

# Memo

To: **EEAC**  
From: **Consultant Team**  
Date: **12 May 2015**  
Subject: **Comparison of PA 2016-2018 Plan with Consultant Team Goal Framework Analysis**

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## SUMMARY OF THIS REPORT

This document provides the Consultant Team's review of the April 30, 2015 submission of the 2016-2018 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan ("Initial Draft Plan" or "Plan"). The Consultant Team appreciates the efforts of the PAs and the extensive work that went into the Initial Draft Plan. We also appreciate the collaborative approach and good faith perspectives of the PAs. There was very good progress toward Massachusetts energy efficiency goals in the last three years, and we look forward to working with the Council, the PAs, and other stakeholders to make additional progress during 2016-2018.

This section summarizes our key findings regarding the PAs' proposed statewide savings, budgets, and benefits; the qualitative aspects of the proposed program plans. Subsequent sections provide additional detail on these topics. The detailed review of savings segmented by sector (i.e., C&I separate from residential and low income) and includes additional information on the qualitative aspects of the proposed program plans included in the Initial Draft Plan. These are followed by a short discussion of the Council's recommendations. The last section of this memo contains a full set of tables showing the Plan's budgets and cost per unit of energy saved.

### Summary of Proposed Statewide Savings and Budgets

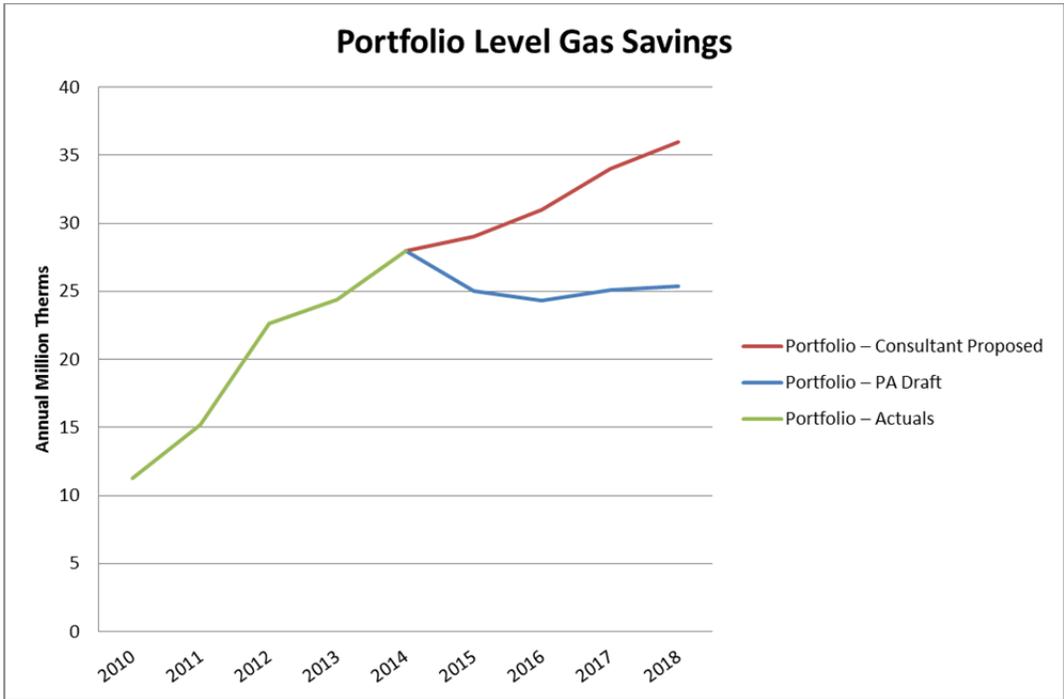
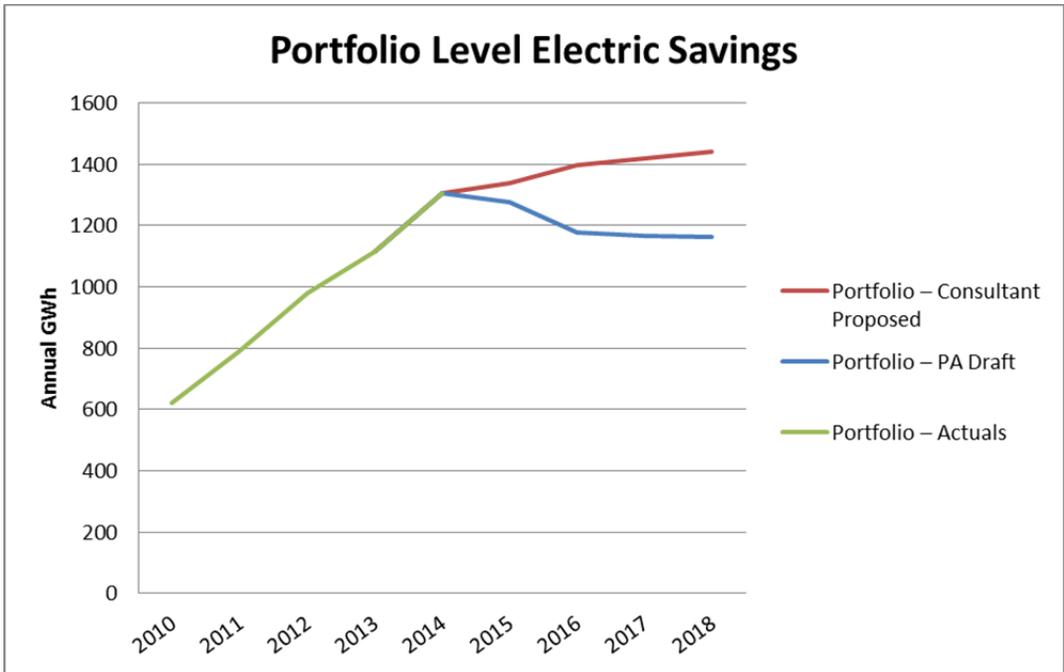
Tables 1 and 2 below summarize the major components of the PAs' proposed electric and gas plans and compare these aspects to the Consultants' proposed goals framework. Although the Consultant Team identified potential oil savings goals in its goals framework memo, the PAs have not proposed oil savings goals. Therefore, oil is not addressed in this report. Beyond the differences in the proposed plan for 2016-2018, the PAs and the Consultants also presented differences in historical and current program data. For 2014, the PAs reported the planned program activity (as presented in the PA's 2013-2015 Three-Year Plan) where the Consultants presented actual 2014 results as reported in the PAs' 4<sup>th</sup> Quarter/Year-End report. For 2015, the PAs reported planned program activity, where the Consultants presented an estimate of 2015 results based in part on 2014 results. The differences in annual energy savings between the PAs' Plan and the Consultants' goals framework are further illustrated in Figures 1 and 2, following the tables. Additional details on the savings goals proposed by the PAs and Consultant Team can be found in subsequent sections and in Appendix A.

**Table 1 | Massachusetts Portfolio Level Statewide Electric Plan Summary**

|   | 2014 (Q4/<br>Planned) | 2015<br>(Estimated/<br>Planned) | 2016   | 2017   | 2018   | Total (2016-18) |
|---|-----------------------|---------------------------------|--------|--------|--------|-----------------|
| <b>Electric Savings – Consultant Proposed</b> |                       |                                 |        |        |        |                 |
| <i>Annual Energy (GWh)</i>                    | 1,306                 | 1,340                           | 1,398  | 1,421  | 1,440  | 4,259           |
| <i>Annual Energy (% of Sales)</i>             | 2.69%                 | 2.81%                           | 2.98%  | 3.03%  | 3.09%  | 3.04%           |
| <i>Lifetime Energy (GWh)</i>                  | 13,342                | 13,855                          | 14,506 | 14,765 | 14,988 | 44,259          |
| <i>Summer Peak Demand (MW)</i>                | 172                   | 189                             | 188    | 195    | 201    | 584             |
| <i>Program Budget (million \$)</i>            | \$504                 | \$520                           | \$522  | \$530  | \$534  | \$1,586         |
| <b>Electric Savings – PA Draft</b>            |                       |                                 |        |        |        |                 |
| <i>Annual Energy (GWh)</i>                    | 1,237                 | 1,275                           | 1,179  | 1,168  | 1,162  | 3,509           |
| <i>Annual Energy (% of Sales)</i>             | 2.55%                 | 2.60%                           | 2.51%  | 2.49%  | 2.50%  | 2.50%           |
| <i>Lifetime Energy (GWh)</i>                  | 13,269                | 13,864                          | 11,049 | 10,987 | 11,136 | 33,171          |
| <i>Summer Peak Demand (MW)</i>                | 174                   | 177                             | 173    | 171    | 171    | 515             |
| <i>Program Budget (million \$)</i>            | \$496                 | \$519                           | \$581  | \$605  | \$633  | \$1,819         |

**Table 2 | Massachusetts Portfolio Level Statewide Gas Plan Summary**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016  | 2017  | 2018  | Total (2016-18) |
|--|-----------------------|------------------------------|-------|-------|-------|-----------------|
| <b>Gas Savings – Consultant Proposed</b> |                       |                              |       |       |       |                 |
| <i>Annual Energy (Million Therms)</i>    | 28                    | 29                           | 31    | 34    | 36    | 101             |
| <i>Annual Energy (% of Sales)</i>        | 1.33%                 | 1.37%                        | 1.38% | 1.47% | 1.54% | 1.47%           |
| <i>Lifetime Energy (Million Therms)</i>  | 380                   | 393                          | 421   | 452   | 476   | 1,349           |
| <i>Program Budget (million \$)</i>       | \$166                 | \$169                        | \$189 | \$210 | \$234 | \$633           |
| <b>Gas Savings – PA Draft</b>            |                       |                              |       |       |       |                 |
| <i>Annual Energy (Million Therms)</i>    | 24                    | 25                           | 24    | 25    | 25    | 75              |
| <i>Annual Energy (% of Sales)</i>        | 1.15%                 | 1.17%                        | 1.07% | 1.09% | 1.09% | 1.08%           |
| <i>Lifetime Energy (Million Therms)</i>  | 313                   | 321                          | 325   | 339   | 345   | 1009            |
| <i>Program Budget (million \$)</i>       | \$175                 | \$180                        | \$202 | \$208 | \$213 | \$623           |



**Summary of Key Issues**

The body of this report describes the Consultants' initial view of several important issues raised by the Plan. There will likely be substantial discussion and negotiation around many of these issues. In the limited time we have had to review the lengthy plan, none of these should be interpreted as fatal flaws or insurmountable challenges.

