>524,423</td>
<td>712,538</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street Lights</td>
<td>3,766</td>
<td>23,132</td>
<td>20,792</td>
<td>3,014</td>
<td>20,792</td>
<td></td>
</tr>
<tr>
<td>Other / Specialty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>111,248</td>
<td>33,976</td>
<td>45,396</td>
<td>584,500</td>
<td>987,073</td>
<td>1,680,276</td>
</tr>
</tbody>
</table>

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January 26, 2018  
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### 8.3.3 End use breakdowns

#### Table 8-33. Field names: end use breakdown tables

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>Count of the unique number of tracking projects, including those that could</td>
</tr>
<tr>
<td></td>
<td>not be linked with billing, identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>Savings (kWh)</td>
<td>Sum of the gross annual kWh savings for the tracking projects, including</td>
</tr>
<tr>
<td></td>
<td>those that could not be linked with billing, identified in the C&amp;I evaluation</td>
</tr>
<tr>
<td>% of Projects</td>
<td>Proportion tracking projects, including those that could not be linked with</td>
</tr>
<tr>
<td></td>
<td>billing, represented by the analysis bin (row)</td>
</tr>
<tr>
<td>% of kWh Savings</td>
<td>Proportion of the gross annual kWh savings for the tracking projects,</td>
</tr>
<tr>
<td></td>
<td>including those that could not be linked with billing, represented by the</td>
</tr>
<tr>
<td></td>
<td>analysis bin (row)</td>
</tr>
<tr>
<td>% of All Project for End Use</td>
<td>Proportion tracking projects, including those that could not be linked with</td>
</tr>
<tr>
<td></td>
<td>billing, represented by the analysis bin (row) as a percent of the total</td>
</tr>
<tr>
<td></td>
<td>number of projects for the analysis bin statewide</td>
</tr>
<tr>
<td>% of all kWh Savings for End Use</td>
<td>Proportion of the gross annual kWh savings for the tracking projects,</td>
</tr>
<tr>
<td></td>
<td>including those that could not be linked with billing, represented by the</td>
</tr>
<tr>
<td></td>
<td>analysis bin (row) as a percent of the total number of projects for the</td>
</tr>
<tr>
<td></td>
<td>analysis bin statewide</td>
</tr>
</tbody>
</table>

#### Table 8-34. Statewide end use overview – electric, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (kWh)</th>
<th>% of total projects</th>
<th>% of total electric savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>22</td>
<td>77,916,841</td>
<td>0.1%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>97</td>
<td>12,651,536</td>
<td>0.3%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>198</td>
<td>12,429,261</td>
<td>0.7%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Food Service</td>
<td>44</td>
<td>30,331</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>130</td>
<td>214,389</td>
<td>0.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>HVAC</td>
<td>790</td>
<td>103,493,631</td>
<td>2.9%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Lighting</td>
<td>6,814</td>
<td>327,655,722</td>
<td>24.6%</td>
<td>41.4%</td>
</tr>
<tr>
<td>Motors/Drives</td>
<td>82</td>
<td>5,585,424</td>
<td>0.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Process</td>
<td>343</td>
<td>55,603,659</td>
<td>1.2%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>679</td>
<td>14,893,322</td>
<td>2.4%</td>
<td>1.9%</td>
</tr>
<tr>
<td>N/A</td>
<td>886</td>
<td>3,634,731</td>
<td>3.2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>16,558</td>
<td>167,808,802</td>
<td>59.7%</td>
<td>21.2%</td>
</tr>
<tr>
<td>Upstream Other</td>
<td>1,054</td>
<td>9,366,940</td>
<td>3.8%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Total (including suppressed)</td>
<td>27,697</td>
<td>791,284,589</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 8-35. Cape Light Compact end uses – electric, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (kWh)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all electric savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>34</td>
<td>756,886</td>
<td>3%</td>
<td>4%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Lighting</td>
<td>335</td>
<td>7,554,520</td>
<td>27%</td>
<td>39%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>N/A</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>37</td>
<td>684,589</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>72</td>
<td>417,025</td>
<td>6%</td>
<td>2%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>716</td>
<td>8,612,870</td>
<td>58%</td>
<td>45%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td>1,233</td>
<td>19,153,339</td>
<td>100%</td>
<td>100%</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table 8-36. Eversource end uses – electric, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (kWh)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all electric savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>45</td>
<td>7,595,270</td>
<td>0%</td>
<td>2%</td>
<td>46%</td>
<td>60%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>83</td>
<td>5,340,295</td>
<td>1%</td>
<td>1%</td>
<td>42%</td>
<td>43%</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>431</td>
<td>69,124,942</td>
<td>3%</td>
<td>16%</td>
<td>55%</td>
<td>67%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>114</td>
<td>170,930</td>
<td>1%</td>
<td>0%</td>
<td>88%</td>
<td>80%</td>
</tr>
<tr>
<td>Lighting</td>
<td>3,161</td>
<td>149,983,796</td>
<td>23%</td>
<td>35%</td>
<td>46%</td>
<td>46%</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>39</td>
<td>2,754,012</td>
<td>0%</td>
<td>1%</td>
<td>48%</td>
<td>49%</td>
</tr>
<tr>
<td>N/A</td>
<td>872</td>
<td>2,696,489</td>
<td>6%</td>
<td>1%</td>
<td>98%</td>
<td>74%</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>155</td>
<td>18,314,600</td>
<td>1%</td>
<td>4%</td>
<td>45%</td>
<td>33%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>309</td>
<td>11,229,755</td>
<td>2%</td>
<td>3%</td>
<td>46%</td>
<td>75%</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>568</td>
<td>7,656,994</td>
<td>4%</td>
<td>2%</td>
<td>54%</td>
<td>82%</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>8,001</td>
<td>94,488,107</td>
<td>58%</td>
<td>22%</td>
<td>48%</td>
<td>56%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td>13,789</td>
<td>425,683,296</td>
<td>100%</td>
<td>100%</td>
<td>50%</td>
<td>54%</td>
</tr>
</tbody>
</table>

Table 8-37. National Grid end uses – electric, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (kWh)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all electric savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>51</td>
<td>5,055,446</td>
<td>0%</td>
<td>1%</td>
<td>53%</td>
<td>40%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>111</td>
<td>6,853,083</td>
<td>1%</td>
<td>2%</td>
<td>56%</td>
<td>55%</td>
</tr>
<tr>
<td>Food Service</td>
<td>40</td>
<td>21,142</td>
<td>0%</td>
<td>0%</td>
<td>91%</td>
<td>70%</td>
</tr>
<tr>
<td>HVAC</td>
<td>323</td>
<td>33,457,835</td>
<td>3%</td>
<td>10%</td>
<td>41%</td>
<td>32%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Lighting</td>
<td>3,211</td>
<td>167,377,815</td>
<td>26%</td>
<td>49%</td>
<td>47%</td>
<td>51%</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>35</td>
<td>1,995,031</td>
<td>0%</td>
<td>1%</td>
<td>43%</td>
<td>36%</td>
</tr>
<tr>
<td>N/A</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>183</td>
<td>36,590,109</td>
<td>1%</td>
<td>11%</td>
<td>53%</td>
<td>66%</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>331</td>
<td>2,952,068</td>
<td>3%</td>
<td>1%</td>
<td>49%</td>
<td>20%</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>413</td>
<td>1,173,339</td>
<td>3%</td>
<td>0%</td>
<td>39%</td>
<td>13%</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>7,734</td>
<td>64,012,840</td>
<td>62%</td>
<td>19%</td>
<td>47%</td>
<td>38%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td>12,471</td>
<td>341,711,732</td>
<td>100%</td>
<td>100%</td>
<td>45%</td>
<td>43%</td>
</tr>
</tbody>
</table>
### Table 8-38. Unitil end uses – electric, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (kWh)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all electric savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CHP</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Lighting</td>
<td>107</td>
<td>2,739,591</td>
<td>47%</td>
<td>52%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Motors / Drives</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>N/A</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream HVAC</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Lighting</td>
<td>107</td>
<td>694,984</td>
<td>47%</td>
<td>13%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td><strong>226</strong></td>
<td><strong>5,221,182</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>1%</strong></td>
<td><strong>1%</strong></td>
</tr>
</tbody>
</table>
8.3.4 Industry sector breakdowns, participants and savings

