Massachusetts Behavioral Programs Process Evaluation

Report in the Cross-Cutting Research Areas of Behavior and Education

Prepared for:
Massachusetts Program Administrators and the Energy Efficiency Advisory Council

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Navigant Consulting, Inc.
1375 Walnut Street
Suite 200
Boulder, CO 80302

303-728-2479
www.navigant.com

ILLUME Advising, LLC.
440 Science Drive
Suite 202
Madison, WI 53711

608-807-2061
www.illumeadvising.com

Prepared by:

Anne Dougherty
Allison Carlson
ILLUME Advising, LLC

Ken Seiden
Debbie Brannan
Navigant Consulting, Inc.

Karen Ehrhardt-Martinez
Human Dimensions

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Executive Summary

This report presents the results of the process evaluation for the Massachusetts Home Energy Report (HER) programs offered through Eversource Energy (formerly WMECo and NSTAR) and National Grid (the Program Administrators, or PAs) in 2014. The HER program is implemented by Opower, and was first piloted in 2009 by National Grid. Statewide, the program has expanded to include over 1.4 million Massachusetts customers across fuel groups (approximately 983,000 electric, 378,000 gas, and 47,000 dual fuel customers) in 2014.

The last comprehensive process evaluation was completed in 2012. Since then, the program has expanded to cover large portions of National Grid and Eversource Energy's service territories in Massachusetts. In this expansion, HER efforts moved beyond its standard high energy users to target and treat a wider range of customers, including customers with over-lapping service territories.

In this process evaluation, Navigant Consulting and Illume Advising (the Navigant Team) sought to verify whether customers are still satisfied with the HER and interested in continuing to receive the reports. In addition, this evaluation sought to answer other important questions, including the following:

(1) Are customers continuing to report taking energy saving actions, and is there evidence that the program measure life may be greater than one year?

(2) With such comprehensive treatment, are customers taking actions that impact other fuel sources above and beyond the specific fuels for which they receive information (cross-fuel effects)?

(3) Are customers who receive reports from more than one PA (i.e. "cross PA" customers) satisfied with this double-treatment?

(4) Are there additional services or offerings that might expand the PA's role in promoting energy conservation among Massachusetts residents?

These objectives were investigated through a telephone survey of both program treatment and control group populations.[1] The telephone survey assessed differences between the treatment and control groups' energy saving actions, with differences attributed to the HER program. Follow-up in-depth interviews were conducted with a subset of treatment customers who reported varying levels of energy-saving actions in the survey. These interviews explored more deeply how the reports drive energy savings and what other information or services from PAs might help customers to engage in energy saving actions.

Findings and Recommendations

Here, we summarize evaluation findings as they relate to each of these over-arching questions and provide our recommendations for consideration by the PAs and EEAC. Due to the large number of

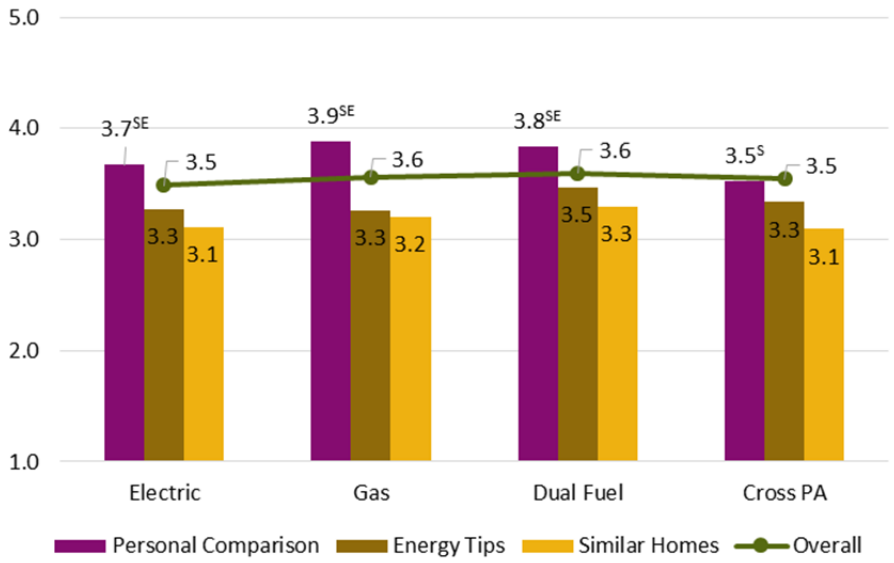
[1] Treatment customers receive the home energy reports, while control customers do not and are retained as a comparison to calculate program energy savings.

programs and PA cohorts[2], we examine our survey results by fuel treatment type (electric, gas, combined dual-fuel, and cross PA). Detailed PA results are provided in Appendix B.

Are customers still satisfied with the HER and interested in continuing to receive the reports?

Overall, customers remain satisfied with the HER reports and the frequency of treatment. Across fuel groups, 74% to 80% of customers indicated that they want the reports to be sent at "about the same" frequency as they are now. Additionally, over half of customers (55-58% across fuel groups) classify the reports overall as useful (defined as a four or five, with five being very useful). Over half of all fuel groups read all of the reports in the past year, dual fuel customers read the most. These observations are detailed in Figures 1 and 2 below.

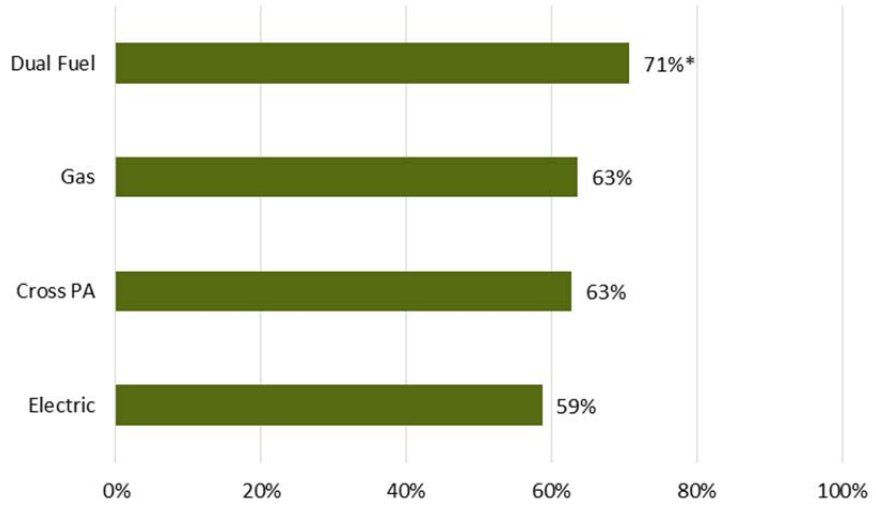
Figure 1. How useful are the reports overall and the different report sections, by fuel group?
(Mean scores shown on a scale of one to five, five being very useful)



S, E, P Denote a significantly higher mean score than another report section at the p<0.05 level; S – similar homes, E – energy tips, P – personal comparison.