Across all sectors, low savings in the PA draft Plans compared to the Consultant Team goals and actual 2014 Q4 results will need to be explored. Some analysis and explanation from the PAs of why savings, and in some cases participation, are expected to drop from 2014 levels will help to better inform differences in the proposed savings

goals. At this time, there is not sufficient detail and back-up data on savings to complete and analyses of the differences. It is also difficult to assess whether all PAs intend to implement all elements in the Plan. Addressing the Council Resolutions comprehensively in the Plan will also be important in the goal development process.

For the C&I sector, more specific information is needed about what will be offered through some of the programs and initiatives still in the investigation stage. For the residential programs, issues of interest include why the PAs are proposing to move backwards rather than forwards with share of LEDs in lighting initiative, and the similar static nature of participation and savings for the behavioral initiative (with the exception of Berkshire gas efforts).

### Summary of Council Recommendations

Collaborative processes and meetings in early 2015 resulted in a comprehensive list of recommendations for the PAs' consideration in the next Three-Year Plan. While the PAs have indicated that they will be providing a summary of the extent to which they addressed each recommendation, this document has not been made available to the Consultants as of this writing.

The Consultant Team may amend this memo after the PAs' summary is made available for review.

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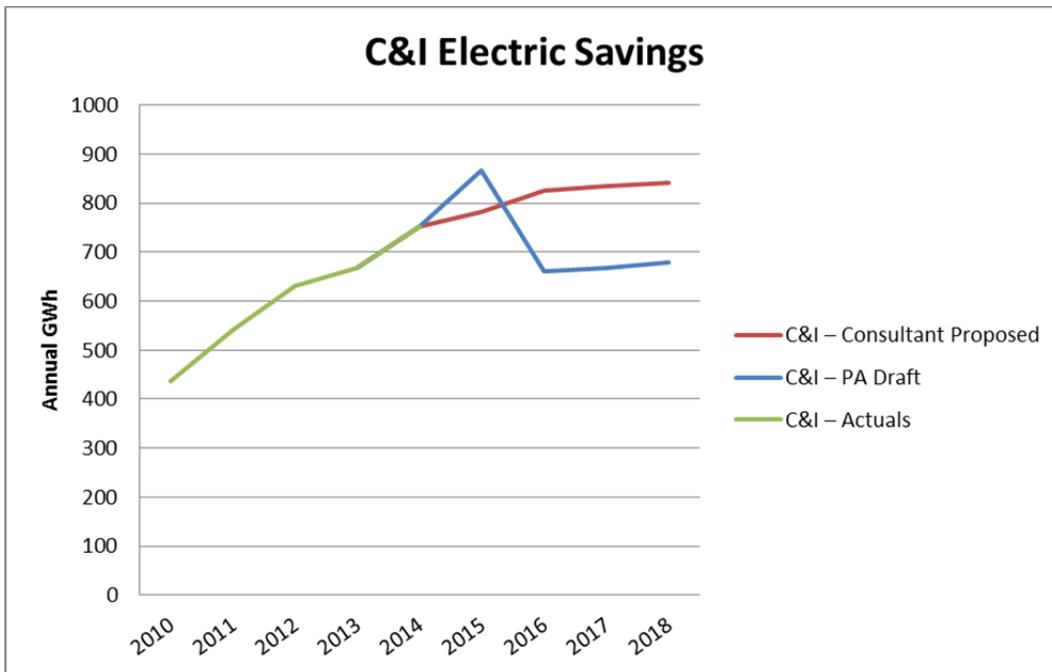
## QUANTITATIVE DATA REVIEW – COMMERCIAL & INDUSTRIAL SECTOR

### Electric

The following table summarizes the major components of the PAs' proposed electric C&I plan and compares these aspects to the Consultants' proposed goals framework. The differences in annual electric savings between the PAs' Plan and the Consultants' goals framework are further illustrated in the figure following the table.

**Table 3 | Massachusetts C&I Statewide Electric Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016    | 2017   | 2018   | Total (2016-18) |
|--|-----------------------|------------------------------|---------|--------|--------|-----------------|
| <b>Consultant Proposed</b>                       |                       |                              |         |        |        |                 |
| <i>Annual Energy (GWh)</i>                       | 751                   | 781                          | 825     | 834    | 841    | 2,501           |
| <i>Annual Energy % Change from Previous Year</i> |                       | 3.99%                        | 5.63%   | 1.09%  | 0.84%  |                 |
| <i>Annual Energy (% of Sales)</i>                | 2.45%                 | 2.61%                        | 2.82%   | 2.86%  | 2.91%  | 2.86%           |
| <i>Lifetime Energy (GWh)</i>                     | 9,112                 | 9,563                        | 10,110  | 10,258 | 10,390 | 30,758          |
| <i>Summer Peak Demand (MW)</i>                   | 100                   | 118                          | 112     | 115    | 119    | 346             |
| <b>PA Draft</b>                                  |                       |                              |         |        |        |                 |
| <i>Annual Energy (GWh)</i>                       | 844                   | 867                          | 660     | 668    | 678    | 1,388           |
| <i>Annual Energy % Change from Previous Year</i> |                       | 2.73%                        | -23.88% | 1.21%  | 1.50%  |                 |
| <i>Annual Energy (% of Sales)</i>                | 2.75%                 | 2.89%                        | 2.25%   | 2.29%  | 2.35%  | 2.30%           |
| <i>Lifetime Energy (GWh)</i>                     | 11,056                | 11,624                       | 7,665   | 7,597  | 7,744  | 23,006          |
| <i>Summer Peak Demand (MW)</i>                   | 107                   | 107                          | 93      | 94     | 96     | 283             |



The table below presents a brief listing of major differences between the PAs' Plan and either our proposed electric goals or historic trends for the C&I sector.

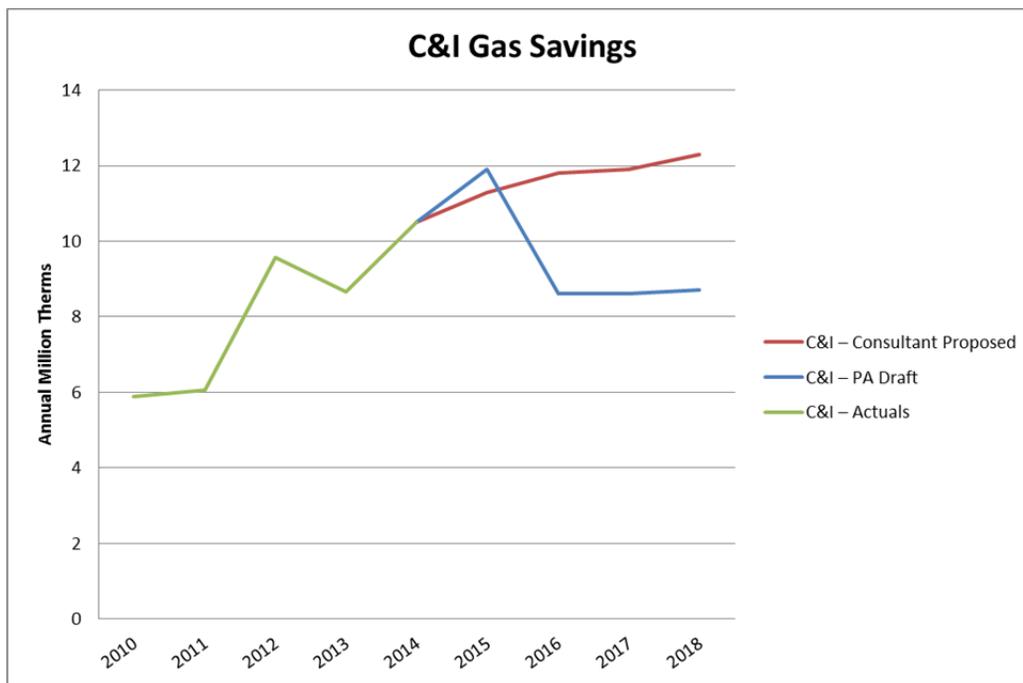
| Datapoint                        | Issue   |
|----------------------------------|---|
| C&I Electric Savings Decrease    | PA Proposed plan values are less than both 2013 and 2014 achievement, as well as the Consultant proposed level. The 2016 proposed goals represent a 24% reduction from the 2015 annual goal, and a 34% reduction in the lifetime goal.  |
| C&I Cost to Achieve Increases    | Cost to achieve annual savings increases 3% from 2016 to 2018, and 5% for lifetime savings.   |
| C&I Benefit Cost Ratio Decreases | The C&I Programs will see a 7.6% budget decrease from 2015 to 2016 as proposed in the PA plan.  |
| C&I Budget Distribution Shifts   | The C&I budgets show a shift from participant incentives, which decline from an historical average of 72% to 69% of the C&I budget, and an increase in sales, technical assistance and training which increases from an historical average of 11% to 14% of the C&I budget. Technical assistance can provide more value to customers than incentives. |

## Gas

The following table summarizes the major components of the PAs' proposed gas C&I plan and compare these aspects to the Consultants' proposed goals framework. The differences in annual gas savings between the PAs' Plan and the Consultants' goals framework are further illustrated in the figure following the table.