Table 8-39. Field names: industry sector breakdown tables

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>Count of the unique number of tracking participants including those that could not be linked with billing, identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>Savings (kWh)</td>
<td>Sum of the gross annual kWh savings for the tracking participants including those that could not be linked with billing, identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>% of Participants</td>
<td>Proportion tracking participants including those that could not be linked with billing, represented by the analysis bin (row)</td>
</tr>
<tr>
<td>% of kWh Savings</td>
<td>Proportion of the gross annual kWh savings for the tracking participants including those that could not be linked with billing, represented by the analysis bin (row)</td>
</tr>
<tr>
<td>% of All Participants for Industry Sector</td>
<td>Proportion tracking participants including those that could not be linked with billing, represented by the analysis bin (row) as a percent of the total number of participants for the analysis bin statewide</td>
</tr>
<tr>
<td>% of all kWh Savings for Industry Sector</td>
<td>Proportion of the gross annual kWh savings for the tracking participants, including those that could not be linked with billing, represented by the analysis bin (row) as a percent of the total number of participants for the analysis bin statewide</td>
</tr>
</tbody>
</table>
Table 8-40. Cape Light Compact participants and savings by industry sector, 2016 – electric, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2016 Total Incentives</th>
<th>% of Participants</th>
<th>% of kWh Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All kWh Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>250</td>
<td>4,452,945</td>
<td>639,101</td>
<td>19.08%</td>
<td>23.25%</td>
<td>9.65%</td>
<td>7.14%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>115</td>
<td>1,301,521</td>
<td>245,097</td>
<td>8.78%</td>
<td>6.80%</td>
<td>8.20%</td>
<td>5.41%</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
<td>52</td>
<td>1,022,514</td>
<td>312,787</td>
<td>3.97%</td>
<td>5.34%</td>
<td>3.13%</td>
<td>1.26%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>78</td>
<td>827,383</td>
<td>386,399</td>
<td>5.95%</td>
<td>4.32%</td>
<td>5.47%</td>
<td>0.89%</td>
</tr>
<tr>
<td>Information</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>53</td>
<td>374,087</td>
<td>195,831</td>
<td>4.05%</td>
<td>1.95%</td>
<td>3.60%</td>
<td>0.30%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>73</td>
<td>592,067</td>
<td>245,368</td>
<td>5.57%</td>
<td>1.95%</td>
<td>7.50%</td>
<td>3.31%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>194</td>
<td>1,353,863</td>
<td>432,516</td>
<td>14.81%</td>
<td>7.07%</td>
<td>3.44%</td>
<td>1.44%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>75</td>
<td>1,191,318</td>
<td>970,838</td>
<td>5.73%</td>
<td>6.22%</td>
<td>10.47%</td>
<td>5.96%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>211</td>
<td>5,249,645</td>
<td>1,362,774</td>
<td>16.11%</td>
<td>27.41%</td>
<td>5.68%</td>
<td>6.10%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>49</td>
<td>372,480</td>
<td>136,972</td>
<td>3.74%</td>
<td>1.94%</td>
<td>8.96%</td>
<td>1.52%</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unknown</td>
<td>132</td>
<td>2,226,151</td>
<td>687,431</td>
<td>10.08%</td>
<td>11.62%</td>
<td>10.65%</td>
<td>6.51%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,310</strong></td>
<td><strong>19,153,339</strong></td>
<td><strong>5,697,286</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>5.39%</strong></td>
<td><strong>2.42%</strong></td>
</tr>
</tbody>
</table>
Figure 8-11. Cape Light Compact savings contribution by sector, 2016 – historical electric snapshot, including unlinked tracking data
Table 8-41. Eversource participants and savings by industry sector, 2016 – electric, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2016 Total Incentives</th>
<th>% of Participants</th>
<th>% of kWh Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All kWh Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>1,206</td>
<td>20,541,197</td>
<td>$4,930,989</td>
<td>10.82%</td>
<td>6.01%</td>
<td>46.56%</td>
<td>32.93%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>88</td>
<td>2,088,961</td>
<td>$785,267</td>
<td>0.79%</td>
<td>0.61%</td>
<td>97.78%</td>
<td>99.35%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>703</td>
<td>9,903,801</td>
<td>$2,076,382</td>
<td>6.31%</td>
<td>2.90%</td>
<td>50.11%</td>
<td>41.18%</td>
</tr>
<tr>
<td>Construction</td>
<td>358</td>
<td>8,040,406</td>
<td>$2,461,639</td>
<td>3.21%</td>
<td>2.35%</td>
<td>90.63%</td>
<td>84.82%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>757</td>
<td>31,811,452</td>
<td>$9,265,375</td>
<td>6.79%</td>
<td>9.31%</td>
<td>45.49%</td>
<td>39.07%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>262</td>
<td>8,331,630</td>
<td>$2,154,569</td>
<td>2.35%</td>
<td>2.44%</td>
<td>48.88%</td>
<td>61.57%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>729</td>
<td>23,977,459</td>
<td>$5,920,891</td>
<td>6.54%</td>
<td>6.85%</td>
<td>51.09%</td>
<td>25.14%</td>
</tr>
<tr>
<td>Information</td>
<td>83</td>
<td>5,444,171</td>
<td>$1,193,753</td>
<td>0.74%</td>
<td>1.59%</td>
<td>48.26%</td>
<td>62.25%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>911</td>
<td>78,482,201</td>
<td>$19,959,154</td>
<td>8.18%</td>
<td>22.97%</td>
<td>61.85%</td>
<td>63.55%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>668</td>
<td>11,348,389</td>
<td>$3,039,317</td>
<td>5.99%</td>
<td>3.32%</td>
<td>68.65%</td>
<td>63.37%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>1,586</td>
<td>25,368,193</td>
<td>$5,459,532</td>
<td>14.23%</td>
<td>7.42%</td>
<td>28.12%</td>
<td>26.93%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>353</td>
<td>9,907,839</td>
<td>$2,912,858</td>
<td>3.17%</td>
<td>2.90%</td>
<td>49.30%</td>
<td>49.57%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>397</td>
<td>15,515,286</td>
<td>$6,334,091</td>
<td>3.56%</td>
<td>4.54%</td>
<td>30.56%</td>
<td>20.80%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1,916</td>
<td>50,455,411</td>
<td>$12,570,723</td>
<td>17.19%</td>
<td>14.77%</td>
<td>51.59%</td>
<td>58.65%</td>
</tr>
<tr>
<td>Utilities</td>
<td>252</td>
<td>8,911,865</td>
<td>$2,173,553</td>
<td>2.26%</td>
<td>2.61%</td>
<td>46.07%</td>
<td>36.40%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>49</td>
<td>4,180,801</td>
<td>$835,756</td>
<td>0.44%</td>
<td>1.22%</td>
<td>81.67%</td>
<td>56.95%</td>
</tr>
<tr>
<td>Unknown</td>
<td>507</td>
<td>14,754,579</td>
<td>$3,516,577</td>
<td>4.55%</td>
<td>4.32%</td>
<td>40.92%</td>
<td>43.12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,143</strong></td>
<td><strong>341,711,732</strong></td>
<td><strong>$89,286,761</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>45.86%</strong></td>
<td><strong>43.16%</strong></td>
</tr>
</tbody>
</table>
Figure 8-12. Eversource savings contribution by sector, 2016 – historical electric snapshot, including unlinked tracking data
Table 8-42. National Grid participants and savings by industry sector, 2016 – electric, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2016 Total Incentives</th>
<th>% of Participants</th>
<th>% of kWh Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All kWh Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>1,119</td>
<td>37,189,475</td>
<td>$8,049,238</td>
<td>9.62%</td>
<td>8.74%</td>
<td>43.20%</td>
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<tr>
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<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
</tr>
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<td>571</td>
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<td>40.70%</td>
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<tr>
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<td>13.65%</td>
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<td>832</td>
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<td>11.24%</td>
<td>50.00%</td>
<td>58.79%</td>
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<td>266</td>
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<td>1.18%</td>
<td>49.63%</td>
<td>37.02%</td>
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<td>67,997,521</td>
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<td>42.96%</td>
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<td>$780,805</td>
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<td>*</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
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<td>1.80%</td>
<td>1.34%</td>
<td>21.48%</td>
<td>31.86%</td>
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<td>68.16%</td>
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<td>2.08%</td>
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<td>44.39%</td>
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<td>58,824,303</td>
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<td>13.82%</td>
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<td>41.87%</td>
<td>34.64%</td>
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<td>2.08%</td>
<td>3.57%</td>
<td>44.24%</td>
<td>62.02%</td>
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<td>*</td>
<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>Unknown</td>
<td>593</td>
<td>17,127,621</td>
<td>$3,832,660</td>
<td>5.10%</td>
<td>4.02%</td>
<td>47.86%</td>
<td>50.05%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,636</strong></td>
<td><strong>425,683,296</strong></td>
<td><strong>$101,567,091</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>47.89%</strong></td>
<td><strong>53.76%</strong></td>
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</table>
Figure 8-13. National Grid savings contribution by sector, 2015 - historical electric snapshot, including unlinked tracking data
<table>
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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2016 Total Incentives</th>
<th>% of Participants</th>
<th>% of kWh Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All kWh Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>15</td>
<td>201,068</td>
<td>$38,829</td>
<td>7.14%</td>
<td>3.85%</td>
<td>0.58%</td>
<td>0.32%</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
<td>23</td>
<td>723,624</td>
<td>$165,697</td>
<td>10.95%</td>
<td>13.86%</td>
<td>1.38%</td>
<td>0.89%</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Information</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>20</td>
<td>1,256,072</td>
<td>$269,052</td>
<td>9.52%</td>
<td>24.06%</td>
<td>1.36%</td>
<td>1.02%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>23</td>
<td>262,445</td>
<td>$121,851</td>
<td>10.95%</td>
<td>5.03%</td>
<td>2.36%</td>
<td>1.47%</td>
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<td>1.18%</td>
<td>0.28%</td>
<td>0.07%</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Retail Trade</td>
<td>32</td>
<td>530,242</td>
<td>$303,899</td>
<td>15.24%</td>
<td>10.16%</td>
<td>0.86%</td>
<td>0.62%</td>
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<td>Transportation and Warehousing</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Utilities</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Wholesale Trade</td>
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<td>*</td>
<td>*</td>
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<td>*</td>
<td>*</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210</strong></td>
<td><strong>5,221,182</strong></td>
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<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>0.86%</strong></td>
<td><strong>0.66%</strong></td>
</tr>
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</table>
Figure 8-14 Unitil savings contribution by sector, 2015 - historical electric snapshot, including unlinked tracking data
### 8.3.5 Industry sector by multi-end use

Table 8-44. Cape Light Compact multi end use and savings proportion by industry sector – electric, excluding unlinked tracking data

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small -</td>
<td>-</td>
<td>0%</td>
<td>188,594</td>
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</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>Small</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>Small</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Construction</td>
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<td>*</td>
<td>*</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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</tr>
<tr>
<td>Health Care and Social Assistance</td>
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<td>*</td>
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<td>*</td>
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</tr>
<tr>
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<td>*</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
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<td>*</td>
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</tr>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
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</tr>
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<td>77%</td>
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</tr>
</tbody>
</table>
Table 8-45. Eversource multi end use and savings proportion by industry sector – electric, excluding unlinked tracking data