[2] A cohort is a group of customers who began receiving reports from a PA at the same time. A table including report start dates for each cohort by PA is included in Appendix A.

Figure 2. Percent of Customers that Report Reading All Reports in the Past Year, by Fuel Group



*Dual fuel customers read all of the reports at a statistically higher rate than electric ($p<0.05$), and gas and cross PA fuel groups ($p<0.10$).

The survey results also suggest that the HER programs are enhancing customer satisfaction among electric treatment groups, who are statistically more satisfied than control groups with the energy efficiency services received from their utility (mean scores of 3.58 vs. 3.42 respectively, on a five-point scale where five is very satisfied). While statistically significant differences were not found between treatment and control groups for gas or dual fuel customers, gas treatment customers were the most satisfied out of all fuel treatment groups, with a mean score of 3.98 on the five point scale.

Are customers continuing to report taking energy saving actions, and is there evidence that the program measure life may be greater than one year?

The HER program is one among many ways customers are prompted to save energy in Massachusetts through various education and information initiatives, yet there is a clear lift in energy-saving actions among treatment customers above their control counterparts. Our in-depth interviews indicated that customers relied on the reports to serve as a reminder to save energy. Further, the survey results indicate that treatment customers took a significantly higher number of energy saving actions in 2014 across both behavior change and energy efficient equipment purchase/measure installation categories compared to the control groups.

The survey results suggest that program measure life may extend beyond one year. Several measures experiencing "lift" (statistically significant difference in treatment actions over control) have long measure lives, such as 25 years for insulation (building envelope category) and 15 years for energy efficient furnaces (heating/cooling category).[3] Notably, the reports also appear to support the

[3] Massachusetts Technical Reference Manual, 2013-2015 planning period.

maintenance of conservation-based behaviors[4]. Statistically significant lift[5] in (1) high efficiency measure categories reflecting equipment with longer lives, and (2) behavior categories representing energy saving behaviors maintained are shown in the table below.[6]

Table 1. Program "Lift" in High Efficiency Equipment and Maintained Conservation Behaviors, by Composite Category

	Electric (%)	Gas (%)	Dual Fuel (%)
High Efficiency Measures (a) (installed/purchased in 2014)			
Heating/Cooling (includes furnace, boiler, CAC, etc.)	3.4**	-	3.8^
Appliances (clothes washers, heat pump water heater, dehumidifier, etc.)	5.2**	4.2^	-
Lighting (CFL/LED fixtures, bulbs)	8.6**	-	-
Building Envelope (insulation, windows)	3.7**	-	-
Behaviors Maintained (a) (started in previous years and maintained in 2014)			
Lighting (turn off lights in unoccupied rooms)	2.0**	-	-
Hot Water Usage (wash laundry in cold water, fully load dishwasher, etc.)	-	4.0**	-

(a) See Table 6 in body of report for additional details on high efficiency measure and behavior category definitions.
** Denotes that treatment group was significantly higher than control group at p<0.05.
^ Denotes that treatment group was significantly higher than control group at p<0.10.

Although most energy saving actions appear to be independent of other programs (i.e. received no financial incentives) gas customers showed greater cross-program participation. A greater number of electric treatment customers report taking measure-based actions without the use of other program offers, while a higher proportion of gas customers report taking advantage of rebates.[7]

Recommendation #1: *While the savings associated with other programs cannot be double-counted across the portfolio, the net benefit of cross-program promotion and participation is positive. The PAs and EEAC should consider mechanisms to balance the "costs" of cross-program effects to avoid undue burden on the HER program where cross-program savings are substantial. Options for consideration include prorating these benefit*

[4] As a part of the survey we asked customers whether they regularly took specific behaviors in the past year. For behaviors that did not start or increase in frequency in the previous year, customers began these behaviors in previous years and are still maintaining them.
[5] Lift calculated in the table below by subtracting percent of control households taking action from percent of treatment households.
[6] Note any behaviors "maintained" or initiated are captured and removed in our channeling analysis. Please note that cross-program effects are small and likely do not rep
[7] We asked treatment and control customers whether they received rebates, financial incentives, or free offerings (such as during a home energy audit) for any of the measures they reported installing or purchasing in the past year.

adjustments to all programs, or conducting joint benefit-cost tests across the affected energy-efficiency and behavior-based programs.

With such comprehensive treatment, are customers taking actions that impact other fuel sources above and beyond the specific fuels for which they receive information (cross-fuel effects)?

Yes, self-reported data suggests that cross-fuel effects may be occurring. Our analysis shows that electric treatment customers who have non-electric heat installed building envelope measures at a significantly higher rate than the control groups (5% lift). Additionally, gas treatment groups installed lighting measures and advanced power strips (0.9% lift) and set back thermostat temperatures for cooling (0.7% lift) at significantly higher rates than the control groups.

Are customers who receive reports from more than one PA ("cross PA" customers) satisfied with this double-treatment?

Cross PA customers are satisfied with the frequency of their reports, and do not differ significantly from dual fuel customers in their views on report usefulness. Seventy-seven percent of cross PA customers (representing 1% of treatment customers) said that they would like to receive the reports at "about the same" frequency as they do now. Comparisons were drawn between cross PA customers and dual fuel customers, who also receive HER information on two fuels (electric and gas) but from just one PA. While dual fuel customers have higher readership rates than all other fuel groups, including cross PA customers (70% vs. 63% read all reports), statistically significant differences were not found between dual fuel and cross PA customers regarding how useful they found the reports overall (mean scores of 3.6 and 3.5, respectively, on a five point scale where five is very useful).

Recommendation #2: *Overall, feedback from cross PA customers is positive and similar to most other fuel groups. Therefore, PAs should continue with the current treatment for these customers without concern of negative customer satisfaction side effects.*

Are customers interested in additional support services from PAs?

Our in-depth interviews suggest customers could be better educated on the impact of various end uses on their household consumption. Notably, only half of interview participants cite the largest contributors to their household energy use when asked, indicating more education is needed. Customers cite appliances that they plug-in first when discussing the items that use the most energy, with cooling (12 of 24) and heating (10 of 24) cited as often as clothes washers/dryers (12 of 24) and refrigerators (10 of 24). A few customers were aware of their lack of knowledge and indicated a desire for more detailed information on the drivers of their energy use**.** Two respondents wanted to receive more information on how much energy they use by end-use category, and three respondents noted that energy audits would be helpful.

Interviews suggest that customers may benefit from smarter home appliances and automation. As part of our interviews, respondents were read a list of behaviors that they said, as a part of the survey effort, they did not do regularly in the past year. Of these, respondents were asked if they would like to perform any of the behaviors more often than they do now. The most frequently mentioned regular behaviors respondents would like to do more of were unplugging devices (5), and switching off power strips (3). Other actions mentioned once included turning off lights, turning off computer or setting it into "sleep" mode, and setting back thermostat.