**Table 4 | Massachusetts C&I Statewide Gas Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016    | 2017  | 2018  | Total<br>(2016-18) |
|--|-----------------------|------------------------------|---------|-------|-------|--------------------|
| <b>Gas Savings – Consultant Proposed</b>         |                       |                              |         |       |       |                    |
| <i>Annual Energy (Million Therms)</i>            | 10.5                  | 11.3                         | 11.8    | 11.9  | 12.3  | 35.9               |
| <i>Annual Energy % Change from Previous Year</i> |                       | 7.62%                        | 4.42%   | 0.85% | 3.36% |                    |
| <i>Annual Energy (% of Sales)</i>                | 1.08%                 | 1.15%                        | 1.13%   | 1.12% | 1.14% | 1.13%              |
| <i>Lifetime Energy (Million Therms)</i>          | 154.6                 | 166.2                        | 173.3   | 175.5 | 180.8 | 529.7              |
| <b>Gas Savings – PA Draft</b>                    |                       |                              |         |       |       |                    |
| <i>Annual Energy (Million Therms)</i>            | 11.3                  | 11.9                         | 8.6     | 8.6   | 8.7   | 26                 |
| <i>Annual Energy % Change from Previous Year</i> |                       | 5.31%                        | -27.73% | 0.00% | 1.16% |                    |
| <i>Annual Energy (% of Sales)</i>                | 1.17%                 | 1.22%                        | 0.83%   | 0.82% | 0.81% | 0.82%              |
| <i>Lifetime Energy (Million Therms)</i>          | 165.3                 | 176                          | 124     | 124   | 125   | 373                |



The table below presents a brief listing of major differences between the PAs' Plan and either our proposed gas goals or historic trends for the C&I sector.

| Datapoint                     | Issue  |
|-------------------------------|--|
| C&I Gas Savings Decrease      | PA Proposed plan values are less than 2014 achievement, and the same as 2013. The 2016 proposed goals represent a 28% reduction from the 2015 annual goal, and a 30% reduction in the lifetime goal. |
| C&I Cost to Achieve Increases | Cost to achieve annual savings increases 4% from 2016 to 2018, and the same for lifetime savings.  |
| C&I Benefit Cost Ratio        | The BCR for C&I gas programs decreases from 2.34 to 2.29 from  |

|                                |   |
|--------------------------------|---|
| Decreases Slightly             | 2016-2018.  |
| C&I Budget Distribution Shifts | The C&I budgets show a shift from Participant Incentives, which decline from an historical average of 68% to 60% of the C&I budget, and an increase in Sales, Technical Assistance and Training which increases from an historical average of 13% to 16% of the C&I budget. Technical assistance can provide more value to customers than incentives. |

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## QUALITATIVE PLAN REVIEW – COMMERCIAL & INDUSTRIAL SECTOR

The following are preliminary comments and observations of the Draft Three Year Plan, intended to highlight areas of the plan where the Consultant Team believes there could be improvements or clarifications made to enhance the value of the plan. As stated above, the Consultant Team has maintained a good working relationship with the C&I Management Committee and believes many of the changes mentioned below will be considered over the coming months.

### **C&I Program Overview Lacks Specifics**

The overview does not provide a clear picture of the C&I market and the PA position(s) within that market, nor does it provide a clear description of where savings will come from over the next three years. It would be informative to describe at least qualitatively by initiative or sector where savings will decline, where they will stay the same, and where they will increase. There are no deadlines or commitments as to when planned activities will occur.

### **The Plan Does Not Fully Meet the Intent of the Green Communities Act**

Page 23, Section F.1 outlines the requirements of the Green Communities Act (GCA) with respect to the sustained acquisition of all cost effective resources. These include a balance of:

- Identifying the potential level of cost effective resource currently available;
- Exploring ways in which this level can be increased;
- Assessing the capability of the energy efficiency vendor and contractor industry to support increased program activity; and
- Assessing the capacity of the Program Administrators to administer increases in program activity efficiently and effectively.

The goals presented by the PAs are lower than actual 2014 achievement. This indicates that the PAs do not believe increased electric savings are possible and that gas savings likewise are unsustainable at the 2014 actual achieved rate. The proposed goals appear to be contrary to the intent of the second bullet above.

The Consultant Team has identified a number of sources of potential savings which could allow for increased savings. The PAs have not provided an explanation for why at least matching the 2014 level of achievement is not feasible, even though they expect costs to increase.

### **Proof of Market Saturation**

The Plan states, “it is necessary to acknowledge that many market factors, including increases in codes and standards, the saturation of certain markets, and lower avoided costs, suggest that a leveling off of savings is anticipated and that there will be a natural evolution toward higher costs to secure additional kilowatt hour and therm savings.”<sup>1</sup>

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<sup>1</sup> Page 28, para. 4 of the 2016-18 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency

Unless benchmark or other data suggests that a market is saturated, there should be cost effective opportunity for savings. Additional potential exists even for markets that have been the focus of targeted initiatives in Massachusetts, such as hospitals. For example, comparing the regional average energy consumption for large hospitals as documented in the Commercial Building Energy Consumption Survey to the data reported in the 2013 customer profile report shows that large hospitals in Massachusetts consume more energy than large hospitals in New England on average:

**Thermal use:** 242kbtu/sf NE large Hospitals<sup>2</sup> -vs- 265 kbtu/sf MA large hospitals<sup>3</sup>

**Electric use:** 26.2 kWh/sq ft NE Large Hospitals<sup>4</sup> -vs- 40 kWh/sf<sup>5</sup> average for MA large hospitals

This indicates that even where the PAs have made one of their largest investments and advancement, significant opportunities remain. The healthcare market is not saturated or fully efficient even in the areas where the PAs have focused most closely. The Plan should be specific as to what markets are considered saturated.

### Stakeholder Engagement Could be Improved

Stakeholder engagement is cited in the Plan as important and ongoing. However, there is likely room for improvement in several areas:

- A recent trial to test a commercial laundry product included only a single vendor and customer. Testing comparable measures from multiple vendors with multiple customers is a more inclusive, comprehensive, and rigorous approach.<sup>6</sup>
- While the PAs appear to provide a lot of information to their vendors and contractors, recent evaluations including the Small Business process evaluation indicate that even vendors under contract to the PAs do not feel like they have effective communication.
- Other than formal proposals, which present a very high bar, the PAs lack a formal mechanism for communication from interested stakeholders.

The Plan outlines many ways in which the PAs are currently engaging with stakeholders, but does not offer any plans for the improvement EMV studies suggests is possible.

### New Buildings and Major Renovations Program Lacks Specifics

The Plan presents a high level overview of the program and process. There is limited discussion of how projects are identified and enrolled in the program, or what percentage of new construction (by quantity of participants or number of square feet) is participating in the program. Improvements to the Plan should include:

- A description of how projects are identified early in the process and how the rate of inclusion in the programs may be improved. Setting a target for improvement would be even better. For example, in the public sector, where data on new construction tends to be more readily available, do the PAs have a working relationship with the Massachusetts School Building Authority to provide outreach to both funded and non-funded school proposals?
- An explanation of how the program works with design professionals that are not already part of

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Plan

<sup>2</sup> <http://www.eia.gov/consumption/commercial/reports/2007/large-hospital.cfm>

<sup>3</sup> Calculated from data in Section 5 - <http://ma-eeac.org/wordpress/wp-content/uploads/2013-CI-Customer-Profile-Report.pdf>

<sup>4</sup> <http://www.eia.gov/consumption/commercial/reports/2007/large-hospital.cfm>

<sup>5</sup> Section 5 - <http://ma-eeac.org/wordpress/wp-content/uploads/2013-CI-Customer-Profile-Report.pdf>

<sup>6</sup> Page 32, para. 5 of the 2016-18 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan

the “team of prescreened energy design experts.”

- A description of how the program is treating codes for baseline purposes, and changes to the code during the project process.

### **Sustainable Office Design Addresses Only lighting and Lighting Controls**

The time when one tenant leaves a commercial space and another moves in is called Tenant Improvement (TI). This time is recognized in the plan as an excellent window of opportunity to make energy efficiency improvements.

While the Consultant Team recognizes that the central HVAC systems are not generally impacted during TI, retrofitting the distribution system with tenant space does present an opportunity.<sup>7</sup> Lighting system approaches are a great step, but HVAC system approaches need to be integrated into the TI work to be comprehensive. HVAC controls, programmable thermostats, zoning, distribution layout (minimizing static pressure), and end equipment efficiency (high performance heat pumps and ECMs in fan powered VAV boxes) are key areas to harvest savings. In addition, where controls are funded by ratepayers, commissioning by an independent third party should be part of the requirement for the project for both lighting and HVAC.