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<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
</thead>
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<td>Accommodation and Food Services</td>
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<td>905,575</td>
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<td>4,131,065</td>
<td>17%</td>
<td>20,731,024</td>
<td>83%</td>
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<td>*</td>
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<td>*</td>
</tr>
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<td>Arts, Entertainment, and Recreation</td>
<td>Large</td>
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<td>*</td>
<td>*</td>
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<td>*</td>
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<td>Finance and Insurance</td>
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<td>211,584</td>
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<td>Health Care and Social Assistance</td>
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<td>1,073,476</td>
<td>28%</td>
<td>2,791,717</td>
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</tr>
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<td>23,107</td>
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<td>376,527</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Small</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td>160,582</td>
<td>41%</td>
<td>235,845</td>
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</tr>
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<td>Large</td>
<td>1,316,800</td>
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<td>2,513,894</td>
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</tr>
<tr>
<td>Public Administration</td>
<td>Small</td>
<td>1,045,396</td>
<td>23%</td>
<td>3,552,129</td>
<td>77%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td>13,980,865</td>
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<td>32,264,354</td>
<td>70%</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>Large</td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Utilities</td>
<td>Small</td>
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<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Wholesale Trade</td>
<td>Large</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>Unknown</td>
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<td>18,930</td>
<td>17%</td>
<td>92,633</td>
<td>83%</td>
</tr>
<tr>
<td>Total</td>
<td>Large</td>
<td>68,216,341</td>
<td>23%</td>
<td>226,586,759</td>
<td>77%</td>
</tr>
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</table>
Table 8-46. National Grid multi end use and savings proportion by industry sector – electric, excluding unlinked tracking data

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>Small</td>
<td>-</td>
<td>0%</td>
<td>4,236,833</td>
<td>100%</td>
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<tr>
<td></td>
<td>Large</td>
<td>88,183</td>
<td>1%</td>
<td>9,686,129</td>
<td>99%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>Small</td>
<td>-</td>
<td>0%</td>
<td>128,501</td>
<td>100%</td>
</tr>
<tr>
<td></td>
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<td>-</td>
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<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>Small</td>
<td>9,344</td>
<td>6%</td>
<td>135,079</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>81,511</td>
<td>2%</td>
<td>5,181,270</td>
<td>98%</td>
</tr>
<tr>
<td>Construction</td>
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<td>-</td>
<td>0%</td>
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<td>100%</td>
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<td>-</td>
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<td>Educational Services</td>
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<td>1,179,554</td>
<td>100%</td>
</tr>
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<td>Large</td>
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<td>24,516,656</td>
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</tr>
<tr>
<td>Finance and Insurance</td>
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<td>-</td>
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</tr>
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<td></td>
<td>Large</td>
<td>328,036</td>
<td>5%</td>
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<td>Large</td>
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<td>18,190,463</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>-</td>
<td>0%</td>
<td>4,703,480</td>
<td>100%</td>
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<td>Small</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Small</td>
<td>39,624</td>
<td>6%</td>
<td>604,270</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>1,508,435</td>
<td>2%</td>
<td>73,590,977</td>
<td>98%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>Small</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td>4,254</td>
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<td>664,189</td>
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</tr>
<tr>
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<td>119,401</td>
<td>1%</td>
<td>9,617,404</td>
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<td>Small</td>
<td>-</td>
<td>0%</td>
<td>433,344</td>
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</tr>
<tr>
<td></td>
<td>Large</td>
<td>1,630,262</td>
<td>7%</td>
<td>23,033,436</td>
<td>93%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>Small</td>
<td>-</td>
<td>0%</td>
<td>340,925</td>
<td>100%</td>
</tr>
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<td></td>
<td>Large</td>
<td>-</td>
<td>0%</td>
<td>9,382,676</td>
<td>100%</td>
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</tr>
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<td>1,003,946</td>
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<td>100%</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>-</td>
<td>0%</td>
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<td>3%</td>
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</tr>
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</table>
Table 8-47. Unitil multi end use and savings proportion by industry sector – electric, excluding unlinked tracking data

<table>
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<th>Industry Sector</th>
<th>Consumption</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
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<td></td>
<td>Size</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>*</td>
<td>*</td>
</tr>
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<td></td>
<td>Large</td>
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<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>Small</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Construction</td>
<td>Small</td>
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<td></td>
<td>*</td>
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</tr>
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<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
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<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
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<td>Finance and Insurance</td>
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</tr>
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<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>Small</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
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<td>Information</td>
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<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Small</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>0%</td>
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</tr>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
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<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>Small</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>45,479</td>
<td>10%</td>
<td>406,090</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Utilities</td>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
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<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
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<td>*</td>
<td></td>
<td>*</td>
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<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td><strong>-</strong></td>
<td><strong>0%</strong></td>
<td><strong>72,726</strong></td>
<td><strong>100%</strong></td>
</tr>
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<td><strong>45,479</strong></td>
<td><strong>1%</strong></td>
<td><strong>4,044,483</strong></td>
<td><strong>99%</strong></td>
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</table>
### 8.3.6 Industry sector, participation and savings rates

**Table 8-48. Cape Light Compact participation rates – electric, including unlinked tracking**

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
</tr>
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<td>Accommodation and Food Services</td>
<td>143</td>
<td>4,576</td>
<td>1,537,626</td>
<td>150,368,811</td>
<td>$414,643</td>
<td>3.1%</td>
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</tr>
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<td>Administrative and Support and Waste</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>524,466</td>
<td>41,398,018</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
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<td>194</td>
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<td>36,113,582</td>
<td>$294,317</td>
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<td>*</td>
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<td>542</td>
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<td>$5,697,286</td>
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<td>-34.0%</td>
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<td><strong>Total</strong></td>
<td><strong>1,310</strong></td>
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<td><strong>19,153,339</strong></td>
<td><strong>774,337,528</strong></td>
<td><strong>$5,697,286</strong></td>
<td><strong>5.1%</strong></td>
<td><strong>2.5%</strong></td>
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Table 8-49. Eversource participation rates – electric, including unlinked tracking

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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>7,111</td>
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<td>1.9%</td>
</tr>
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<td></td>
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<tr>
<td>Management and Remediation Services</td>
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<td>*</td>
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<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td>*</td>
<td>*</td>
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<td>Arts, Entertainment, and Recreation</td>
<td>153</td>
<td>1,604</td>
<td>8,104,824</td>
<td>251,902,570</td>
<td>$2,777,512</td>
<td>9.5%</td>
<td>3.2%</td>
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<tr>
<td>Construction</td>
<td>22</td>
<td>633</td>
<td>1,293,457</td>
<td>33,052,220</td>
<td>$196,549</td>
<td>3.5%</td>
<td>3.9%</td>
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<tr>
<td>Educational Services</td>
<td>357</td>
<td>3,369</td>
<td>38,181,595</td>
<td>1,066,895,721</td>
<td>$10,162,984</td>
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<td>4,809,506</td>
<td>514,931,563</td>
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<td>0.9%</td>
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<tr>
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<td>4,061</td>
<td>62,418,131</td>
<td>1,313,241,922</td>
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<td>8,195</td>
<td>3,216,142</td>
<td>571,792,295</td>
<td>$780,805</td>
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<td>2,255</td>
<td>41,480,353</td>
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<td>5,705,698</td>
<td>161,962,109</td>
<td>$2,054,409</td>
<td>6.8%</td>
<td>3.5%</td>
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<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>2,342</td>
<td>79,666</td>
<td>54,138,053</td>
<td>3,330,777,696</td>
<td>$18,592,163</td>
<td>2.9%</td>
<td>1.6%</td>
</tr>
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<td>Public Administration</td>
<td>275</td>
<td>9,503</td>
<td>8,832,312</td>
<td>115,351,208</td>
<td>$2,290,929</td>
<td>2.9%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>872</td>
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<td>58,602,520</td>
<td>2,427,395,480</td>
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<td>4.5%</td>
<td>2.4%</td>
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<tr>
<td>Retail Trade</td>
<td>826</td>
<td>12,208</td>
<td>23,411,224</td>
<td>1,322,666,104</td>
<td>$7,505,567</td>
<td>6.8%</td>
<td>1.8%</td>
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<tr>
<td>Transportation and Warehousing</td>
<td>106</td>
<td>6,190</td>
<td>14,203,829</td>
<td>167,172,621</td>
<td>$3,756,195</td>
<td>1.7%</td>
<td>8.5%</td>
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<tr>
<td>Utilities</td>
<td>*</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Wholesale Trade</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>8,056</td>
<td>69,295,066</td>
<td>141,411,190</td>
<td>$101,567,091</td>
<td>62.1%</td>
<td>49.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,636</strong></td>
<td><strong>170,406</strong></td>
<td><strong>425,683,296</strong></td>
<td><strong>14,391,731,622</strong></td>
<td><strong>$101,567,091</strong></td>
<td><strong>6.8%</strong></td>
<td><strong>3.0%</strong></td>
</tr>
</tbody>
</table>
### Table 8-50. National Grid participation rates – electric, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>731</td>
<td>31,417</td>
<td>14,648,910</td>
<td>851,552,036</td>
<td>$4,280,242</td>
<td>2.3%</td>
<td>1.7%</td>
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<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>88</td>
<td>4,173</td>
<td>2,088,961</td>
<td>121,811,361</td>
<td>$785,267</td>
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<td>1.7%</td>
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<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>156</td>
<td>2,403</td>
<td>5,562,150</td>
<td>205,920,648</td>
<td>$1,552,098</td>
<td>6.5%</td>
<td>2.7%</td>
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<tr>
<td>Construction</td>
<td>358</td>
<td>10,082</td>
<td>8,040,406</td>
<td>265,640,606</td>
<td>$2,461,639</td>
<td>3.6%</td>
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<tr>
<td>Educational Services</td>
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<td>4,095</td>
<td>27,649,136</td>
<td>852,915,361</td>
<td>$8,543,899</td>
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<td>3.2%</td>
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<td>Finance and Insurance</td>
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<td>4,792</td>
<td>8,237,679</td>
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<td>$2,116,729</td>
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<td>9,681</td>
<td>20,786,800</td>
<td>990,737,697</td>
<td>$5,427,810</td>
<td>4.7%</td>
<td>2.1%</td>
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<td>6,877</td>
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<td>*</td>
<td>*</td>
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<tr>
<td>Manufacturing</td>
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<td>6,020</td>
<td>77,159,983</td>
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<td>$19,633,272</td>
<td>9.8%</td>
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<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Professional, Scientific, and Technical Services</td>
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<td><strong>341,711,732</strong></td>
<td><strong>11,816,120,800</strong></td>
<td><strong>$89,286,761</strong></td>
<td><strong>6.2%</strong></td>
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</table>
Table 8-51. Unitil participation rates – electric, including unlinked tracking