Recommendation #3: *The PAs should consider conducting more comprehensive exploratory research, such as in-home ethnography, to identify the potential for home automation solutions to target plug load. Across the interviews, this was the most commonly cited end use where customers were interested in additional support and solutions. Further, customers admit that actions like unplugging appliances and switching off power strips are too burdensome to take on a regular basis. It is important to note that this research is currently underway in in Massachusetts and follow-up research has been proposed for 2016.*

Among automation technologies, Wi-Fi thermostats are of great interest to some, but many customers are skeptical that this technology will save more energy than their existing programmable thermostats. Just over half of (13 out of 24) in-depth interview respondents believed that a Wi-Fi thermostat would be very helpful or somewhat helpful, the remaining could not imagine themselves using a Wi-Fi thermostat or did not think it would be helpful in saving energy.

1. Introduction

In this section we discuss the programs evaluated in this process evaluation, the key research questions explored, and the structure of the report.

1.1 HERs Programs Evaluated

National Grid and Eversource Energy have long-standing Home Energy Report (HER) programs, with both companies greatly expanding them since the launch of the first program pilot by National Grid in 2009. The last comprehensive process evaluation was completed in July 2012.[8] As of the end of 2014, there were fifteen electric cohorts (nine for National Grid, five for NSTAR, and one for WMECo), ten gas cohorts (seven for National Grid and three for NSTAR), and four dual fuel cohorts (one for National Grid and three for NSTAR[9]). The program consists of just over 1.4 million treatment customers and about 353,000 control customers, as noted in the table below.

Other PA's are considering or have begun implementation of similar behavior programs in 2015 and for the next three-year program planning period. For example, Berkshire Gas Company began implementation of HER in 2015 and recently executed a contract for its continuation in 2016 through 2018. Also, please note that the small MA PAs currently do not implement HER due to large upfront costs and expectation of not covering those costs due to population size limitations.

Table 2. Number of Customers by Fuel Type in 2014

Fuel Group	Number of Treatment Customers	Number of Control Customers	Total
Electric	982,998	217,033	1,200,031
Gas	378,004	93,063	471,067
Duel Fuel	47,292	42,680	89,972
Total	1,408,294	352,776	1,761,070

Note: Approximately 1% of customers treated receive reports from two different Program Administrators (e.g. electric report from Eversource and gas report from National Grid)

The HER program is implemented by Opower for both Program Administrators (PAs). The primary objective of the program is to provide residential households with information on their energy consumption and tips on how to save energy to prompt them to take action to reduce their natural gas and/or electric usage. Research in psychology and behavioral economics suggests that behavioral approaches, such as appealing to people's social norms through energy usage comparisons to their neighbors, can be a cost-effective way to get customers to take energy-saving actions.

[8] "Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report", July 2012, Opinion Dynamics and Navigant Consulting.

[9] Two of these cohorts formally received gas-only reports. In 2014, dual fuel eligible customers from these cohorts began receiving dual fuel reports.

Opower randomly assigns customers into each treatment and control group. Treatment customers receive mailer reports on an ongoing basis, and also have access to a web portal that provides additional tips and information on household energy usage, while control groups are reserved for evaluation purposes. The HER program is an "opt-out" model, meaning that customers are not asked if they want to participate prior to receiving a report; however, if they do not wish to receive the reports they can discontinue them.

A table including report start dates for each cohort by PA is also included in Appendix A.

1.2 Research Questions

The primary research questions investigated as a part of this process evaluation are listed below.

1. **Are customers still satisfied with the HER and interested in continuing to receive the reports?** Our research explored customer satisfaction levels for treatment versus control customers and reviewed customer perspectives on the HER reports. More specifically, the following questions were posed:
    - How is the HER program affecting customer satisfaction levels in the energy efficiency services received?
    - Are customers satisfied with the frequency level of the reports? What are report readership levels?
    - Do customers still find the reports overall and the different report sections (personal comparison, similar homes comparison, and energy saving tips) useful?
2. **Are customers continuing to report taking energy saving actions, and is there evidence that the program measure life is greater than one?** Both treatment and control customers were asked whether they took specific energy saving actions over the past year to determine what contributed to savings in 2014. The following areas were investigated in detail:
    - How many energy saving actions did customers take in the past year, and what were they?
    - Are any behaviors being maintained by customers that started in previous years?
    - How attributable are measure-based actions to the HERs versus other programs?
3. **With such comprehensive treatment, are customers taking actions that impact other fuel sources above and beyond the specific fuels for which they receive information (cross-fuel effects)?** More specifically, we investigated the following questions:
    - Are electric treatment customers also taking actions that save non-electric fuels (gas, propane, or oil)? Are gas customers taking actions that save electricity?
    - How impactful are these cross-fuel effects, if any?
4. **Are customers who receive reports from more than one PA satisfied with this double treatment?** To assess this we answered the following questions:
    - Are they satisfied with the frequency with which they receive the reports?
    - How does their satisfaction and experience with the HER reports compare to other customers?

5. **Are customers interested in additional support services from the PAs?** Specifically, the following sub-research questions were explored:
    - How knowledgeable are customers on ways to save energy in the home? What do they think uses the most energy in their home?
    - How motivated are customers to save energy? What challenges do they encounter?
    - How might the PAs support additional engagement with the reports to increase energy saving actions? What information, technologies, or other solutions would be helpful?

1.3 Report Structure

The remainder of this report is organized as follows:

- Chapter 2. Methodology
- Chapter 3. Participant Satisfaction and Perspectives on HERs
- Chapter 4. Energy Saving Actions Taken
- Chapter 5. Conclusions and Recommendations

2. Methodology

The evaluation consisted of the following major activities:

1. Telephone survey with treatment and control group customers
2. In-depth interviews with treatment customers

The following sections discuss our approach to each of these activities.

2.1 Telephone Survey

As a part of our evaluation of the HER program, we completed a phone survey in March and April of 2015 with program treatment and control group customers. The survey instrument is provided in Appendix C. One of the main goals of the survey was to understand how the reports have affected participant energy-saving actions, and how these actions may have changed over time. The survey was designed to make comparisons between treatment and control customers to determine which actions are contributing to program savings.

The following energy-saving action categories were explored:

- **Measure-based actions**: This includes the purchase or installation of energy saving measures, including higher cost items, such as furnaces or boilers, and lower cost items, such as low-flow showerheads or weather-stripping materials, and,
- **Behavior-based actions:** This includes behaviors performed to save energy, such as turning off lights, washing clothes in cold water, or turning down the water heater temperature.

The surveys also assessed the following areas, as listed below:

- Customer satisfaction with their utility's energy efficiency services,
- Questions exploring how participants interact with the reports, such as readership levels,
- The usefulness of the different report modules and the reports overall, and,
- How participants thought the reports might be improved.