### **Building Energy Codes and Appliance Standards is Largely Retrospective**

More information is required about the effects of codes and standards over the next three years. These are important for assessing how baselines will change, and the impact on savings. For example, information is needed on when the next code cycle is expected, how the PAs will be positioned to support this cycle, and how the PAs are measuring the impact of their efforts on compliance.

### **Lending/Appraisal/Rental Impacts of Green or Energy Efficient Buildings is not Discussed**

There have been studies done that indicate green and energy efficient buildings can be rented or sold for more money than equivalent but less efficient buildings.<sup>8</sup> It would be helpful to know how the PAs are educating financial institutions regarding the value of energy efficiency. These institutions could routinely ask developers the following questions:

- What is the annual energy cost of this building?
- How does that compare to a code building?
- What would it cost to drop that number by 30%?
- What would that do to the annual cashflow?
- How much are you getting in EE incentives?
- How does your cost of occupancy compare to your competitors?
- What premium is available for rents due to energy efficient or green features?

Getting financial institutions interested in the economic impacts of building operating efficiency is key to gaining increased market share and higher levels of energy efficiency in new construction.

### **No SEM/CEI Studies, Initiatives or Pilots Planned**

The Plan outlines current Strategic Energy Management (SEM) activities to include Retro-commissioning, training, and behavior approaches through the MOU/SEMP model and limits these activities to the largest customers. The plan intends to expand on the current approaches, and to include benchmarking and virtual audits.

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<sup>7</sup> Commenter has led the Mechanical, Electrical, and Plumbing (MEP) design of over 1 million square feet of TI and every project included all three trades with a major HVAC design component.

<sup>8</sup> <http://www.usgbc.org/articles/business-case-green-building>

The plan does not include any mention of the C&I Council Resolution 13, parts a and b, which state:

13. In recognition of the significance of C&I customer behavior on energy efficiency, the PAs shall:

- a. Deliver a report by the end of 2016 on Strategic Energy Management (SEM)/ Continuous Energy Improvement (CEI) programs for large commercial and industrial customers that:
  - i. Researches SEM/ CEI programs to determine their applicability, cost effectiveness, and feasibility of implementation in Massachusetts;
  - ii. Evaluates the potential savings from SEM/CEI programs;
  - iii. Develops guidelines for how energy savings from SEM/CEI programs can cost-effectively be measured and verified; and
  - iv. Explores leveraging such programs for dispatchable load control.
- b. Based on the reports, if appropriate, implement SEM/CEI with large commercial and industrial customers, including providing technical assistance to identify opportunities and/or project management support for implementation.

The Consultant Team believes that the SEM programs referred to in 13.a. are those currently being implemented in the Pacific Northwest by multiple utilities. These programs are characterized by the use of regression analysis to establish a baseline for energy use against which progress and savings are measured. The minimum elements of a SEM program are outlined by the Consortium for Energy Efficiency here:

[http://library.cee1.org/sites/default/files/library/11283/SEM\\_Minimum\\_Elements.pdf](http://library.cee1.org/sites/default/files/library/11283/SEM_Minimum_Elements.pdf)

The Consulting Team would like to see the Plan meet the intent of C&I Resolution 13, parts a and b.

We recommend that the PAs consider opening up the Retro-commissioning, training, and behavior approaches to medium to large sized customers, in addition to the very largest customers.

### **Lack of Consistency with MOUs and SEMP**

Only the largest PAs engage the largest customers with either an MOU or a SEMP, and there is not alignment between the two approaches. The lack of alignment can cause issues for large customers who want to standardize on one approach across several locations or campuses in different gas and electric utility jurisdictions. Because not all of the smaller PAs are engaging their largest customers in this more comprehensive way, this may be contributing to the small PAs reduced performance with respect to realizing savings from large customers.

Standardization of one MOU approach or template on a statewide basis, while maintaining enough flexibility within the template to meet the mutual goals of the customer and the utility, could help to promote this effective tool.

### **Small Business Initiative Plan Needs More Specifics**

While successful, the small business initiative is expensive and inconsistent in its results. A recent evaluation of the process reveals that the level of service varies between PAs, even when the same vendor is working for both PAs. A single statewide contract with multiple awards and territories could help this issue.

In addition, the plan states that a number of strategies and changes are being considered. Some efforts to increase the number and savings of thermal measures are already being implemented. The plan could be improved by a discussion of the methodology and criteria by which changes are tested in the field and adopted, and a timeframe in which it will happen.

### **Upstream Lighting Incentives Cover 100% of Incremental Cost**

Page 150 states, “The incentives are structured to entirely remove the price premium between conventional and premium products at the point of purchase, thereby placing premium product in direct competition with the conventional product on the basis of attributes of quality and efficiency alone – with the assumption that the purchaser will make the wise choice.”

The Team wonders whether it is necessary for the incentive to cover 100% of the incremental cost. A price premium for efficient products indicates higher quality and may actually increase sales, in addition to saving ratepayer funds and reducing program costs.

In addition, the Upstream Lighting Initiative should be characterized as simply Upstream, to allow for the inclusion of other non-lighting measures.

### **Large Projects Should be Included in Planning**

The Plan states that, “Because large projects are not typical or replicable, they should not be included in the planning process to estimate budgets or savings, or when calculating costs to achieve savings.”<sup>9</sup> Instead of treating large projects as anomalies, we recommend that the PAs strive to do more large projects as a matter of course, including CHP and industrial process projects as they are very cost effective. While it may be difficult to predict the amount of large projects in any given year, it seems reasonable to count on some average annual number of savings during a three year plan.

### **LED Costs**

The Plan presents cost assumptions for LED A lamps that assume two scenarios: that costs stay the same, and that costs decline at a rate of 20% annually. A number of studies indicate that the 20% annual reduction is overly conservative.<sup>10,11</sup>

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## **RESIDENTIAL AND LOW INCOME QUANTITATIVE PLAN REVIEW**

### **Electric**

The following tables summarize the major components of the PAs’ proposed electric residential and low income plans and compares these aspects to the Consultants’ proposed goals framework. The differences in annual electric savings between the PAs’ Plan and the Consultants’ goals framework are further illustrated in the figure following the tables.

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<sup>9</sup> Page 174, para. 9 of the 2016-18 Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan

<sup>10</sup> [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ssl\\_mypp2014\\_web.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ssl_mypp2014_web.pdf)

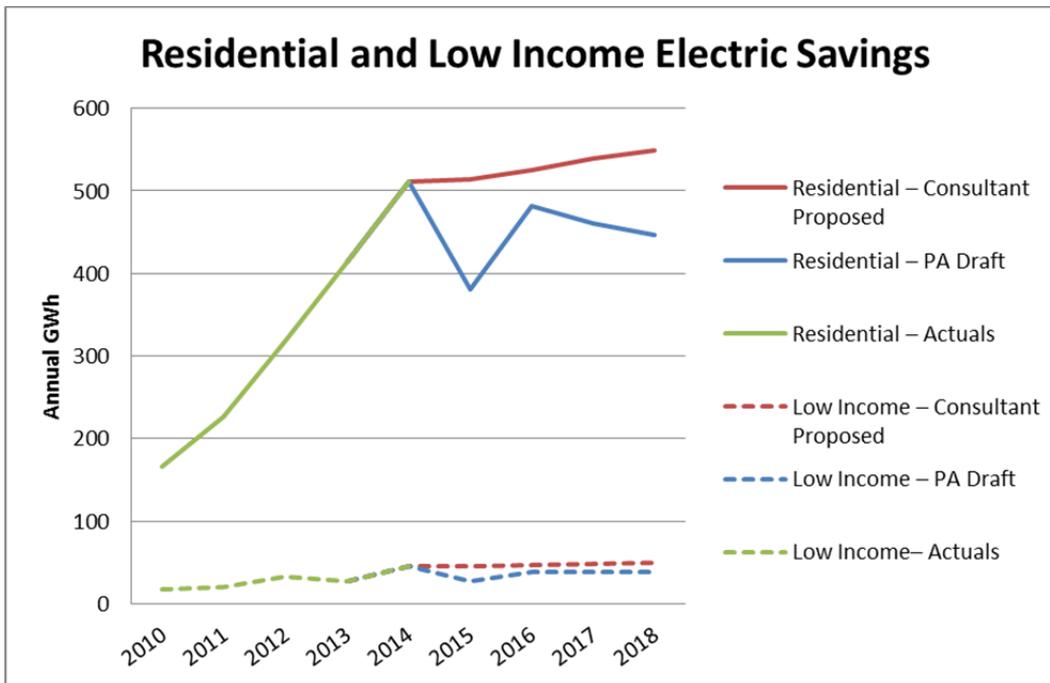
<sup>11</sup> <http://eetd.lbl.gov/sites/all/files/lbnl-6854e.pdf>