<table>
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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>24</td>
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<td>Health Care and Social Assistance</td>
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<td>*</td>
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<tr>
<td>Other Services (except Public Administration)</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Public Administration</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
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</tr>
<tr>
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<td>2.8%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210</strong></td>
<td><strong>110</strong></td>
<td><strong>5,221,182</strong></td>
<td><strong>41,987,304</strong></td>
<td><strong>$1,837,820</strong></td>
<td><strong>190.9%</strong></td>
<td><strong>12.4%</strong></td>
</tr>
</tbody>
</table>

Due to the presence of unlinked tracking accounts, it is possible for the number of participants in a given sector to exceed the number of billed customers.
### 8.3.7 Industry sector, average participant savings achieved

#### Table 8-52. Cape Light Compact average participant savings achieved – electric, excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All kWh Savings for Industry Sector</th>
<th>% of All kWh Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>1,500,011</td>
<td>20,186,332</td>
<td>$397,384</td>
<td>7.4%</td>
<td>3.6%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>523,148</td>
<td>5,059,847</td>
<td>$183,752</td>
<td>10.3%</td>
<td>4.6%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Services</td>
<td>843,613</td>
<td>17,318,540</td>
<td>$288,011</td>
<td>4.9%</td>
<td>1.5%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>523,300</td>
<td>29,929,464</td>
<td>$321,540</td>
<td>1.7%</td>
<td>0.6%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Information</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>345,268</td>
<td>1,746,637</td>
<td>$186,825</td>
<td>19.8%</td>
<td>0.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>522,619</td>
<td>2,574,848</td>
<td>$227,443</td>
<td>20.3%</td>
<td>3.4%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>878,043</td>
<td>14,151,790</td>
<td>$390,002</td>
<td>6.2%</td>
<td>1.1%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>1,012,595</td>
<td>23,295,685</td>
<td>$841,938</td>
<td>4.3%</td>
<td>8.2%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail Trade</td>
<td>4,491,638</td>
<td>34,127,009</td>
<td>$1,237,045</td>
<td>13.2%</td>
<td>6.1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>180,097</td>
<td>2,247,513</td>
<td>$117,501</td>
<td>8.0%</td>
<td>1.1%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
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<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,842,846</strong></td>
<td><strong>149,452,439</strong></td>
<td><strong>$4,198,802</strong></td>
<td><strong>7.3%</strong></td>
<td><strong>1.8%</strong></td>
<td><strong>1.5%</strong></td>
</tr>
</tbody>
</table>
### Table 8-53. Eversource average participant savings achieved – electric, excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All kWh Savings for Industry Sector</th>
<th>% of All kWh Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>25,449,028</td>
<td>422,073,241</td>
<td>$5,996,328</td>
<td>6.0%</td>
<td>61.5%</td>
<td>67.2%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>5,421,883</td>
<td>92,184,732</td>
<td>$1,751,185</td>
<td>5.9%</td>
<td>47.6%</td>
<td>54.9%</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
<td>24,494,358</td>
<td>680,617,346</td>
<td>$6,445,768</td>
<td>3.6%</td>
<td>44.5%</td>
<td>61.2%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>4,076,965</td>
<td>161,310,020</td>
<td>$1,326,045</td>
<td>2.5%</td>
<td>37.2%</td>
<td>50.6%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>59,861,484</td>
<td>719,886,306</td>
<td>$9,341,369</td>
<td>8.3%</td>
<td>73.2%</td>
<td>60.2%</td>
</tr>
<tr>
<td>Information</td>
<td>3,141,910</td>
<td>70,844,977</td>
<td>$772,927</td>
<td>4.4%</td>
<td>38.7%</td>
<td>48.6%</td>
</tr>
<tr>
<td>Manufacturing Companies and Enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>40,359,967</td>
<td>608,223,845</td>
<td>$7,755,021</td>
<td>6.6%</td>
<td>33.6%</td>
<td>25.1%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Services</td>
<td>3,903,952</td>
<td>30,504,231</td>
<td>$1,339,206</td>
<td>12.8%</td>
<td>25.4%</td>
<td>23.3%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>50,724,744</td>
<td>828,096,348</td>
<td>$17,635,813</td>
<td>6.1%</td>
<td>66.3%</td>
<td>75.3%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>1,455,478</td>
<td>28,527,864</td>
<td>$404,282</td>
<td>5.1%</td>
<td>11.7%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>46,842,836</td>
<td>898,311,121</td>
<td>$12,588,943</td>
<td>5.2%</td>
<td>75.4%</td>
<td>85.3%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>26,126,056</td>
<td>354,188,485</td>
<td>$7,811,356</td>
<td>7.4%</td>
<td>35.3%</td>
<td>42.7%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>8,270,795</td>
<td>128,522,995</td>
<td>$2,257,742</td>
<td>6.4%</td>
<td>51.2%</td>
<td>73.8%</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unknown</td>
<td>4,227,450</td>
<td>28,053,948</td>
<td>$1,291,282</td>
<td>15.1%</td>
<td>29.5%</td>
<td>30.3%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>308,940,295</strong></td>
<td><strong>5,125,902,803</strong></td>
<td><strong>$77,642,464</strong></td>
<td><strong>6.0%</strong></td>
<td><strong>49.9%</strong></td>
<td><strong>52.2%</strong></td>
</tr>
</tbody>
</table>
### Table 8-54. National Grid average participant savings achieved – electric, excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All kWh Savings for Industry Sector</th>
<th>% of All kWh Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>13,626,470</td>
<td>172,746,230</td>
<td>$4,337,648</td>
<td>7.9%</td>
<td>32.9%</td>
<td>27.5%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>1,977,308</td>
<td>23,193,562</td>
<td>$841,871</td>
<td>8.5%</td>
<td>99.7%</td>
<td>99.1%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>5,307,679</td>
<td>56,575,243</td>
<td>$1,967,618</td>
<td>9.4%</td>
<td>46.6%</td>
<td>33.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>7,615,562</td>
<td>77,509,964</td>
<td>$2,943,688</td>
<td>9.8%</td>
<td>89.2%</td>
<td>97.8%</td>
</tr>
<tr>
<td>Educational Services</td>
<td>27,282,691</td>
<td>383,536,339</td>
<td>$8,401,088</td>
<td>7.1%</td>
<td>49.6%</td>
<td>34.5%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>6,178,955</td>
<td>153,441,245</td>
<td>$2,054,835</td>
<td>4.0%</td>
<td>56.4%</td>
<td>48.2%</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>19,185,345</td>
<td>411,539,480</td>
<td>$5,835,828</td>
<td>4.7%</td>
<td>23.5%</td>
<td>34.4%</td>
</tr>
<tr>
<td>Information</td>
<td>4,943,520</td>
<td>73,692,827</td>
<td>$1,080,306</td>
<td>6.7%</td>
<td>60.9%</td>
<td>50.6%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>75,315,374</td>
<td>1,664,784,159</td>
<td>$22,448,842</td>
<td>4.5%</td>
<td>62.7%</td>
<td>68.7%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>10,356,072</td>
<td>78,536,808</td>
<td>$3,761,924</td>
<td>13.2%</td>
<td>67.3%</td>
<td>60.0%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>24,156,474</td>
<td>248,088,609</td>
<td>$3,979,552</td>
<td>9.7%</td>
<td>31.6%</td>
<td>22.6%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>9,678,826</td>
<td>117,690,652</td>
<td>$2,881,054</td>
<td>8.2%</td>
<td>78.0%</td>
<td>68.0%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>14,322,298</td>
<td>142,121,328</td>
<td>$6,378,230</td>
<td>10.1%</td>
<td>23.1%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>42,606,175</td>
<td>430,949,958</td>
<td>$13,227,171</td>
<td>9.9%</td>
<td>57.5%</td>
<td>51.9%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>7,606,447</td>
<td>42,011,027</td>
<td>$2,129,095</td>
<td>18.1%</td>
<td>47.1%</td>
<td>24.1%</td>
</tr>
<tr>
<td>Utilities</td>
<td>4,157,882</td>
<td>80,674,706</td>
<td>$829,673</td>
<td>5.2%</td>
<td>56.6%</td>
<td>52.4%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>10,098,467</td>
<td>136,454,311</td>
<td>$3,792,509</td>
<td>7.4%</td>
<td>98.7%</td>
<td>99.3%</td>
</tr>
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<td>Unknown</td>
<td>7,754,968</td>
<td>44,944,152</td>
<td>$2,181,341</td>
<td>17.3%</td>
<td>54.1%</td>
<td>48.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>294,955,201</strong></td>
<td><strong>4,402,284,944</strong></td>
<td><strong>$89,814,048</strong></td>
<td><strong>6.7%</strong></td>
<td><strong>47.7%</strong></td>
<td><strong>44.8%</strong></td>
</tr>
</tbody>
</table>
### Table 8-55. Unitil average participant savings achieved – electric, excluding unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>2016 Savings (kWh)</th>
<th>2015 Usage (kWh)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All kWh for Industry Sector</th>
<th>% of All kWh Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Finance and Insurance</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Information</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1,800,975</td>
<td>115,191,056</td>
<td>$549,111</td>
<td>1.6%</td>
<td>1.5%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>151,546</td>
<td>1,345,121</td>
<td>$81,314</td>
<td>11.3%</td>
<td>0.2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<td>*</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td>0.6%</td>
<td>0.4%</td>
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<tr>
<td>Transportation and Warehousing</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<td>Unknown</td>
<td>175,117</td>
<td>768,670</td>
<td>$103,917</td>
<td>22.8%</td>
<td>1.2%</td>
<td>0.8%</td>
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<td><strong>Total</strong></td>
<td><strong>4,163,089</strong></td>
<td><strong>145,477,497</strong></td>
<td><strong>$1,558,178</strong></td>
<td><strong>2.9%</strong></td>
<td><strong>0.7%</strong></td>
<td><strong>1.5%</strong></td>
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</tbody>
</table>
8.3.8 Time series contribution ratio and percentile bin breakpoint