Surveys were completed with treatment and control group customers of National Grid, NSTAR, and WMECo[10]. Our sampling objectives were three-fold:

- Complete approximately 150 interviews per PA fuel group and treatment type (e.g., NSTAR gas treatment customers). This quota is based on the minimum number of completes we'll need to understand differences in actions taken for each PA and fuel type.
- As noted, some customers receive reports from different electric and gas PAs. Across PA and fuel-specific groups, we interviewed 143 customers who receive more than one report from the different PAs ("cross PA customers"). To be able to draw comparisons between customers who receive one

[10] Note that as of February 2, 2015, NSTAR and WMECo became Eversource Energy. However, to differentiate between program cohorts, we refer to them in the analysis as NSTAR and WMECo.

report and those who receive two from different PAs, we had to set quotas that oversampled these cross PA customers relative to the percentage of customers overall who receive reports from two different PAs.

- Within each quota group (defined by electric and gas PA and treatment/control combination), we set quotas proportional to the specific HER cohorts. This ensured that we were adequately able to represent customers who (a) may have different demographic and housing characteristics, and (b) entered the HER program at different times.

The table below shows how surveys broke out by PA and fuel type.

Table 3. Treatment and Control Surveys

Program Administrator	Treatment Surveys		Control Surveys		Total Surveys	
	Target	Complete	Target	Complete	Target	Complete
National Grid Electric	150	155	150	152	300	307
National Grid Gas[11]	150	154	150	156	300	310
National Grid Dual Fuel	150	150	150	151	300	301
NSTAR Electric	150	152	150	154	300	306
NSTAR Gas	150	152	150	203	300	355
NSTAR Dual Fuel	150	151	150	135*	300	286
WMECo	150	150	150	151	300	301

*Note: Fifteen NSTAR control group customers labeled as dual fuel were not dual fuel eligible and only received gas reports; therefore they were moved into the NSTAR gas group for the analysis.

As mentioned above, we further stratified by HER cohort within each quota group. Within each sub-group defined by electric and gas PA, PA combination and HER cohort, treatment and control customers were randomly selected.

We applied post-stratification and sampling weights to present results by specific analysis groups (e.g. PA and fuel group; fuel group overall; older vs. newer cohorts; within cross-PA cohorts). In all cases, we applied sampling weights to account for (a) the relative oversampling of cross-PA customers versus the population, and (b) differences in respondent's age and homeownership status (own vs. rent) between treatment and control groups. For age and homeownership post-stratification weights, we used the control group as a benchmark for each PA and fuel group's population proportions, and weighted the treatment group to match the control to adjust for any response bias. When reporting at the overall fuel level, we also applied weights to account for the proportion of each PA's program size within each fuel group (e.g., National Grid customers are about 2/3 of all electric HER customers, but only 1/3 of gas HER respondents).

Similarly, to look at results for older vs. younger cohorts (customers who have been receiving reports for two or more years versus less than two years), we also applied weights to account for the proportion of each PA and fuel group's program size within each age group category (older vs. younger).

[11] Note that one National Grid cohort began receiving reports in September, 2014. Because only a few months had passed prior to fielding the survey, we did not include this cohort in the sample.

2.2 *In-Depth Interviews with Participants*

As a part of the process evaluation, we also conducted in-depth interviews with 24 treatment customers. A sample of potential customers was selected for the in-depth interviews from our survey efforts, and customers were recruited in May and June of 2014, for a follow-up discussion to explore their interactions with the reports and energy saving behaviors in more depth.

Our sample was created through assessing the survey data to uncover distinct patterns in the number of energy saving behaviors taken. To ensure that we sampled customers with varying energy usage behaviors, we subdivided the sample into three core groups:

- **Group 1: Customers who reported a large number of behavior changes in the past year (n=12):** These customers reported making three or more behavior changes in last year. Our survey analysis found that the average number of behavior changes per household ranged from 1.33 for electric treatment groups to 1.67 for gas treatment groups.
- **Group 2: Customers who reported no behavior changes in the past year, but who are taking a large number of actions already (n=6):** These customers reported maintaining 16 or more behaviors (in the 75th percentile), but did not change any behaviors in the past year. The survey research found that the average number of behaviors maintained ranged from 14.94 for the dual fuel treatment group to 15.45 for electric treatment groups.
- **Group 3: Customers who reported no behavior changes in the past year, and reported maintaining a comparatively lower number of behaviors (n=6):** These customers reported maintaining 11 of fewer energy saving behaviors (in the 25th percentile) in the past year, and did not change any behaviors.

The sample was also set up to interview a mix of customers receiving reports for different fuel types, from different PAs, and customers representing different age ranges. However, due to the size of the sample, results are largely qualitative.

Table 4. In-Depth Interviews with Program Participants

Program Administrator	Number of Interviews Completed
National Grid Electric	8
National Grid Gas	0
National Grid Dual Fuel	8
NSTAR Electric	3
NSTAR Gas	3
NSTAR Dual Fuel	2
Total	24

Interview questions explored areas of report readership, what participants found compelling or motivating about the reports, how energy saving behaviors are established, what challenges are faced in taking actions, and how the program could help participants to engage with the reports further and take additional energy saving actions. The interview guide is included in Appendix D.

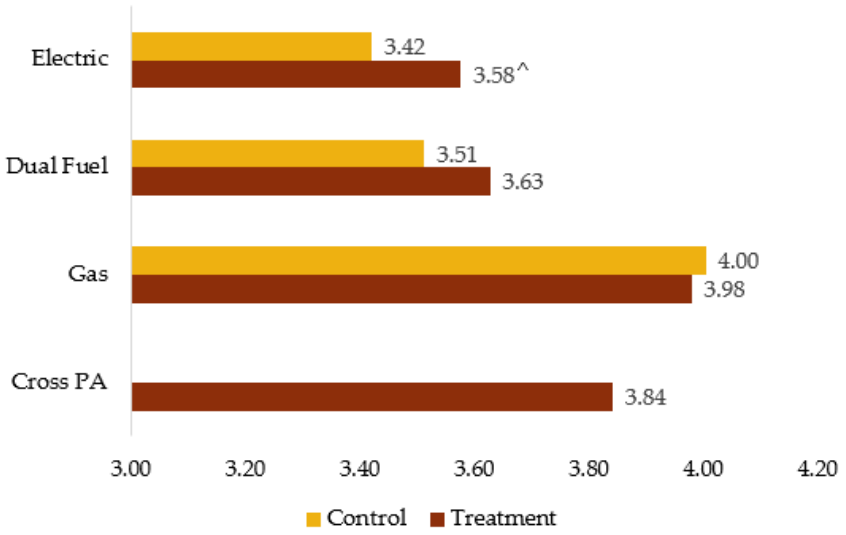
3. Participant Satisfaction and Perspectives on Home Energy Reports

Our survey and in-depth interviews both investigated participant perspectives on the reports, how they use them, and how they drive energy saving actions, among other questions of interest. Results and observations are further explored in the sections below.