**Table 5 | Massachusetts Residential Statewide Electric Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016   | 2017   | 2018   | Total (2016-18) |
|--|-----------------------|------------------------------|--------|--------|--------|-----------------|
| <b>Consultant Proposed</b>                       |                       |                              |        |        |        |                 |
| <i>Annual Energy (GWh)</i>                       | 511                   | 514                          | 525    | 539    | 549    | 1,613           |
| <i>Annual Energy % Change from Previous Year</i> |                       | 0.59%                        | 2.14%  | 2.67%  | 1.86%  |                 |
| <i>Annual Energy (% of Sales)</i>                | 3.23%                 | 3.28%                        | 3.38%  | 3.47%  | 3.55%  | 3.47%           |
| <i>Lifetime Energy (GWh)</i>                     | 3,799                 | 3,852                        | 3,939  | 4,040  | 4,120  | 12,099          |
| <i>Summer Peak Demand (MW)</i>                   | 68                    | 65                           | 71     | 74     | 77     | 223             |
| <b>PA Draft</b>                                  |                       |                              |        |        |        |                 |
| <i>Annual Energy (GWh)</i>                       | 365                   | 380                          | 481    | 461    | 446    | 1,388           |
| <i>Annual Energy % Change from Previous Year</i> |                       | 4.11%                        | 26.58% | -4.16% | -3.25% |                 |
| <i>Annual Energy (% of Sales)</i>                | 2.31%                 | 2.42%                        | 3.10%  | 2.97%  | 2.88%  | 2.98%           |
| <i>Lifetime Energy (GWh)</i>                     | 1,952                 | 1,986                        | 3,020  | 3,022  | 3,017  | 9,058           |
| <i>Summer Peak Demand (MW)</i>                   | 62                    | 64                           | 76     | 73     | 71     | 220             |

**Table 6 | Massachusetts Low Income Statewide Electric Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016   | 2017  | 2018  | Total (2016-18) |
|--|-----------------------|------------------------------|--------|-------|-------|-----------------|
| <b>Consultant Proposed</b>                       |                       |                              |        |       |       |                 |
| <i>Annual Energy (GWh)</i>                       | 45                    | 46                           | 47     | 48    | 49    | 145             |
| <i>Annual Energy % Change from Previous Year</i> |                       | 2.22%                        | 2.17%  | 2.13% | 2.08% |                 |
| <i>Annual Energy (% of Sales)</i>                | 2.23%                 | 2.21%                        | 2.25%  | 2.25% | 2.25% | 2.25%           |
| <i>Lifetime Energy (GWh)</i>                     | 431                   | 440                          | 457    | 468   | 478   | 1,402           |
| <i>Summer Peak Demand (MW)</i>                   | 4.6                   | 5.6                          | 5.0    | 5.2   | 5.4   | 15.6            |
| <b>PA Draft</b>                                  |                       |                              |        |       |       |                 |
| <i>Annual Energy (GWh)</i>                       | 28                    | 27                           | 38     | 39    | 39    | 116             |
| <i>Annual Energy % Change from Previous Year</i> |                       | -3.57%                       | 40.74% | 2.63% | 0.00% |                 |
| <i>Annual Energy (% of Sales)</i>                | 1.39%                 | 1.31%                        | 1.83%  | 1.80% | 1.77% | 2.30%           |
| <i>Lifetime Energy (GWh)</i>                     | 260                   | 254                          | 363    | 369   | 375   | 1,107           |
| <i>Summer Peak Demand (MW)</i>                   | 5.3                   | 5.4                          | 3.7    | 3.7   | 3.7   | 11.1            |



The table below presents a brief listing of major differences between the PAs' Plan and either our proposed electric goals or historic trends for the residential and low income sectors.

| Datapoint  | Issue  |
|--|--|
| Low Income Savings Increase Slightly                 | Plan value is less than both 2014 achievement and Consultant proposed level. Sector savings grow 1% over the 2016-2018 timeframe.  |
| Low Income Participation Rates Increase              | Single family (SF) and multi-family (MF) participation rates increase 2% and 6%, respectively, from 2016 to 2018.  |
| Low Income Savings per Participant Decrease          | Savings per participant declines from 2016-2018 for both SF (5%) and MF (1%).  |
| Low Income Cost to Achieve Increases                 | The cost to achieve savings (\$/kWh) increases 5% from 2016-2018, with most of the increase coming from the SF initiative (9% increase).   |
| Residential Savings Decrease                         | Plan value is less than both 2014 Achievement and Consultant proposed level. Sector savings decline 7% over the 2016-2018 timeframe.   |
| Residential Cost to Achieve Increases                | Cost to achieve annual savings (\$/kWh) increases 22% from 2016-2018 driven in large part by the 55% increase in retail lighting \$/kWh. However, the PAs assume no reduction in LED TRC costs or incentives over the Plan duration. |
| Whole House Program Savings per Participant Decrease | Savings per participant declines from 2016-2018 for each of the Whole House initiatives, ranging from a 10% reduction for New Construction to 2% declines for MF and Behavioral.   |

|   |  |
|---|--|
| Behavioral Initiative Participation Rates Remain Consistent | Participation in the Behavioral Initiative is largely unchanged over the 2016-2018 timeframe.  |
| HES and MF Participation Rates Increase                     | HES and MF participation rates increase 4% and 3%, respectively, from 2016 to 2018.  |
| Retail Lighting Savings Decrease                            | While Lighting Initiative participation increases 22% from 2016-2018, savings decline nearly 15% as savings/participant decline 30%. |

## Gas

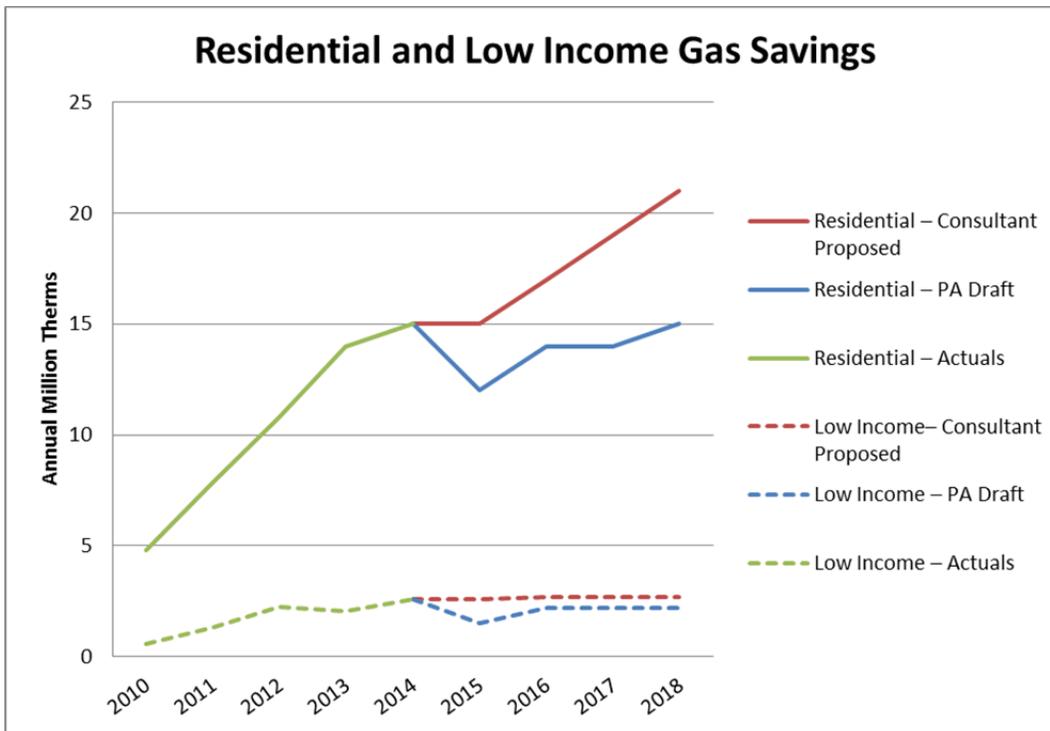
The following tables summarize the major components of the PAs' proposed gas residential and low income plans and compare these aspects to the Consultants' proposed goals framework. The differences in annual gas savings between the PAs' Plan and the Consultants' goals framework are further illustrated in the figure following the tables.

**Table 7 | Massachusetts Residential Statewide Gas Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016   | 2017   | 2018   | Total (2016-18) |
|--|-----------------------|------------------------------|--------|--------|--------|-----------------|
| <b>Gas Savings – Consultant Proposed</b>         |                       |                              |        |        |        |                 |
| <i>Annual Energy (Million Therms)</i>            | 15                    | 15                           | 17     | 19     | 21     | 57              |
| <i>Annual Energy % Change from Previous Year</i> |                       | 0.00%                        | 13.33% | 11.76% | 10.53% |                 |
| <i>Annual Energy (% of Sales)</i>                | 1.45%                 | 1.46%                        | 1.52%  | 1.71%  | 1.82%  | 1.68%           |
| <i>Lifetime Energy (Million Therms)</i>          | 175                   | 175                          | 196    | 224    | 242    | 662             |
| <b>Gas Savings – PA Draft</b>                    |                       |                              |        |        |        |                 |
| <i>Annual Energy (Million Therms)</i>            | 12                    | 12                           | 14     | 14     | 15     | 42              |
| <i>Annual Energy % Change from Previous Year</i> |                       | 0.00%                        | 16.67% | 0.00%  | 7.14%  |                 |
| <i>Annual Energy (% of Sales)</i>                | 1.15%                 | 1.15%                        | 1.20%  | 1.25%  | 1.26%  | 1.24%           |
| <i>Lifetime Energy (Million Therms)</i>          | 119                   | 115                          | 159    | 172    | 177    | 508             |