Figure 8-15. Cape Light Compact historical percentile breakpoints
Figure 8-16. Cape Light Compact contribution ratio time series - includes linked upstream, excludes unlinked tracking
Figure 8-17. Eversource historical percentile breakpoints
Figure 8-18. Eversource contribution ratio time series - includes linked upstream, excludes unlinked tracking
Figure 8-19 National Grid historical percentile breakpoints
Figure 8-20. National Grid contribution ratio time series - includes linked upstream, excludes unlinked tracking
Figure 8-21. Unitil historical percentile breakpoints
Figure 8-22. Unitil contribution ratio time series - includes linked upstream, excludes unlinked tracking
8.3.9 6-year market penetration rates of broad kWh bins, by PA

Figure 8-23. Cape Light Compact electric account participation market penetration rates by broad consumption bin and year, excluding unlinked tracking data
Figure 8-24. Eversource electric account participation market penetration rates by broad consumption bin and year, excluding unlinked tracking data
Figure 8-25. National Grid electric account participation market penetration rates by broad consumption bin and year, excluding unlinked tracking data.
Figure 8-26. Unitil electric account participation market penetration rates by broad consumption bin and year, excluding unlinked tracking data.
8.4 Within PA gas summary

The Customer Profile study generates a large number of analysis products, many of which are discussed in greater depth in earlier chapters of this report. This within-PA analysis includes more detailed versions of the tables for readers who are interested in additional granularity.

The majority of the sections in this chapter require that the tracking accounts be linked to billing accounts to generate the report metrics and tables, specifically the Consumption-Weighted Participation, Participant Savings Achieved, Proportional Consumption Ratio, and Contribution Ratio metrics as well as any industry sector or consumption sections. Since tracking data needed to be linked to billing data to place the material in the appropriate analysis bin, individual table’s “TOTAL” row represents the total for all data that could be matched in the table. To minimize the risk of inaccurate conclusions, tracking data that could not be matched has not been included in the summary tables; this can cause the “TOTAL” row to be lower than it would be for the full unlinked tracking population. The match rates and supporting detail for the billing and tracking data for each PA are presented in section 3.4.1.

DNV GL has also included the individual PA-level summaries in this section. For instances where there were fewer than 15 records in an analysis class, that class was combined with the next closest one(s) until a class with at least 15 records was created. This level of analysis is intended to provide as granular a view of the data as possible while also preserving individual customer confidentiality.

For the summary tables of specific end uses, sector participation, and average savings, DNV GL masked any bins where there were fewer than 15 records, including zeroes.

Finally, given the large population of industry sector data that was available for the 2016 Customer Profile, DNV GL has updated and included time series charts by industry sector to facilitate year-over-year comparisons with the full population of improved data.

Since the purpose of this chapter is to provide granular detail for readers who want to interpret the data themselves, no narrative interpretation of the results is provided.

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91 In the ideal world, all tracking data would link and be allocable in the tables; for reasons detailed in section 3.4.1, no PA has 100% linking between tracking and billing data.
8.4.1 Population summary

Figure 8-27. 2016 Berkshire customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-28. 6-year Berkshire customer population summary by consumption bin
Figure 8-29. 2016 Columbia customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-30. 6-year Columbia customer population summary by consumption bin
Figure 8-31. 2016 Eversource customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-32. 6-year Eversource customer population summary by consumption bin
Figure 8-33. 2016 Liberty customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-34. 6-year Liberty customer population summary by consumption bin
Figure 8-35. 2016 National Grid customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-36. 6-year National Grid customer population summary by consumption bin
Figure 8-37. 2016 Unitil customer population summary by consumption bin, excluding unlinked tracking data

Figure 8-38. 6-year Unitil customer population summary by consumption bin
### Table 8-56. Field name descriptions for tables in Section 6, gas market analysis

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td># Accounts (2016)</td>
<td>Count of the unique accounts identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>2015 Usage (therms)</td>
<td>Sum of the therm usage for the unique accounts for the identified year</td>
</tr>
<tr>
<td># Accounts (2015)</td>
<td>Count of the unique accounts identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>2015 participant Usage (therms)</td>
<td>Sum of the therm usage for match participant accounts only</td>
</tr>
<tr>
<td>2016 Annual Savings (therms)</td>
<td>Sum of gross annual therm savings for the matched tracking accounts</td>
</tr>
<tr>
<td>2016 Lifetime Savings (therms)</td>
<td>Sum of gross lifetime therm savings for the matched tracking accounts either as directly reported by the PAs or derived from the gross annual savings multiplied by the measure lifetime.</td>
</tr>
<tr>
<td># Participants (2016)</td>
<td>Count of the unique number of matched tracking accounts that participated in an efficiency program as identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td># Applications / Projects (2016)</td>
<td>Count of the unique number of project applications numbers for the matched tracking accounts from the efficiency program as identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>Incentive $ (2016)</td>
<td>Sum of the incentive dollars for the matched tracking accounts as identified in the C&amp;I database</td>
</tr>
</tbody>
</table>

### Table 8-57. All PAs’ therm breakouts, excluding unlinked tracking data

<table>
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<tr>
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<tr>
<td>&lt; 8,000 therms</td>
<td>109,226</td>
<td>206,647,910</td>
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<td>3,810,837</td>
<td>989,017</td>
<td>12,719</td>
<td>1,281</td>
<td>1,548</td>
<td>2,916,072</td>
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<tr>
<td>8,000 – 40,000 therms</td>
<td>19,107</td>
<td>319,092,678</td>
<td>20,696</td>
<td>17,758,832</td>
<td>1,670,258</td>
<td>21,102</td>
<td>927</td>
<td>1,214</td>
<td>4,588,603</td>
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<tr>
<td>40,000 – 80,000 therms</td>
<td>2,753</td>
<td>152,792,057</td>
<td>3,002</td>
<td>15,216,376</td>
<td>1,060,571</td>
<td>11,895</td>
<td>272</td>
<td>362</td>
<td>1,968,641</td>
</tr>
<tr>
<td>80,000 – 1,000,000 therms</td>
<td>1,745</td>
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<td>1,968</td>
<td>72,170,443</td>
<td>5,030,736</td>
<td>53,747</td>
<td>254</td>
<td>393</td>
<td>8,904,827</td>
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<td>&gt; 1,000,000 therms</td>
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<td>56,769,527</td>
<td>2,654,518</td>
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<td>43</td>
<td>2,587,812</td>
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<tr>
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<td>135,362</td>
<td>1,419,975,577</td>
<td>159,996</td>
<td>165,726,015</td>
<td>11,405,100</td>
<td>130,229</td>
<td>2,755</td>
<td>3,560</td>
<td>20,965,955</td>
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</table>
Table 8-58. Berkshire therm breakouts, excluding unlinked tracking data

<table>
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<tr>
<td>&lt; 8,000 therms</td>
<td>4,336</td>
<td>9,262,126</td>
<td>4,418</td>
<td>170,084</td>
<td>51,810</td>
<td>1,003</td>
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<td>64</td>
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<td>11,879,531</td>
<td>697</td>
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<td>4,842,161</td>
<td>85</td>
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<tr>
<td>&gt; 1,000,000 therms</td>
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<td>65</td>
<td>1,671,685</td>
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<td>1,868</td>
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<td>311,824</td>
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<td>5,328</td>
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<td>184,896</td>
<td>2,871</td>
<td>96</td>
<td>108</td>
<td>536,336</td>
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</table>

Table 8-59. Columbia therm breakouts, excluding unlinked tracking data

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<tr>
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<td>76,507</td>
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<td>3,383,509</td>
<td>244,574</td>
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<td>170</td>
<td>197</td>
<td>544,239</td>
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<td>40,000 – 80,000 therms</td>
<td>581</td>
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<td>2,727,978</td>
<td>90,179</td>
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<td>58</td>
<td>207,939</td>
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<td>&gt; 1,000,000 therms</td>
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<td>12,786,402</td>
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<td>63</td>
<td>846,406</td>
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<td>19,556,021</td>
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<td>16,200</td>
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Table 8-60. Eversource therm breakouts, excluding unlinked tracking data