3.1 Are participants satisfied with the energy efficiency services received?

The survey results show that electric treatment customers experience higher satisfaction levels in the energy efficiency services received than control customers. While statistically significant differences were not found between treatment and control groups for gas and dual fuel customers, gas treatment customers were statistically more satisfied ($p<0.05$) than either dual fuel or electric treatment groups.

Figure 3. Average Satisfaction with Utility Energy Efficiency Services Received by Fuel Group



Note: Satisfaction rated on a scale of one to five, with five being very satisfied. The cross PA group is a subset of the electric and gas treatment groups, and therefore does not have its own control group.
^Significantly higher than control group at $p<0.10$.

Satisfaction for dual fuel customers was also compared to cross PA customers, as both receive HER information for two fuels (electric and gas), but dual fuel customers receive one report from one PA addressing both fuels, and cross PA customers receive two reports from different PAs. Cross PA customers gave an average satisfaction rating of 3.84 on the same scale noted above. Interestingly, this is just slightly higher than dual fuel customers, but found to be a statistically significant difference. We also compared satisfaction scores for the overall fuel groups (gas, electric, and dual fuel) to the total number of equipment and behavior actions[12] taken in the past year to determine whether there is any correlation between these two metrics. No correlation was found ($\varrho = 0.01$, $p = 0.59$), indicating that taking a large number of energy saving actions does not seem to impact satisfaction with the efficiency services received (and vice versa).

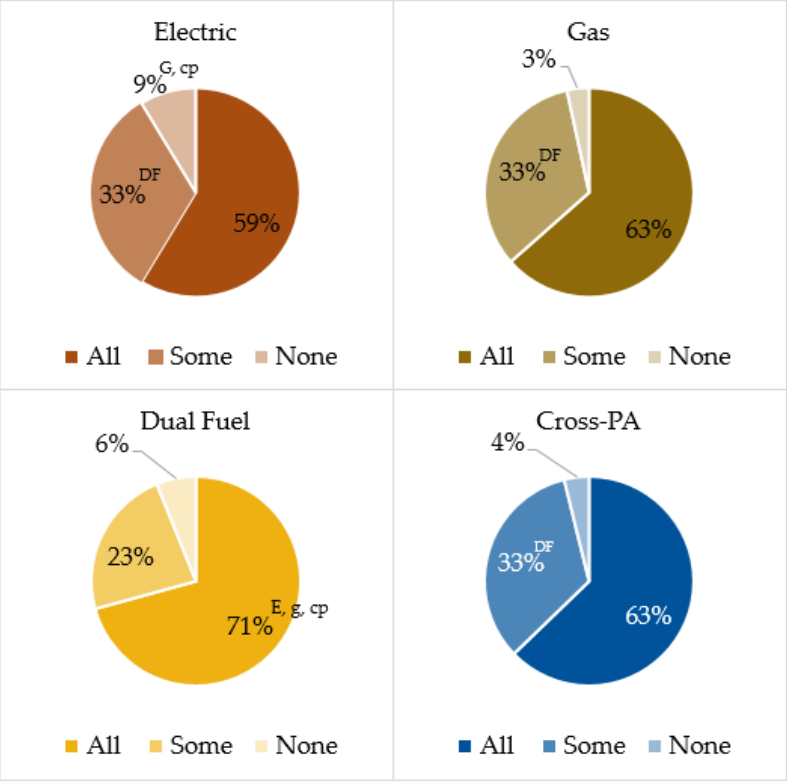
[12] In this case, defined as the number of equipment actions and regular behavior actions taken in the past year (including those maintained from previous years).

3.2 *Are participants reading the reports, and how often do they want them?*

The majority of treatment customers are reading the reports. At least 59% of customers in each fuel group reported reading the report each time it arrived, as shown in the figure below. This includes cross PA customers, who receive one report from their electric PA and another from their gas PA.

Notably, the dual fuel customers reported reading all of the reports at a significantly higher rate than any of the other fuel groups, including the cross PA group, with 71% of dual fuel respondents saying that they read all of the reports. Electric customers had the highest rate of customers who reported reading none of the reports (9%), which is significantly higher than the gas and cross PA groups. Looking across all fuel groups, 60% of customers say they read all of the reports. This is similar to past evaluation results from 2011, which found that approximately 63% of customers read all of the reports.[13]

Figure 4. How many of the Home Energy Reports did you read in the past year?



E,G,DF,CP Denotes results in this category are significantly greater at the 95% confidence level than in another fuel category (E – electric, G – gas, DF – dual fuel, CP – cross PA)

e,g,df,cp Denotes results in this category are significantly greater at the 90% confidence level than in another fuel category (e – electric, g – gas, df – dual fuel, cp – cross PA)

The majority of participants want to maintain the level of frequency with which they receive reports. In each fuel category, at least 74% of treatment customers (80% for dual fuel, 77% for electric, and 74% for gas) reported that they would like to receive the reports at "about the same" level of frequency as they do now.

[13] "Massachusetts Cross-Cutting Behavioral Evaluation", June 2011, Opinion Dynamics.

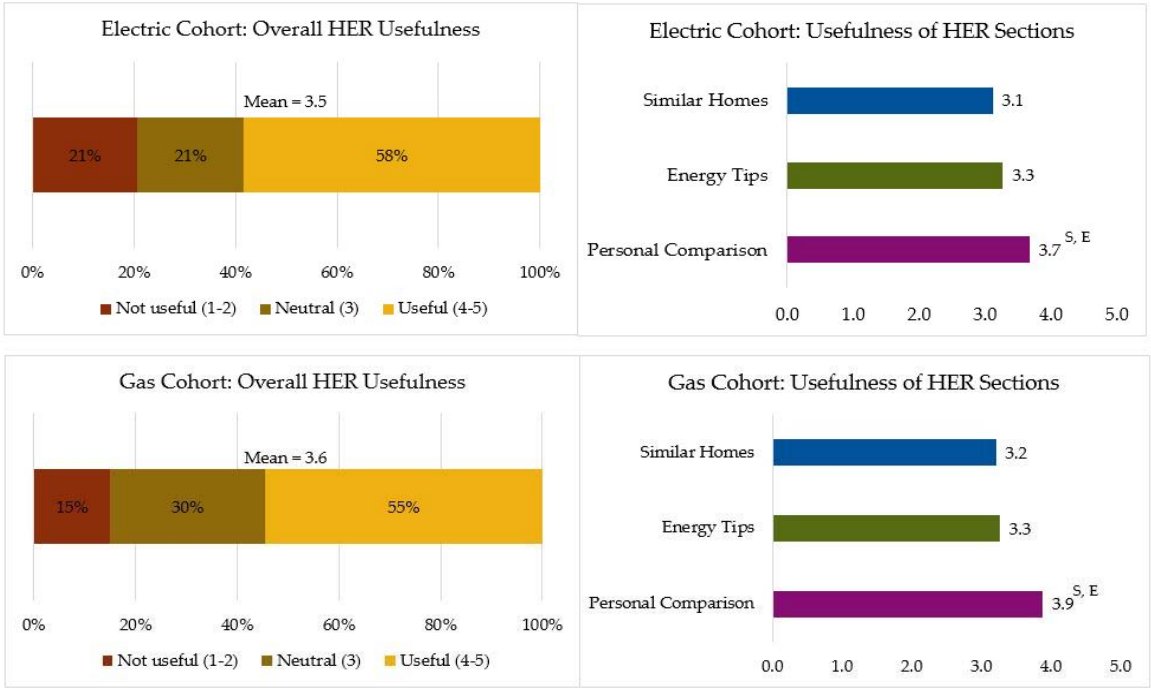
This point is also true of cross-PA participants. Seventy-seven percent of these customers wanted to receive reports at the same frequency they do now.