**Table 8 | Massachusetts Low Income Statewide Gas Savings**

|  | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016   | 2017  | 2018  | Total (2016-18) |
|--|-----------------------|------------------------------|--------|-------|-------|-----------------|
| <b>Gas Savings – Consultant Proposed</b>         |                       |                              |        |       |       |                 |
| <i>Annual Energy (Million Therms)</i>            | 2.6                   | 2.6                          | 2.7    | 2.7   | 2.7   | 8.1             |
| <i>Annual Energy % Change from Previous Year</i> |                       | 0.00%                        | 3.85%  | 0.00% | 0.00% |                 |
| <i>Annual Energy (% of Sales)</i>                | 2.41%                 | 2.41%                        | 2.41%  | 2.41% | 2.41% | 2.41%           |
| <i>Lifetime Energy (Million Therms)</i>          | 51.1                  | 51.4                         | 51.7   | 52.3  | 52.9  | 156.9           |
| <b>Gas Savings – PA Draft</b>                    |                       |                              |        |       |       |                 |
| <i>Annual Energy (Million Therms)</i>            | 1.4                   | 1.5                          | 2.2    | 2.2   | 2.2   | 6.5             |
| <i>Annual Energy % Change from Previous Year</i> |                       | 7.14%                        | 46.67% | 0.00% | 0.00% |                 |
| <i>Annual Energy (% of Sales)</i>                | 1.28%                 | 1.37%                        | 1.96%  | 1.95% | 1.93% | 1.94%           |
| <i>Lifetime Energy (Million Therms)</i>          | 28.3                  | 29.3                         | 42.3   | 42.5  | 42.6  | 127.5           |



The table below presents a brief listing of major differences between the PAs' Plan and either our proposed gas goals or historic trends for the residential and low income sectors.

| Datapoint   | Issue  |
|---|--|
| Low Income Savings Stay Relatively Flat                 | Plan value is less than both 2014 achievement and Consultant proposed level. Sector savings grow less than 1% over the 2016-2018 timeframe.                  |
| Low Income Participation Rates                          | SF participation rate is flat and MF participation increases 1% from 2016 to 2018.   |
| Low Income Savings per Participant Stay Relatively Flat | Savings per participant is flat from 2016-2018 for SF (0%) and decreases 1% for MF.  |
| Low Income Cost to Achieve Increases                    | The cost to achieve savings (\$/therm) increases 2% from 2016-2018, with most of the increase coming from the SF initiative (3% increase).                   |
| Residential Savings Increase                            | Sector savings increase 8% over the 2016-2018 timeframe.   |
| Residential Cost to Achieve Decreases                   | Cost to achieve annual savings (\$/therm) decreases 1% from 2016-2018 driven mostly by the 8% decrease in HES \$/therm and the 5% decrease in HVAC \$/therm. |
| Whole House Program Savings per Participant Increase    | Savings per participant increases—ranging from 4% to 13%—from 2016-2018 for all of the Whole House initiatives.  |
| Behavioral Initiative Participation Rates Stay          | Participation in the electric Behavioral Initiative is unchanged over the  |

|   |   |
|---|---|
| Constant                                | 2016-2018 timeframe.  |
| HES and MF Participation Rates Increase | HES and MF participation rates increase 3% and 4%, respectively, from 2016 to 2018. |

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## RESIDENTIAL AND LOW INCOME QUALITATIVE PLAN REVIEW

This section presents a qualitative review of the draft Plan in two sections: 1) a review of the sector goals from the draft Plan and comparison to those presented by the Consultants in the goals framework memo, and 2) a preliminary review of the programmatic descriptions and details for the residential and low income sectors. The latter will be the focus of a Council workshop on June 4, and the PAs are in the process of completed a matrix noting how they addressed each of the Council recommendations from the resolution. With the expectation that additional information exchange and discussion will be occurring over the next several weeks, we have highlighted a few of the recommendations that were the most significant focus of discussion during the Council workshop process.

### Initiative Planning Assumptions Yield Lower Savings

#### RESIDENTIAL

Residential electric savings presented in the PA plan are significantly lower than the savings presented in the Consultant Team Goals and the PA Q4 2014 preliminary savings. The higher Consultant proposed goals are driven mainly by increased participation rates overall, most notably in the Behavioral and Lighting Initiatives. Higher savings per participant for certain initiatives, again, most notably in the Behavioral Initiative and, to a lesser extent, the Lighting Initiative, also account for this difference. The higher lighting savings are in part due to much higher proportions of LEDs being promoted (see below). It is not yet clear what assumptions are driving the low PA plan residential electric savings, as the draft plans do not address the savings levels in any detail.

Conversely, we have assumed lower savings per participant and lower overall savings in the Residential Multi-Family and Home Energy Services (HES) Initiatives. This is mostly due to reduced lighting savings from lower net to gross ratios and from fewer installed bulbs per home as the saturation of efficient lighting in homes continues to increase.

Residential gas savings presented in the PA plan are also significantly lower than the savings presented in the Consultant Team Goals and the PA Q4 2014 preliminary savings. Higher Consultant proposed goals are driven mainly by increased participation rates overall in line with the trend in recent years; most notably in the Behavioral, HES and HVAC Initiatives. Higher savings per participant for all initiative participants, again, notably in the Behavioral and HES Initiatives, also play a role. HVAC Initiative savings increases are tempered somewhat by assumptions regarding the combined impact of both higher baselines and lower net to gross ratios.

As first described in the C&I section, proposed goals that are lower than actual 2014 achievement indicate that the PAs do not believe increased savings are possible or unsustainable at the 2014 actual achieved rate. The PAs preliminary proposed goals appear to be contrary to the intent of the Green Communities Act.

We recommend that the PAs revisit their key Initiative planning assumptions and prior program performance and revise their electric and gas savings upwards. We further recommend that the PAs detail out their assumptions in order to provide appropriate justification and support for their conclusions.

#### LOW INCOME

Electric low income savings increase slightly from 2016 to 2018 with Single Family Initiative savings declining and Multi-Family increasing. The PAs' electric low income savings decline from 2016 to 2018. The Consultant proposed savings are considerably higher in each of the Plan's three years. The PAs' preliminary 2014 Q4 savings are notably higher than the PAs' proposed 2016-2018 goals, and unlikely to be reduced by evaluation findings.

For gas, low income savings increase slightly and remain largely unchanged between 2016 and 2018 with both

the Single Family and Multi-Family Initiative savings increasing less than 1%. The PA's gas low income savings decline from 2016 to 2018. The Consultant proposed savings are considerably higher in each of the Plan's three years.

We recommend that the PAs revisit and explain their key initiative planning assumptions and prior program performance and revise their savings upwards.

### **Insufficient Acceleration of Support for LEDs**

Through the end of March 2015, 43% of products invoiced in 2015 in the Lighting Initiative were LEDs. In the Plan, the PAs propose to significantly reduce this to 33% in 2016. In 2017 the percentage of LEDs increases to 42%, still less than current 2015 year-to-date performance. Only in 2018 does the LED program share of 51% finally exceed current 2015 results. There are also significant differences in LED program share across the PAs. In comparison, the Consultant proposed savings goals assume an LED program share that based on the existing trend grows to 100% in 2018. Additionally, the Consultant's overall level of program activity is considerably higher than that assumed by the PAs.

A review of the PAs' planning inputs for this Initiative also raises significant questions regarding the PAs' LED cost and incentive assumptions. These values are held constant over the Plan's three years in sharp contrast to historical trends. All data sources that we are familiar with including those from Northeast Energy Efficiency Partnerships, the U.S. Department of Energy, Lawrence Berkeley National Laboratory, and preliminary analysis and projections done of Massachusetts LED pricing show continued and projected significant reductions in LED pricing. As a result, PA Initiative costs are likely to be significantly overstated and Initiative benefits and net benefit substantially understated in the draft Plan.

If the program share for LEDs were to increase there would be a small, but non-trivial, increase in annual savings. However, lifetime savings, benefits, and net benefits would all increase substantially due to longer LED measure lives. We believe there is a strong case for a greater share of LEDs in 2016, growing to 100% adoption by 2018 and that the Plan should be revised to reflect that with more realistic cost projections.

Support for LEDs through direct installation in the Whole House Program is more robust in the draft Plan, with LEDs constituting 81% of all units installed across all of the Whole House Initiatives statewide by 2018. At the same time, there are notable disparities between individual PAs' plans. In 2018, National Grid plans to be installing 29% of lighting units as CFLs, while all of the other electric PAs are at 10% or less.

### **Limited Growth in Behavioral Initiative Savings and Participation**

Over the Three-Year Plan duration there is almost no change in the Behavioral Initiatives' electric savings and participation and only a small increase in gas savings. Among the electric PAs, National Grid and Eversource remain the only PAs with system-wide implementation of a behavioral offering and even they appear to have the opportunity to reach more customers. Unitil has no savings attributed to this Initiative in 2016-2018, while the Cape Light Compact grows a small initiative effort from 350 to 450 participants with savings representing less than 0.1% of sector savings. Among the gas PAs, in addition to existing programs at National Grid and Eversource, Berkshire Gas has 5,000 participants in a new initiative offer. Neither Columbia Gas nor Liberty Utilities propose Initiative efforts in the 2016-2018 timeframe.

For Columbia Gas alone, we have estimated almost 100,000 new gas participants and almost 1 million therms in annual savings over the course of 2016-2018. Based on the difference between the number of Behavioral Initiative participants in 2014 (almost 1 million combined electric and gas) and the number of households in Massachusetts (2.5 million in 2013, minus 13 percent served by municipal utilities), we continue to believe there is additional savings potential for the electric and gas Behavioral Initiatives. The Plan's new enhancements related to home automation technologies, real-time feedback, and mobile applications offer additional promise in this regard. We would like to better understand why the PAs are not proposing more significant growth in the draft Plan.