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<td>41,021,787</td>
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<td>714,779</td>
<td>358,909</td>
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<td>285</td>
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<td>8,000 – 40,000 therms</td>
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<td>58,877,486</td>
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<td>3,264,716</td>
<td>293,167</td>
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<td>604</td>
<td>1,961,213</td>
<td>192,538</td>
<td>2,946</td>
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<td>41</td>
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<td>80,000 – 1,000,000 therms</td>
<td>399</td>
<td>89,315,463</td>
<td>472</td>
<td>52,881,955</td>
<td>2,268,542</td>
<td>25,505</td>
<td>57</td>
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<td>239,911,393</td>
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<td>634</td>
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</table>

Table 8-61. Liberty therm breakouts, excluding unlinked tracking data

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<td>&lt; 8,000 therms</td>
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<td>8,000 – 40,000 therms</td>
<td>534</td>
<td>9,075,196</td>
<td>421</td>
<td>4,121,147</td>
<td>96,135</td>
<td>411</td>
<td>287</td>
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<td>40,000 – 80,000 therms</td>
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<td>4,638,332</td>
<td>61</td>
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<td></td>
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<tr>
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<td></td>
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<tr>
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<td>4,128</td>
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<td>4,121,147</td>
<td>96,135</td>
<td>411</td>
<td>287</td>
<td>288</td>
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<tr>
<td>TOTAL</td>
<td>4,128</td>
<td>41,524,121</td>
<td>4,216</td>
<td>4,121,147</td>
<td>96,135</td>
<td>411</td>
<td>287</td>
<td>288</td>
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### Table 8-62. National Grid therm breakouts, excluding unlinked tracking data

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<td>793</td>
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<td>176,392,645</td>
<td>11,082</td>
<td>9,023,319</td>
<td>990,360</td>
<td>11,574</td>
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<td>82,903,240</td>
<td>1,562</td>
<td>9,326,437</td>
<td>760,437</td>
<td>7,634</td>
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<td>240</td>
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<td>284</td>
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<td>117,735,781</td>
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<td><strong>TOTAL</strong></td>
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<td>84,087</td>
<td>80,488,787</td>
<td>6,658,299</td>
<td>72,076</td>
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### Table 8-63. Unitil therm breakouts, excluding unlinked tracking data

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</thead>
<tbody>
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<td>-</td>
<td>-</td>
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<td>1,422</td>
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<td>4,052,095</td>
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<td>895,593</td>
<td>80,887</td>
<td>1,288</td>
<td>22</td>
<td>23</td>
<td>$ 135,513</td>
</tr>
<tr>
<td>40,000 – 80,000 therms</td>
<td>31</td>
<td>1,680,915</td>
<td>30</td>
<td>895,593</td>
<td>80,887</td>
<td>1,288</td>
<td>22</td>
<td>23</td>
<td>$ 135,513</td>
</tr>
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</tr>
<tr>
<td>&gt; 1,000,000 therms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1,785</td>
<td>16,985,594</td>
<td>1,787</td>
<td>895,593</td>
<td>80,887</td>
<td>1,288</td>
<td>22</td>
<td>23</td>
<td>$ 135,513</td>
</tr>
</tbody>
</table>
### Table 8-64. Field names: end use breakdown tables

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects</td>
<td>Count of the unique number of tracking projects, including those that could not be linked with billing, identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>Savings (therms)</td>
<td>Sum of the gross annual therm savings for the tracking projects, including those that could not be linked with billing, identified in the C&amp;I evaluation database</td>
</tr>
<tr>
<td>% of Projects</td>
<td>Proportion tracking projects, including those that could not be linked with billing, represented by the analysis bin (row)</td>
</tr>
<tr>
<td>% of therm Savings</td>
<td>Proportion of the gross annual therm savings for the tracking projects, including those that could not be linked with billing, represented by the analysis bin (row)</td>
</tr>
<tr>
<td>% of All Project for End Use</td>
<td>Proportion tracking projects, including those that could not be linked with billing, represented by the analysis bin (row) as a percent of the total number of projects for the analysis bin statewide</td>
</tr>
<tr>
<td>% of all therm Savings for End Use</td>
<td>Proportion of the gross annual therm savings for the tracking projects, including those that could not be linked with billing, represented by the analysis bin (row) as a percent of the total number of projects for the analysis bin statewide</td>
</tr>
</tbody>
</table>

### Table 8-65. Statewide end use overview - gas

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of total projects</th>
<th>% of total gas savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>174</td>
<td>1,270,019</td>
<td>4.4%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>56</td>
<td>1,899,765</td>
<td>1.4%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Food Service</td>
<td>172</td>
<td>91,352</td>
<td>4.3%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>1,171</td>
<td>1,657,020</td>
<td>29.5%</td>
<td>11.5%</td>
</tr>
<tr>
<td>HVAC</td>
<td>1,135</td>
<td>4,609,288</td>
<td>28.6%</td>
<td>32.0%</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>233</td>
<td>3,039,927</td>
<td>5.9%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>1,011</td>
<td>1,407,883</td>
<td>25.5%</td>
<td>9.8%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td><strong>3,952</strong></td>
<td><strong>13,975,254</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Table 8-66. Berkshire end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>16</td>
<td>19,964</td>
<td>13%</td>
<td>8%</td>
<td>9%</td>
<td>2%</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>55</td>
<td>94,536</td>
<td>46%</td>
<td>39%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>20</td>
<td>15,000</td>
<td>17%</td>
<td>6%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td><strong>119</strong></td>
<td><strong>240,996</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>3%</strong></td>
<td><strong>2%</strong></td>
</tr>
</tbody>
</table>
Table 8-67. Columbia end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>32</td>
<td>74,900</td>
<td>4%</td>
<td>4%</td>
<td>18%</td>
<td>6%</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>21</td>
<td>1,120,645</td>
<td>3%</td>
<td>26%</td>
<td>38%</td>
<td>59%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>31</td>
<td>19,136</td>
<td>4%</td>
<td>0%</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>HVAC</td>
<td>185</td>
<td>691,211</td>
<td>24%</td>
<td>16%</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>297</td>
<td>68,021</td>
<td>88%</td>
<td>34%</td>
<td>25%</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>182</td>
<td>1,411,624</td>
<td>23%</td>
<td>32%</td>
<td>78%</td>
<td>46%</td>
</tr>
<tr>
<td>Process</td>
<td>177</td>
<td>244,917</td>
<td>23%</td>
<td>6%</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>Total (including suppressed)</td>
<td>848</td>
<td>1,865,149</td>
<td>100%</td>
<td>100%</td>
<td>21%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Table 8-68. Eversource end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>21</td>
<td>1,120,645</td>
<td>3%</td>
<td>26%</td>
<td>38%</td>
<td>59%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>31</td>
<td>19,136</td>
<td>4%</td>
<td>0%</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>HVAC</td>
<td>185</td>
<td>691,211</td>
<td>24%</td>
<td>16%</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>154</td>
<td>500,873</td>
<td>20%</td>
<td>11%</td>
<td>13%</td>
<td>30%</td>
</tr>
<tr>
<td>Other</td>
<td>182</td>
<td>1,411,624</td>
<td>23%</td>
<td>32%</td>
<td>78%</td>
<td>46%</td>
</tr>
<tr>
<td>Process</td>
<td>177</td>
<td>244,917</td>
<td>23%</td>
<td>6%</td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td>Total (including suppressed)</td>
<td>775</td>
<td>4,361,188</td>
<td>100%</td>
<td>100%</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Table 8-69. Liberty end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>297</td>
<td>68,021</td>
<td>88%</td>
<td>34%</td>
<td>25%</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>20</td>
<td>8,487</td>
<td>6%</td>
<td>4%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Total (including suppressed)</td>
<td>336</td>
<td>198,480</td>
<td>100%</td>
<td>100%</td>
<td>8%</td>
<td>1%</td>
</tr>
</tbody>
</table>
### Table 8-70. National Grid end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>114</td>
<td>1,154,948</td>
<td>6%</td>
<td>15%</td>
<td>66%</td>
<td>91%</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>33</td>
<td>748,039</td>
<td>2%</td>
<td>10%</td>
<td>59%</td>
<td>39%</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Food Service</td>
<td>93</td>
<td>42,882</td>
<td>5%</td>
<td>1%</td>
<td>54%</td>
<td>47%</td>
</tr>
<tr>
<td>HVAC</td>
<td>590</td>
<td>2,385,014</td>
<td>32%</td>
<td>31%</td>
<td>52%</td>
<td>52%</td>
</tr>
<tr>
<td>Hot Water</td>
<td>395</td>
<td>778,190</td>
<td>21%</td>
<td>10%</td>
<td>34%</td>
<td>47%</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>39</td>
<td>1,558,023</td>
<td>2%</td>
<td>20%</td>
<td>17%</td>
<td>51%</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td><strong>1,860</strong></td>
<td><strong>7,636,117</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>47%</strong></td>
<td><strong>53%</strong></td>
</tr>
</tbody>
</table>

### Table 8-71. Unitil end uses, including unlinked tracking data

<table>
<thead>
<tr>
<th>End use</th>
<th>2016 projects</th>
<th>2016 savings (therms)</th>
<th>% of projects</th>
<th>% of savings</th>
<th>% of all projects for end use</th>
<th>% of all gas savings for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Shell</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Building Systems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Comprehensive Design</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>HVAC</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Process</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Food Service</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Upstream Hot Water</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total (including suppressed)</strong></td>
<td><strong>34</strong></td>
<td><strong>84,060</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>1%</strong></td>
<td><strong>1%</strong></td>
</tr>
</tbody>
</table>
### 8.4.4 Industry sector breakdowns, participants and savings