3.3 Do participants think the reports are useful?

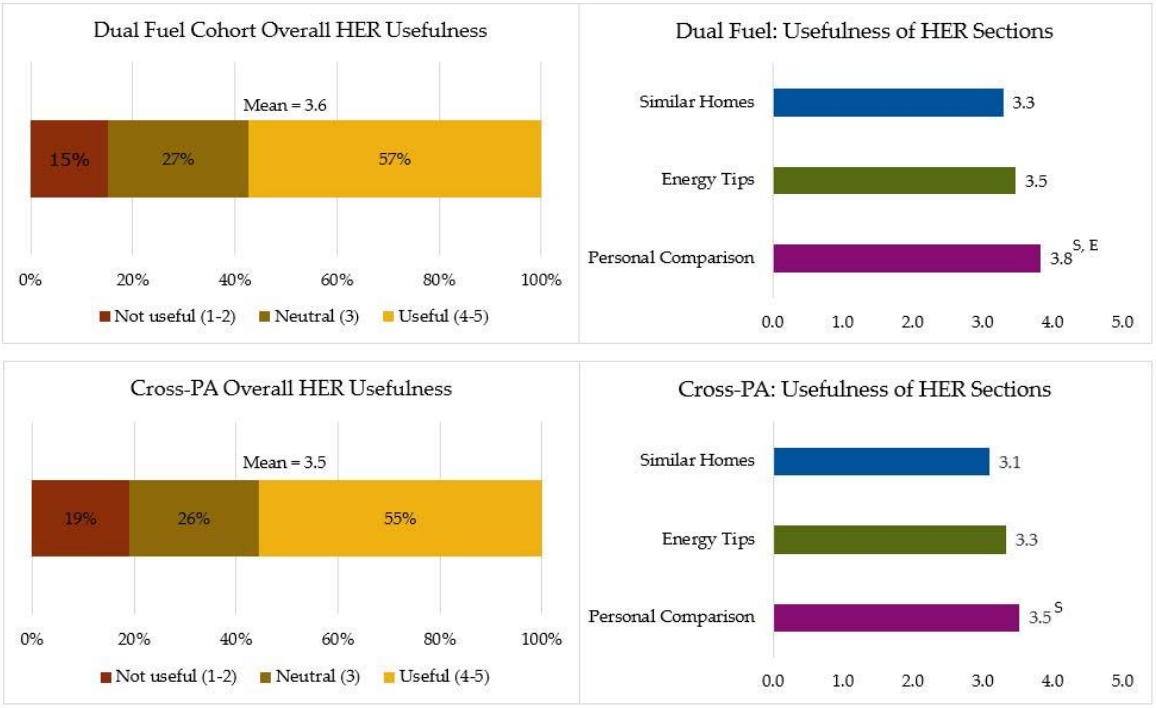
The majority of participants found the home energy reports useful overall, including cross PA customers, with between 55% and 58% of respondents (depending on fuel type) rating the reports a four or five on a five-point scale, with five being very useful. Statistically significant differences were not found between cross PA and dual fuel customers in overall usefulness of the reports.

Electric, gas, and dual fuel customers find the personal energy usage comparison the most useful, giving it an average score ranging from 3.5 to 3.9 on a five point scale, where five is very useful. These results are similar to evaluations of other similar programs.[14] Participants were asked how useful they thought specific sections of the report were, including (1) the personal usage comparison, (2) the similar homes comparison, and (3) the energy saving tips section. When asked about specific sections of the report, the personal usage comparison had a significantly higher average rating than the other sections of the report in every fuel category with the exception of the cross PA group, where the personal comparison was only rated significantly higher than the similar homes comparison. While energy tips had a higher average rating than similar homes across fuel types, the difference was not significant. The figure below details these findings.

Figure 5. How useful do participants find the report sections and the reports overall?



[14] An evaluation of the Energy Trust of Oregon's Personal Energy Report program (implemented by Opower) asked customers how useful they found report sections, on the same one to five scale. The historical (or personal) comparison was found to be the most useful, with a mean score of 3.7. The neighbor comparison received a score of 3.3, and energy saving tips a score of 3.1 (Opinion Dynamics, August 2011).



S, E, P Denote a significantly higher mean score than another report section at the p<0.05 level; S – similar homes, E – energy tips, P – personal comparison
Note: Usefulness was rated on a scale of one to five. Scores of one and two are not useful, three is neutral, and four and five are useful.

The Navigant team also conducted in-depth interviews with survey respondents to understand underlying drivers and barriers to behavior change to inform ways to better serve PA customers. As noted in the methodology (Section 2), to ensure that we sampled customers with varying energy usage behaviors, we subdivided the sample into three core groups, which included (1) customers reporting a large number of behavior changes in the past year (n=12), (2) customers who reported no behavior changes but who are taking a large number of actions already (n=6), and (3) customers who reported no behavior changes and are maintaining a comparatively lower number of energy saving actions (n=6).

Below we provide insights from our in-depth interview findings. Where relevant, we call out differences between groups.

Across all groups, customers reported a similar level of motivation to save energy and report readership, which did not vary by type of customer described above. Respondents were asked how frequently the reports got them to take action to reduce their energy consumption, and what it was about the reports that prompted them to take action. Eleven of 23 in-depth interview respondents said that the reports motivated them to take energy saving actions very frequently or somewhat frequently. Specifically:

- **Similar homes comparisons were cited by six (6) customers as motivating.** One respondent said she was trying to "beat" her neighbors. She was told her home was a "high-use" home, but has since become a "low-use" home. In addition, one respondent said he saw how his energy use compared to his neighbors, which prompted him to get an energy audit. Upon receiving the audit, the respondent found that his sump pump was running continuously.

- **Next most cited, the personal energy usage comparison was mentioned by five (5) as motivating.** One respondent likes "seeing how energy use changes over time."
- **Only one (1) participant mentioned the energy saving tips as useful,** noting that they liked the "hints/tips on how to save energy."