### **Several Positive Additions to Multi-Family Retrofit Initiative**

In the description of exciting innovations in the 2016-2018 Plan (p. 11), the draft Plan states that the Multi-Family Retrofit Initiative will include creation of a project-level lead to ensure optimal customer experience, tracking and reporting of commercial and residential meter savings separately. We are very pleased to see these developments, as well as the preliminary commitment to building operator certification training, and believe they will be strong enhancements. We note, however, that these developments are not mentioned in the full narrative description of the Multi-Family Retrofit Initiative on pp. 46-52, which appears to describe this Initiative as it is currently being implemented. We would like to see these new developments described with a timeframe for implementation as well and to better understand why Council recommendations about adding a benchmarking plan or initiative, more fully leveraging refinancing events, and developing program offerings for different market segments are not included.

### **Promising Step for Renters**

The Special Renter Visit included in the draft Plan seems promising. To more fully assess this option, additional details are needed about how it differs from current practice of special visits, how it was selected, how and when was selected, how it will be implemented, and how landlords will be effectively engaged. We would also like to see additional information on how the PAs intend to engage trusted third parties (e.g., municipalities, community groups) to increase the reach and success of their own efforts.

### **Additional Information Needed Regarding Plans to Serve Moderate Income Customers**

The draft Plan indicates that the Program Administrators are working on “a new 61-80% of median income opt-in approach for those with weatherization opportunities, to be more fully developed with program partners.” Since the Council resolution specified that an income range of up to 120% Area Median Income be assessed, the Plan should provide additional information regarding how the narrower income range was selected. It should also provide information on how the selection relates to previous discussions during the Council workshops about that population being served by the Low Income Program, especially customers in multi-family buildings. The Plan should also provide additional information about what program partners will be involved in program development and delivery and to what extent.

### **No Incentives for Net-Zero New Construction**

The draft Plan indicates that the PAs will promote the value of net-zero and renewable-ready measures to builders through marketing, education, and training. The Plan does not indicate that the PAs are planning to revise their tiers to require renewable ready measures in the higher tier(s) and/or provide financial incentives for net-zero new construction. The addition of incentives to the Plan for net-zero new construction will help reestablish Massachusetts as a leader alongside California in this specific area and align the PAs more closely with DOER’s efforts to stimulate net-zero energy construction. We would like additional information on why this hasn’t been included in the Plan.

### **Financing (HEAT Loan) Appears Unchanged**

The Council Resolution recommended that the PAs evaluate several changes to the HEAT Loan. The Plan contains no mention of such an evaluation, and we feel that additional details are warranted.

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## **PROGRAM BUDGETS AND COSTS TO ACHIEVE**

The tables below present a comparison of the statewide program budgets and costs to achieve between the PAs’ proposed electric and gas plans and Consultants’ proposed goals framework.

### **Electric**

**Table 9 | Massachusetts Sector Level Electric Statewide Program Budgets, Millions of \$**

|                              | 2016  | 2016 % of Total | 2017  | 2017 % of Total | 2018  | 2018 % of Total | Total (2016-18) | Total (2016-18) % of Total (2016-18) |
|------------------------------|-------|-----------------|-------|-----------------|-------|-----------------|-----------------|--------------------------------------|
| <b>Electric – Consultant</b> | \$522 |                 | \$530 |                 | \$534 |                 | \$1,586         |                                      |
| <i>Residential</i>           | \$187 | 36%             | \$189 | 36%             | \$192 | 36%             | \$568           | 36%                                  |
| <i>Low Income</i>            | \$63  | 12%             | \$66  | 12%             | \$69  | 13%             | \$198           | 12%                                  |
| <i>C&amp;I</i>               | \$272 | 52%             | \$274 | 52%             | \$273 | 51%             | \$819           | 52%                                  |
| <b>Electric – PA</b>         | \$581 |                 | \$605 |                 | \$633 |                 | \$1,818         |                                      |
| <i>Residential</i>           | \$244 | 42%             | \$259 | 43%             | \$276 | 44%             | \$779           | 43%                                  |
| <i>Low Income</i>            | \$68  | 12%             | \$69  | 11%             | \$72  | 11%             | \$209           | 11%                                  |
| <i>C&amp;I</i>               | \$269 | 46%             | \$277 | 46%             | \$284 | 45%             | \$831           | 46%                                  |

**Table 10 | Electric Cost to Achieve, Consultant vs. PA Plans (\$/annual energy unit)**

|                                      | 2014 (Q4/Planned) | 2016    | 2017    | 2018    | Total (2016-18) |
|--------------------------------------|-------------------|---------|---------|---------|-----------------|
| <b>Electric Savings – Consultant</b> | \$0.386           | \$0.374 | \$0.373 | \$0.370 | \$0.372         |
| <i>Residential</i>                   | \$0.405           | \$0.357 | \$0.351 | \$0.349 | \$0.352         |
| <i>Low Income</i>                    | \$1.306           | \$1.333 | \$1.361 | \$1.390 | \$1.362         |
| <i>C&amp;I</i>                       | \$0.318           | \$0.330 | \$0.329 | \$0.324 | \$0.328         |
| <b>Electric Savings – PA</b>         | \$0.401           | \$0.443 | \$0.454 | \$0.460 | \$0.452         |
| <i>Residential</i>                   | \$0.319           | \$0.465 | \$0.481 | \$0.503 | \$0.483         |
| <i>Low Income</i>                    | \$1.221           | \$1.447 | \$1.438 | \$1.469 | \$1.441         |
| <i>C&amp;I</i>                       | \$0.370           | \$0.326 | \$0.332 | \$0.338 | \$0.332         |

**Table 11 | Electric Cost to Achieve, Consultant vs. PA Plans (\$/lifetime energy unit)**

|                                      | 2014 (Q4/Planned) | 2016    | 2017    | 2018    | Total (2016-18) |
|--------------------------------------|-------------------|---------|---------|---------|-----------------|
| <b>Electric Savings – Consultant</b> | \$0.038           | \$0.036 | \$0.036 | \$0.036 | \$0.036         |
| <i>Residential</i>                   | \$0.054           | \$0.048 | \$0.047 | \$0.047 | \$0.047         |
| <i>Low Income</i>                    | \$0.135           | \$0.138 | \$0.141 | \$0.144 | \$0.141         |
| <i>C&amp;I</i>                       | \$0.026           | \$0.030 | \$0.027 | \$0.026 | \$0.027         |
| <b>Electric Savings – PA</b>         | \$0.037           | \$0.053 | \$0.055 | \$0.057 | \$0.055         |
| <i>Residential</i>                   | \$0.083           | \$0.081 | \$0.086 | \$0.091 | \$0.086         |
| <i>Low Income</i>                    | \$0.211           | \$0.187 | \$0.187 | \$0.192 | \$0.189         |
| <i>C&amp;I</i>                       | \$0.025           | \$0.035 | \$0.036 | \$0.037 | \$0.036         |

## Gas

**Table 12 | Massachusetts Sector Level Gas Statewide Program Budgets, Millions of \$**

|                         | 2016  | 2016 % of Total | 2017  | 2017 % of Total | 2018  | 2018 % of Total | Total (2016-18) | Total (2016-18)<br>% of Total (2016-18) |
|-------------------------|-------|-----------------|-------|-----------------|-------|-----------------|-----------------|---|
| <b>Gas – Consultant</b> | \$189 |                 | \$210 |                 | \$234 |                 | \$633           |   |
| <i>Residential</i>      | \$110 | 58%             | \$129 | 61%             | \$150 | 64%             | \$388           | 61%                                     |
| <i>Low Income</i>       | \$40  | 21%             | \$41  | 20%             | \$42  | 18%             | \$123           | 19%                                     |
| <i>C&amp;I</i>          | \$39  | 21%             | \$40  | 19%             | \$43  | 18%             | \$122           | 19%                                     |
| <b>Gas – PA</b>         | \$202 |                 | \$208 |                 | \$213 |                 | \$623           |   |
| <i>Residential</i>      | \$120 | 59%             | \$124 | 60%             | \$127 | 60%             | \$371           | 60%                                     |
| <i>Low Income</i>       | \$43  | 21%             | \$43  | 21%             | \$44  | 21%             | \$129           | 21%                                     |
| <i>C&amp;I</i>          | \$40  | 20%             | \$41  | 20%             | \$42  | 20%             | \$123           | 20%                                     |

**Table 13 | Gas Cost to Achieve, Consultant vs. PA Plans (\$/annual energy unit)**

|                                 | 2014 (Q4/<br>Planned) | 2016     | 2017     | 2018     | Total (2016-18) |
|---------------------------------|-----------------------|----------|----------|----------|-----------------|
| <b>Gas Savings – Consultant</b> | \$5.873               | \$6.003  | \$6.187  | \$6.520  | \$6.248         |
| <i>Residential</i>              | \$6.170               | \$6.460  | \$6.646  | \$7.135  | \$6.769         |
| <i>Low Income</i>               | \$14.554              | \$14.862 | \$15.173 | \$15.490 | \$15.177        |
| <i>C&amp;I</i>                  | \$3.265               | \$3.334  | \$3.404  | \$3.475  | \$3.406         |
| <b>Gas Savings – PA</b>         | \$7.157               | \$8.313  | \$8.287  | \$8.386  | \$8.307         |
| <i>Residential</i>              | \$7.242               | \$8.571  | \$8.857  | \$8.467  | \$8.833         |
| <i>Low Income</i>               | \$25.663              | \$19.545 | \$19.545 | \$20.000 | \$19.846        |
| <i>C&amp;I</i>                  | \$4.584               | \$4.651  | \$4.767  | \$4.828  | \$4.731         |