**Table 8-72. Berkshire participants and savings by industry sector, 2016 – gas, including unlinked tracking**

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>16</td>
<td>10,704</td>
<td>$37,587</td>
<td>15.09%</td>
<td>4.44%</td>
<td>2.20%</td>
<td>1.44%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>4.20%</td>
<td>5.26%</td>
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<td>100%</td>
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Figure 8-39. Berkshire savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
### Table 8-73. Columbia participants and savings by industry sector, 2016 – gas, including unlinked tracking

<table>
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<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
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<td>20.07%</td>
<td>7.35%</td>
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<td><strong>100%</strong></td>
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</table>
Figure 8-40. Columbia savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
### Table 8-74. Eversource participants and savings by industry sector, 2016 – gas, including unlinked tracking

<table>
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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
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</thead>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
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<td>Construction</td>
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<td><strong>100%</strong></td>
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</table>
Figure 8-41. Eversource savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
Table 8-75. Liberty participants and savings by industry sector, 2016 – electric, including unlinked tracking

<table>
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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
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<tbody>
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<td>Wholesale Trade</td>
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<tr>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>304</strong></td>
<td><strong>198,480</strong></td>
<td><strong>$305,619</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>8.60%</strong></td>
<td><strong>1.38%</strong></td>
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</table>
Figure 8-42. Liberty savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
### Table 8-76. National Grid participants and savings by industry sector, 2016 – gas, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>305</td>
<td>459,174</td>
<td>$997,350</td>
<td>18.31%</td>
<td>6.01%</td>
<td>41.90%</td>
<td>61.68%</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
<td>16</td>
<td>5,930</td>
<td>$15,433</td>
<td>0.96%</td>
<td>0.08%</td>
<td>84.21%</td>
<td>14.94%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>42</td>
<td>55,193</td>
<td>$139,240</td>
<td>2.52%</td>
<td>0.72%</td>
<td>65.08%</td>
<td>57.45%</td>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>41</td>
<td>67,780</td>
<td>$150,536</td>
<td>2.46%</td>
<td>0.89%</td>
<td>59.64%</td>
<td>47.33%</td>
</tr>
<tr>
<td>Construction</td>
<td>201</td>
<td>1,417,931</td>
<td>$3,022,782</td>
<td>12.06%</td>
<td>18.57%</td>
<td>59.64%</td>
<td>47.33%</td>
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<td>Educational Services</td>
<td>21</td>
<td>83,847</td>
<td>$312,392</td>
<td>1.26%</td>
<td>1.10%</td>
<td>60.00%</td>
<td>15.83%</td>
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<tr>
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<td>164</td>
<td>1,211,220</td>
<td>$1,932,193</td>
<td>9.84%</td>
<td>15.86%</td>
<td>61.42%</td>
<td>75.41%</td>
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<td>15</td>
<td>35,044</td>
<td>$80,960</td>
<td>0.90%</td>
<td>0.46%</td>
<td>65.22%</td>
<td>79.30%</td>
</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>57</td>
<td>1,306,589</td>
<td>$1,701,815</td>
<td>3.42%</td>
<td>17.11%</td>
<td>43.18%</td>
<td>53.47%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>70</td>
<td>391,340</td>
<td>$685,437</td>
<td>4.20%</td>
<td>5.12%</td>
<td>21.08%</td>
<td>43.23%</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
<td>128</td>
<td>156,474</td>
<td>$412,428</td>
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<td>2.05%</td>
<td>67.37%</td>
<td>81.27%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>70</td>
<td>391,340</td>
<td>$685,437</td>
<td>4.20%</td>
<td>5.12%</td>
<td>21.08%</td>
<td>43.23%</td>
</tr>
<tr>
<td>Public Administration</td>
<td>59</td>
<td>161,020</td>
<td>$398,326</td>
<td>3.54%</td>
<td>2.11%</td>
<td>43.70%</td>
<td>30.97%</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>188</td>
<td>553,002</td>
<td>$1,981,073</td>
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<td>7.24%</td>
<td>63.73%</td>
<td>46.59%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>113</td>
<td>398,651</td>
<td>$1,057,427</td>
<td>6.78%</td>
<td>5.22%</td>
<td>39.10%</td>
<td>80.15%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>15</td>
<td>7,669</td>
<td>$55,104</td>
<td>0.90%</td>
<td>0.10%</td>
<td>65.22%</td>
<td>64.78%</td>
</tr>
<tr>
<td>Utilities</td>
<td>23</td>
<td>64,408</td>
<td>$240,881</td>
<td>1.38%</td>
<td>0.84%</td>
<td>79.31%</td>
<td>82.83%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>202</td>
<td>790,785</td>
<td>$2,675,660</td>
<td>12.12%</td>
<td>10.36%</td>
<td>38.55%</td>
<td>41.75%</td>
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<tr>
<td>Total</td>
<td>1,666</td>
<td>7,636,117</td>
<td>$16,357,255</td>
<td>100%</td>
<td>100%</td>
<td>47.16%</td>
<td>53.08%</td>
</tr>
</tbody>
</table>
Figure 8-43. National Grid savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
Table 8-77. Unitil participants and savings by industry sector, 2016 – gas, including unlinked tracking

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>2016 Savings (therms)</th>
<th>Total Incentives (2016)</th>
<th>% of Participants</th>
<th>% of Therm Savings</th>
<th>% of All Participants for Industry Sector</th>
<th>% of All Therm Savings for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td></td>
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<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
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<tr>
<td>Construction</td>
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<tr>
<td>Educational Services</td>
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<tr>
<td>Finance and Insurance</td>
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<tr>
<td>Health Care and Social Assistance</td>
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<td>Management of Companies and Enterprises</td>
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<tr>
<td>Manufacturing</td>
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<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>Other Services (except Public Administration)</td>
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<tr>
<td>Professional, Scientific, and Technical Services</td>
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<td>Real Estate and Rental and Leasing</td>
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<tr>
<td>Retail Trade</td>
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<tr>
<td>Transportation and Warehousing</td>
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<td>Utilities</td>
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<tr>
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<tr>
<td>Total</td>
<td>31</td>
<td>84,060</td>
<td>$144,194</td>
<td>100%</td>
<td>100%</td>
<td>0.88%</td>
<td>0.58%</td>
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</table>
Figure 8-44. Unitil savings contribution by sector, 2016 – historical gas snapshot, including unlinked tracking data
### 8.4.5 Industry sector by multi-end use

**Table 8-78. Berkshire multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data**

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>Small</td>
<td>*</td>
<td>*</td>
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<tr>
<td></td>
<td>Large</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Administrative and Support and Waste Management</td>
<td>Small</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Remediation Services</td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>Small</td>
<td>*</td>
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<td>Large</td>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>Small</td>
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<tr>
<td>Construction</td>
<td>Small</td>
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<tr>
<td>Educational Services</td>
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</tr>
<tr>
<td>Finance and Insurance</td>
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<td>*</td>
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<tr>
<td>Health Care and Social Assistance</td>
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<td>Management of Companies and Enterprises</td>
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</tr>
<tr>
<td>Manufacturing</td>
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</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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</tr>
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<td>Professional, Scientific, and Technical Services</td>
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<tr>
<td>Public Administration</td>
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<td>Real Estate and Rental and Leasing</td>
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<tr>
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<td>Transportation and Warehousing</td>
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<tr>
<td>Utilities</td>
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<tr>
<td>Wholesale Trade</td>
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<tr>
<td>Unknown</td>
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<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>Small</td>
<td>6,435</td>
<td>12%</td>
<td>45,375</td>
<td>88%</td>
</tr>
<tr>
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<td>Large</td>
<td>25,665</td>
<td>19%</td>
<td>107,421</td>
<td>81%</td>
</tr>
</tbody>
</table>
### Table 8-79. Columbia multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>Small</td>
<td>197</td>
<td>1%</td>
<td>13,370</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>-</td>
<td>0%</td>
<td>40,805</td>
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</tr>
<tr>
<td>Administrative and Support and Waste Management and Remediation Services</td>
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<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>Small</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<tr>
<td></td>
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<td>*</td>
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</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>Small</td>
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<tr>
<td>Construction</td>
<td>Small</td>
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<tr>
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Table 8-80. Eversource multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data

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<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
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Table 8-81. Liberty multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data

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<th>Industry Sector</th>
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<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
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<td>13,522</td>
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### Table 8-82. National Grid multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data

<table>
<thead>
<tr>
<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
</tr>
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<td>*</td>
</tr>
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<td></td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td>*</td>
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<td>*</td>
</tr>
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<td>*</td>
</tr>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
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<td>7,679</td>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
<td>Manufacturing</td>
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</tr>
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<td>*</td>
<td>*</td>
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</tr>
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<td>7,679</td>
<td>72%</td>
</tr>
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<td>-</td>
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<td>223,249</td>
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<tr>
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Table 8-83. Unitil multi end use and savings proportion by industry sector – gas, excluding unlinked tracking data

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<th>Industry Sector</th>
<th>Consumption Size</th>
<th>Sum Savings for Multi End Use Accounts</th>
<th>Industry Sector Savings Proportion from Multi End Use</th>
<th>Sum Savings for Single End Use Accounts</th>
<th>Proportion from Single End Use</th>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>Administrative and Support and Waste Management and Remediation Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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</tr>
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<td>Arts, Entertainment, and Recreation</td>
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</tr>
<tr>
<td>Educational Services</td>
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</tr>
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<td>Finance and Insurance</td>
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</tr>
<tr>
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<td>*</td>
</tr>
<tr>
<td>Manufacturing</td>
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<td>*</td>
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<td></td>
<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>*</td>
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<td>*</td>
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</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>Large</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>Professional, Scientific, and Technical Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>*</td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Public Administration</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
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<td>*</td>
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<td>*</td>
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</tr>
<tr>
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</tr>
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### 8.4.6 Industry sector, participation and savings rates