A large majority of respondents (18 of 24) indicated that the reports were helpful reminders to save energy. Eight (8) said that the home energy reports were "very helpful", and 10 said the reports were "somewhat helpful."

Aside from the reports, the energy bill was the most commonly cited prompt to save energy. Eight (8) respondents said that their utility bill or thinking about potential cost savings served as a reminder to conserve energy**.** One respondent noted that "putting money in the bank" is what helps them remember, while another said that the "cost of the energy bill" is a good reminder.

3.4 How might Home Energy Reports be improved?

As a part of our larger survey efforts, we also asked participants how the reports could be improved.

Most participants did not have any suggestions for improvement, with 38% reporting that nothing needed to be changed and 16% of respondents saying they did not know what should be changed.

The most common theme amongst respondents who did suggest improvements was additional customization in the reports. The top three improvements suggested were a similar homes comparison more specific to the home/situation of respondents (requested by 9% of respondents), more information about the similar homes comparison (requested by 5%), and more personalized energy tips (requested by 5%).

Many people requesting a similar homes comparison that was more specific to their home/situation were skeptical about the validity of the comparison. They cited household differences in characteristics such as size, number of occupants, square footage, age of home, heating/cooling system, occupancy characteristics, and fuel type as areas they believed were affecting the results. An additional 5% of respondents who requested additional information about the similar homes comparison had similar concerns about differences in household characteristics.

3.5 How do participants go about establishing energy saving behaviors, and what challenges do they encounter?

Among the in-depth interview group already taking a large number energy saving actions (group #2), culture appeared to play a role in forming customer behavior. Three respondents mentioned that their personal histories or relationships helped them to remember to take energy saving actions. One noted his "military history," while two others said they learned particular behaviors from their parents.

Group #2 was also more likely to cite incremental changes to conserve energy, such as adjusting settings. Notably, a greater proportion of customers who take a larger number of actions regularly cited appliance settings and temperature adjustments as a way to save energy (such as water heater adjustments and refrigerator temperatures). These actions were not cited as frequently among other groups.

Among those who are taking a comparatively lower number of actions (group #3), a lack of knowledge of what saves energy, cost, other family members, and age/medical limitations were cited as barriers. Similar barriers were also cited among other groups as reasons for not taking greater action.

Other customers in energy-saving groups (group #1 and #3) perceive they cannot or do not need to save additional energy. Five people believed that they have already done everything they could to save energy (3) or didn't know how to reduce it further (2). Three respondents were unwilling or unable to make further adjustments to save energy. One person said he likes his "creature comforts", while another cited "comfort and age" as key factors affecting their willingness to change habits. Another respondent said that they feel they are "using what they need" to meet their needs.

We discuss specific energy saving actions taken by customers in the next section.

4. Energy-Saving Actions

As previously noted, we surveyed treatment and control group customers to understand what energy savings actions contributed to program savings in 2014. Actions explored included both measures (e.g. an ENERGY STAR furnace, etc.) installed or purchased in the past year, and energy saving behaviors (e.g. wash clothes in cold water, etc.) taken in the past year. For energy saving behaviors taken in the past year, we analyzed both of the following: (1) behaviors started or increased in frequency (i.e. behaviors "changed"), and (2) behaviors maintained from previous years. To determine program lift, we measured for statistically significant differences between the treatment and control group customers on these metrics.

The results in the sub-sections below are primarily presented by overall fuel group (electric, gas, and dual fuel). The overall electric fuel group includes one WMECO, nine National Grid, and five NSTAR cohorts. The overall gas fuel group includes six National Grid[15] and three NSTAR cohorts. Finally, the overall dual fuel treatment group includes one National Grid and three NSTAR cohorts. Energy action results by specific PA fuel groups are included in the Appendix B.

4.1 How many actions are participants taking?

Our analysis suggests that the reports have been effective in motivating customers to purchase or install energy efficient equipment and adopt energy saving behaviors. These findings are detailed more in the table below, where we show the average number of actions taken per household for each overall fuel group. Notably, electric and dual fuel treatment customers purchased or installed significantly more equipment than electric control groups. Gas treatment customers also changed behaviors at a significantly higher rate than control customers, while both electric and gas treatment groups maintained more energy saving behaviors than their respective control groups, indicating that some behaviors persist from year to year.

Table 5. Average Number of Measures Taken in 2014 per Household by Overall Fuel Group

	Electric		Gas		Dual Fuel	
Measure Type	**Control (n=457)**	**Treatment (n=457)**	**Control (n=306)**	**Treatment (n=359)**	**Control (n=301)**	**Treatment (n=286)**
Measures Installed/Purchased in Past Year	1.06	1.41**	1.13	1.24	1.15	1.39^
Behaviors Changed	1.39	1.33	1.09	1.67**	1.06	1.37
Behaviors Maintained from Previous Years	13.24	14.04**	13.26	14.02**	13.36	13.54
Total Actions Taken in Past Year*	14.30	15.45**	14.38	15.26**	14.51	14.94

*Includes all actions: measures installed/purchased, behaviors changed, and behaviors maintained.
**Significantly higher than control group at p<0.05.
^Significantly higher than control group at p<0.10.

[15] Note that one National Grid gas cohort was not surveyed, as they just began receiving reports in September 2014 and only a few months before the survey was administered.

Our data suggest that older cohorts (customers in the program for two or more years) have more instances of significant lift in the number of energy saving actions taken than younger ones. Specifically, our comparison of these two groups revealed:

- **Older electric treatment customers installed more energy efficient equipment** (1.51 measures on average) in the past year as compared to controls (1.06 on average), a statistically significant difference ($p<0.05$). Younger treatment customers also installed more equipment (1.16 measures on average) than controls (1.0 on average), but the differences were less significant ($p<0.10$).
- **Older electric treatment customers maintained more behaviors on average than controls** (14.22 vs. 13.13, $p<0.10$), while significant differences were not found between younger treatment and control groups.
- **On average, older gas treatment customers changed more behaviors than controls** (1.74 vs. 1.06, $p<0.10$) and maintained more behaviors (14.05 vs. 13.2, $p<0.10$), while younger cohorts did not.

4.2 What specific energy saving actions have participants taken in the past year?

Treatment customers appear to be installing measures with savings that will persist over several years at greater rates than the control groups, such as insulation. In Table 6 we present results by overall fuel group for several composite end-use categories. For example, households that purchased a high efficiency furnace in the past year are included in the "Heating/Cooling" category, and households that reported reducing their water heater temperature are included under "hot water usage" category. More detailed tables by measure and by PA fuel group can be found in Appendix B.