**Table 14 | Gas Cost to Achieve, Consultant vs. PA Plans (\$/lifetime/energy unit)**

|                                 | 2014 (Q4/<br>Planned) | 2016    | 2017    | 2018    | Total (2016-18) |
|---------------------------------|-----------------------|---------|---------|---------|-----------------|
| <b>Gas Savings – Consultant</b> | \$0.436               | \$0.448 | \$0.466 | \$0.493 | \$0.470         |
| <i>Residential</i>              | \$0.535               | \$0.560 | \$0.576 | \$0.618 | \$0.587         |
| <i>Low Income</i>               | \$0.750               | \$0.770 | \$0.780 | \$0.800 | \$0.782         |
| <i>C&amp;I</i>                  | \$0.221               | \$0.230 | \$0.230 | \$0.240 | \$0.231         |
| <b>Gas Savings – PA</b>         | \$0.558               | \$0.622 | \$0.614 | \$0.617 | \$0.617         |
| <i>Residential</i>              | \$0.730               | \$0.755 | \$0.721 | \$0.718 | \$0.730         |
| <i>Low Income</i>               | \$1.270               | \$1.017 | \$1.012 | \$1.033 | \$1.012         |
| <i>C&amp;I</i>                  | \$0.313               | \$0.323 | \$0.331 | \$0.336 | \$0.330         |

## APPENDIX A: PA-SPECIFIC DATA

### Electric Savings as a Percent of Sales

**Table 15 | Massachusetts Portfolio Level Annual Electric Savings as Percent of Sales by PA**

|                         | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016  | 2017  | 2018  | Total (2016-18) |
|-------------------------|-----------------------|------------------------------|-------|-------|-------|-----------------|
| Consultant Proposed     | 2.69%                 | 2.81%                        | 2.98% | 3.03% | 3.09% | 3.04%           |
| PA Proposed - Statewide | 2.55%                 | 2.60%                        | 2.51% | 2.49% | 2.50% | 2.50%           |
| Grid                    |                       |                              | 2.47% | 2.46% | 2.49% | 2.47%           |
| NSTAR                   |                       |                              | 2.57% | 2.53% | 2.50% | 2.53%           |
| CLC                     |                       |                              | 2.53% | 2.60% | 2.69% | 2.60%           |
| Unitil                  |                       |                              | 1.85% | 1.87% | 1.89% | 1.87%           |

**Table 16 | Massachusetts Residential Annual Electric Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total (2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|-----------------|
| Consultant Proposed     | 3.23%                    | 3.28%                       | 3.38% | 3.47% | 3.55% | 3.47%           |
| PA Proposed - Statewide | 2.31%                    | 2.42%                       | 3.09% | 2.97% | 2.88% | 2.98%           |
| Grid                    |                          |                             | 3.26% | 3.18% | 3.16% | 3.20%           |
| NSTAR                   |                          |                             | 3.13% | 2.95% | 2.77% | 2.95%           |
| CLC                     |                          |                             | 1.87% | 1.74% | 1.64% | 1.75%           |
| Unitil                  |                          |                             | 1.29% | 1.28% | 1.27% | 1.28%           |

**Table 17 | Massachusetts Low Income Annual Electric Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total (2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|-----------------|
| Consultant Proposed     | 2.23%                    | 2.21%                       | 2.25% | 2.25% | 2.25% | 2.25%           |
| PA Proposed - Statewide | 1.39%                    | 1.31%                       | 1.83% | 1.80% | 1.77% | 1.80%           |
| Grid                    |                          |                             | 1.54% | 1.51% | 1.47% | 1.51%           |
| NSTAR                   |                          |                             | 2.36% | 2.35% | 2.33% | 2.35%           |
| CLC                     |                          |                             | 2.98% | 3.18% | 3.51% | 3.22%           |
| Unitil                  |                          |                             | 0.39% | 0.39% | 0.40% | 0.39%           |

**Table 18 | Massachusetts C&I Annual Electric Savings as Percent of Sales by PA**

|                         | 2014 (Q4/<br>Planned) | 2015 (Estimated/<br>Planned) | 2016  | 2017  | 2018  | Total (2016-18) |
|-------------------------|-----------------------|------------------------------|-------|-------|-------|-----------------|
| Consultant Proposed     | 2.45%                 | 2.61%                        | 2.82% | 2.86% | 2.91% | 2.86%           |
| PA Proposed - Statewide | 2.75%                 | 2.89%                        | 2.25% | 2.29% | 2.35% | 2.30%           |
| Grid                    |                       |                              | 2.07% | 2.11% | 2.18% | 2.12%           |
| NSTAR                   |                       |                              | 2.34% | 2.36% | 2.39% | 2.36%           |
| CLC                     |                       |                              | 3.28% | 3.59% | 3.90% | 3.22%           |
| Unitil                  |                       |                              | 2.45% | 2.49% | 2.53% | 2.49%           |

## Gas Savings as a % of Sales

**Table 19 | Massachusetts Portfolio Level Annual Gas Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total<br>(2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|--------------------|
| Consultant Proposed     | 1.33%                    | 1.37%                       | 1.38% | 1.47% | 1.54% | 1.47%              |
| PA Proposed - Statewide | 1.15%                    | 1.17%                       | 1.07% | 1.09% | 1.09% | 1.08%              |
| NGrid                   |                          |                             | 1.07% | 1.10% | 1.10% | 1.09%              |
| NSTAR                   |                          |                             | 1.15% | 1.15% | 1.15% | 1.15%              |
| CMA                     |                          |                             | 1.15% | 1.16% | 1.17% | 1.16%              |
| NEGC                    |                          |                             | 0.51% | 0.51% | 0.51% | 0.51%              |
| Berkshire               |                          |                             | 0.69% | 0.68% | 0.67% | 0.68%              |
| Unitil                  |                          |                             | 0.80% | 0.82% | 0.82% | 0.82%              |

**Table 20 | Massachusetts Residential Annual Gas Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total<br>(2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|--------------------|
| Consultant Proposed     | 1.45%                    | 1.46%                       | 1.52% | 1.71% | 1.82% | 1.68%              |
| PA Proposed - Statewide | 1.15%                    | 1.15%                       | 1.20% | 1.25% | 1.26% | 1.24%              |
| NGrid                   |                          |                             | 1.36% | 1.44% | 1.45% | 1.42%              |
| NSTAR                   |                          |                             | 1.22% | 1.22% | 1.22% | 1.22%              |
| CMA                     |                          |                             | 0.88% | 0.90% | 0.92% | 0.90%              |
| NEGC                    |                          |                             | 0.47% | 0.46% | 0.46% | 0.46%              |
| Berkshire               |                          |                             | 0.67% | 0.65% | 0.64% | 0.65%              |
| Unitil                  |                          |                             | 0.57% | 0.57% | 0.57% | 0.57%              |

**Table 21 | Massachusetts Low Income Annual Gas Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total<br>(2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|--------------------|
| Consultant Proposed     | 2.41%                    | 2.41%                       | 2.41% | 2.41% | 2.41% | 2.41%              |
| PA Proposed - Statewide | 1.28%                    | 1.37%                       | 1.96% | 1.95% | 1.93% | 1.94%              |
| NGrid                   |                          |                             | 3.28% | 3.21% | 3.15% | 3.21%              |
| NSTAR                   |                          |                             | 1.65% | 1.68% | 1.68% | 1.67%              |
| CMA                     |                          |                             | 1.10% | 1.10% | 1.11% | 1.10%              |
| NEGC                    |                          |                             | 0.42% | 0.41% | 0.41% | 0.41%              |
| Berkshire               |                          |                             | 0.84% | 0.82% | 0.80% | 0.82%              |
| Unitil                  |                          |                             | 0.84% | 0.81% | 0.81% | 0.83%              |

**Table 22 | Massachusetts C&I Annual Gas Savings as Percent of Sales by PA**

|                         | 2014<br>(Actual/Planned) | 2015<br>(Estimated/Planned) | 2016  | 2017  | 2018  | Total<br>(2016-18) |
|-------------------------|--------------------------|-----------------------------|-------|-------|-------|--------------------|
| Consultant Proposed     | 1.08%                    | 1.15%                       | 1.13% | 1.12% | 1.14% | 1.13%              |
| PA Proposed - Statewide | 1.17%                    | 1.22%                       | 0.83% | 0.82% | 0.81% | 0.82%              |
| NGrid                   |                          |                             | 0.59% | 0.57% | 0.56% | 0.58%              |
| NSTAR                   |                          |                             | 1.06% | 1.06% | 1.07% | 1.06%              |
| CMA                     |                          |                             | 1.77% | 1.75% | 1.74% | 1.75%              |
| NEGC                    |                          |                             | 0.58% | 0.60% | 0.61% | 0.60%              |
| Berkshire               |                          |                             | 0.69% | 0.68% | 0.68% | 0.69%              |
| Unitil                  |                          |                             | 0.92% | 0.96% | 0.96% | 0.95%              |