**Table 8-84. Berkshire participation rates – gas, including unlinked tracking**

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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<td>Agriculture, Forestry, Fishing and Hunting</td>
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</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>*</td>
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</tr>
<tr>
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<td>Health Care and Social Assistance</td>
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</tr>
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</tr>
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<td>Other Services (except Public Administration)</td>
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<td>*</td>
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### Table 8-85. Columbia participation rates – gas, including unlinked tracking

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<th>2015 Usage (therms)</th>
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<th>% Participating</th>
<th>% Savings Achieved</th>
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<td><strong>Total</strong></td>
<td><strong>763</strong></td>
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<td><strong>197,155,365</strong></td>
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<td><strong>2.4%</strong></td>
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Table 8-86. Eversource participation rates – gas, including unlinked tracking

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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>Accommodation and Food Services</td>
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<td>90,981</td>
<td>12,299,525</td>
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<tr>
<td>Management and Remediation Services</td>
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<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
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<td></td>
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</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
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<td><strong>1.0%</strong></td>
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Table 8-87. Liberty participation rates – gas, including unlinked tracking

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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>693</td>
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<td>*</td>
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## Table 8-88. National Grid participation rates – gas, including unlinked tracking

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<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
</tr>
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<tbody>
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<td>10,388</td>
<td>455,202</td>
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</tr>
<tr>
<td>Management of Companies and Enterprises</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
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<td>57</td>
<td>4,216</td>
<td>1,306,589</td>
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<td>1.5%</td>
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<tr>
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<td>*</td>
<td>*</td>
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<td>*</td>
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<td>9,824</td>
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<td>59</td>
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<td>8,511</td>
<td>553,002</td>
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<tr>
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<td>*</td>
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<td>*</td>
<td>*</td>
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<td>23</td>
<td>2,849</td>
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<td>233</td>
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<td><strong>Total</strong></td>
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<td><strong>7,636,117</strong></td>
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### Table 8-89. Unitil participation rates – gas, including unlinked tracking

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<tr>
<th>Industry Sector</th>
<th>Number of Participants (2016)</th>
<th>Number of Billed Customers (2016)</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Participating</th>
<th>% Savings Achieved</th>
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<td>Accommodation and Food Services</td>
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<tr>
<td>Administrative and Support and Waste</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<tr>
<td>Management and Remediation Services</td>
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<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
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</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
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<tr>
<td>Construction</td>
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<td>*</td>
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<tr>
<td>Educational Services</td>
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<td>*</td>
<td>*</td>
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</tr>
<tr>
<td>Finance and Insurance</td>
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<tr>
<td>Health Care and Social Assistance</td>
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<td>Management of Companies and Enterprises</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Retail Trade</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Utilities</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<td>*</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>*</td>
<td>*</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>1,787</strong></td>
<td><strong>84,060</strong></td>
<td><strong>16,985,594</strong></td>
<td><strong>$144,194</strong></td>
<td><strong>1.7%</strong></td>
<td><strong>0.5%</strong></td>
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</table>
### 8.4.7 Industry sector, average participant savings achieved

**Table 8-90. Berkshire average participant savings achieved – gas, excluding unlinked tracking**

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<tr>
<th>Industry Sector</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All Therm Savings for Industry Sector</th>
<th>% of All Therm Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>10,148</td>
<td>146,260</td>
<td>$37,235</td>
<td>6.9%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Administrative and Support and Waste</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Construction</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>Educational Services</td>
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<td>318,985</td>
<td>$74,465</td>
<td>13.5%</td>
<td>0.1%</td>
<td>0.0%</td>
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<td>Finance and Insurance</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td>Health Care and Social Assistance</td>
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<td>Management of Companies and Enterprises</td>
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<td>*</td>
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<td>*</td>
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<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other Services (except Public Administration)</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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</tr>
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<td>Real Estate and Rental and Leasing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>*</td>
<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
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<td>*</td>
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<td>*</td>
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</tr>
<tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
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<td>54,746</td>
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<td><strong>Total</strong></td>
<td><strong>184,896</strong></td>
<td><strong>1,841,769</strong></td>
<td><strong>$536,336</strong></td>
<td><strong>10.0%</strong></td>
<td><strong>1.6%</strong></td>
<td><strong>1.1%</strong></td>
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</table>
Table 8-91. Columbia average participant savings achieved – gas, excluding unlinked tracking

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<th>Industry Sector</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All Therm Savings for Industry Sector</th>
<th>% of All Therm Consumption for Industry Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation and Food Services</td>
<td>67,773</td>
<td>1,350,651</td>
<td>$91,311</td>
<td>5.0%</td>
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</tr>
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<td>Administrative and Support and Waste Management and Remediation Services</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>27,767</td>
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<td>$63,715</td>
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<td>0.4%</td>
</tr>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Educational Services</td>
<td>194,965</td>
<td>3,190,896</td>
<td>$249,362</td>
<td>6.1%</td>
<td>0.4%</td>
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</tr>
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<td>Finance and Insurance</td>
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<td>*</td>
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<td>Manufacturing</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Mining, Quarrying, and Oil and Gas Extraction</td>
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<td>*</td>
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<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
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<td>*</td>
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</tr>
<tr>
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<td>$424,431</td>
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<td><strong>Total</strong></td>
<td><strong>1,326,887</strong></td>
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<td><strong>$1,638,491</strong></td>
<td><strong>6.8%</strong></td>
<td><strong>11.3%</strong></td>
<td><strong>11.3%</strong></td>
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### Table 8-92. Eversource average participant savings achieved – gas, excluding unlinked tracking

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<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All Therm Savings for Industry Sector</th>
<th>% of All Therm Consumption for Industry Sector</th>
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<td>Accommodation and Food Services</td>
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<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management and Remediation Services</td>
<td>*</td>
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<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
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<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
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<td>*</td>
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<td>% of All Therm Consumption for Industry Sector</td>
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<td><strong>Total</strong></td>
<td><strong>98,055</strong></td>
<td><strong>4,766,432</strong></td>
<td><strong>$53,513</strong></td>
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<td><strong>0.8%</strong></td>
<td><strong>2.8%</strong></td>
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Table 8-94. National Grid average participant savings achieved – gas, excluding unlinked tracking

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<th>Industry Sector</th>
<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All Therm Savings for Industry Sector</th>
<th>% of All Therm Consumption for Industry Sector</th>
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<tr>
<td>Accommodation and Food Services</td>
<td>419,485</td>
<td>6,789,293</td>
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<td>*</td>
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<td>*</td>
</tr>
<tr>
<td>Management and Remediation Services</td>
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<td>Agriculture, Forestry, Fishing and Hunting</td>
<td>6,479</td>
<td>203,721</td>
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<td>55,404</td>
<td>1,536,177</td>
<td>$133,586</td>
<td>3.6%</td>
<td>0.5%</td>
<td>0.9%</td>
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<tr>
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<td>64,358</td>
<td>834,303</td>
<td>$149,880</td>
<td>7.7%</td>
<td>0.8%</td>
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<td>Educational Services</td>
<td>1,333,374</td>
<td>20,472,332</td>
<td>$2,821,542</td>
<td>6.5%</td>
<td>2.4%</td>
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<td>$315,925</td>
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<td>1,224,333</td>
<td>24,939,035</td>
<td>$1,960,578</td>
<td>4.9%</td>
<td>1.5%</td>
<td>2.1%</td>
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</tr>
<tr>
<td>Management of Companies and Enterprises</td>
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<td>*</td>
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<tr>
<td>Manufacturing</td>
<td>1,311,553</td>
<td>7,752,307</td>
<td>$1,691,329</td>
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<td>Other Services (except Public Administration)</td>
<td>155,597</td>
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<td>9.5%</td>
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<td>Professional, Scientific, and Technical Services</td>
<td>237,703</td>
<td>2,369,744</td>
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<td>$390,802</td>
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<td>3,720,488</td>
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<td>*</td>
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<td>Wholesale Trade</td>
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<td><strong>86,929,425</strong></td>
<td><strong>$13,825,365</strong></td>
<td><strong>7.9%</strong></td>
<td><strong>58.5%</strong></td>
<td><strong>50.3%</strong></td>
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### Table 8-95. Unitil average participant savings achieved – gas, excluding unlinked tracking

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<th>2016 Savings (therms)</th>
<th>2015 Usage (therms)</th>
<th>Total Incentives (2016)</th>
<th>% Savings</th>
<th>% of All Therm Savings for Industry Sector</th>
<th>% of All Therm Consumption for Industry Sector</th>
</tr>
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<td>Educational Services</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
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</table>
8.4.8  Time series contribution ratio and percentile bin breakpoint

Figure 8-45. Berkshire historical percentile breakpoints
Figure 8-46. Berkshire contribution ratio time series – excludes unlinked tracking
Figure 8-47. Columbia historical percentile breakpoints
Figure 8-48. Columbia contribution ratio time series – excludes unlinked tracking
Figure 8-49. Eversource historical percentile breakpoints
Figure 8-50. Eversource contribution ratio time series – excludes unlinked tracking
Figure 8-51. Liberty historical percentile breakpoints
Figure 8-52. Liberty contribution ratio time series – excludes unlinked tracking
Figure 8-53. National Grid historical percentile breakpoints
Figure 8-54. National Grid contribution ratio time series – excludes unlinked tracking
Figure 8-55. Unitil historical percentile breakpoints
Figure 8-56. Unitil contribution ratio time series – excludes unlinked tracking
ABOUT DNV GL
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