When looking at results across all fuel types, treatment customers reported taking significantly more lighting, appliance, building envelope, and refrigerator recycling actions than the control group. The greatest lift was generated in the lighting category (7.4% lift) and seems to be driven largely by the purchase and installation of indoor LED light bulbs. Appliance installation and refrigerator recycling had similar magnitudes of lift (4.8% and 4.6%, respectively), with the lift in the appliance category driven by the installation of heat pump water heaters. The 2.5% lift in the building envelope category was driven by installation of attic, ceiling or wall insulation and double/triple paned windows.

Electric treatment customers reported installing and purchasing significantly more equipment than control customers in several categories, including heating/cooling (3.4% lift), appliances (5.2%), lighting (8.6%), building envelope (3.7%), and refrigerator recycling (5.4%). This lift is generally driven by 1-2 key measures per category. These key measures are described below by category.

- **Heating/Cooling:** Primarily driven by a lift in efficient furnace installation.
- **Appliances:** Primarily driven by a lift in heat pump water heater installation.
- **Lighting:** Driven by a lift in indoor LED light bulb purchase/installation, although purchase/installation of outdoor CFL or LED lighting fixtures also was a factor.
- **Building Envelope:** Mainly driven by a lift in attic, ceiling, and/or wall insulation, although purchase/installation of double or triple paned windows was also a factor.

Notably, several of the measures mentioned above result in energy savings that persist for several years, including energy efficient furnaces, heat pump water heaters, and attic, ceiling, and wall insulation. This is

in contrast to the current measure life of one year for the program. These measures are included in the Massachusetts TRM, and have the following measure lives:

- **High efficiency furnace** with an AFUE equal to or great than 95% and an electronically commutated motor has a measure life of 18 years;
- **Attic, ceiling, and wall insulation** have measure lives of 25 years; and,
- **Heat pump water heater** has a measure life of 10 years.

Measure lift was also experienced for gas customers in appliances and HVAC maintenance. Gas treatment customers showed a significant lift over controls of 4.2% in the energy efficient appliances category. This lift is driven by the installation of efficient clothes washers, and, also interestingly, heat pump water heaters, an electric measure. Gas treatment customers also displayed an 8.4% lift over control groups in the HVAC maintenance group. This lift appears to be mainly driven by participants setting their thermostats at or above 78 degrees for cooling, but also by clearing areas around vents and maintaining their heating and cooling systems.

- **It is interesting to note that lift in the HVAC maintenance category for gas cohorts is largely driven by a measure affecting electric use (adjusting cooling settings).** Similarly, lift in the appliance category is driven partially by installation of electric equipment (heat pump water heaters).

Dual fuel treatment customers also showed some significant measure lift in the heating/cooling equipment category (3.8%), refrigerator recycling (4.1%), and hot water usage behavior category (5.5%).

These results are similar to those found in the 2012 process evaluation, which found a higher number of instances of significant lift for electric treatment groups versus gas treatment groups[16]. In the 2012 report, electric treatment groups experienced significant lift over control groups in three categories, including building envelope (also had significant lift in 2014), low-cost measures[17], and consumer electronics. In 2012, gas treatment groups experienced significant lift in two equipment categories, including light fixtures and building envelope. No significant lift in treatment over control groups was found for energy saving behaviors in 2012, except when looking across both electric and gas groups at HVAC maintenance behaviors.

[16] Note that the 2012 evaluation calculated measure lift for a particular measure to include only those in the "eligible base", or respondents who met specific criteria (e.g. for ES furnaces, must be a homeowner and have a unit). The 2014 results did not calculate lift using an eligible base, as programs have expanded greatly since 2012 to include a wider range of households, including renters.

[17] For the 2014 analysis, we moved refrigerator recycling out of the low-cost measures category and into its own category. Additionally, for 2014, CFL and LED bulbs were moved out of low-cost measures and into the lighting category. This is likely why the low-cost measures category experienced significant lift for electric groups in 2012, while it did not in 2014 (though refrigerator recycling and lighting in 2014 did experience significant lift).

Table 6. Percentage of Households Taking Energy Saving Actions in 2014, by Composite Category

Measure	Electric		Gas		Dual Fuel		All Fuels	
	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment
High Efficiency Measures (a)								
Heating/Cooling	3.1	6.5**	6.2	2.1**	4.9	8.7^	4.0	5.3
Appliances	8.0	13.2**	6.4	10.6^	10.4	8.7	7.7	12.5**
Lighting	48.2	56.8**	51.4	56.5	52.8	52.6	49.3	56.7**
Building Envelope	2.1	5.8**	3.8	3.1	2.4	4.2	2.6	5.1**
Refrigerator Recycling	5.0	10.4**	5.7	8.4	7.5	11.6^	5.3	9.9**
Low-cost Measures	11.8	10.3	11.0	12.2	9.1	12.4	11.5	10.9
Behaviors Changed (b)								
Hot Water Usage	20.5	17.1	15.9	18.7	16.5	22.0^	19.1	17.7
Lighting	15.0	15.9	14.6	16.0	11.1	14.8	14.7	15.9
Personal Electronics	17.8	19.1	17.2	15.0	15.6	20.7	17.6	18.1
HVAC and HVAC Maintenance	19.1	14.5^	12.6	21.0**	13.0	16.7	17.2	16.4
Refrigerator Maintenance	5.1	3.9	5.6	7.8	1.6	2.7	5.1	4.9

(a) High Efficiency Measures Metric: Purchased or installed at least one energy efficient item in group in past year. Includes: (1) Heating/Cooling: Energy Star (ES) central air conditioning (CAC) or ES air source heat pump (ASHP), ES room or wall air conditioning (AC), ES ductless mini-split heat pump, ES boiler, and ES furnace. (2) Appliances: ES or front-load clothes washer, heat pump water heater (ES), tank-less water heater, and ES dehumidifier. (3) Lighting: Indoor LED light bulbs, indoor CFL bulbs, indoor light fixture (LED or CFL), and outdoor light fixture (LED or CFL). (4) Building Envelope: ES double-paned or triple-paned windows, attic/ceiling/wall insulation, and storm windows. (5) Refrigerator Recycling: Recycled second refrigerator. (6) Low-cost Measures: Weather-stripping, low-flow faucet aerators, low-flow showerheads, water heater tank wrap or pipe wrap, motion sensors (e.g. lighting), programmable or Wi-Fi thermostat, advanced power strips, and duct sealing or insulation.

(b) Behaviors Metric: Started or increased at least one of items in behavior group in past year. Includes: (1) Hot water usage: Wash laundry in cold water, fully load washing machine, fully load dishwasher, take short showers, and reduce water heater temperature. (2) Lighting: Turn off lights in unoccupied rooms and turn off outside lights by day. (3) Personal Electronics: Turn off computers at night/when not in use, put computer(s) to sleep, turn off TV(s) when no one is watching, turn off video game console(s) when not in use, switch off power strips, unplug devices when not in use, turn off DVR and/or cable box when not watching TV. (4) HVAC: Use a portable window or ceiling fan, set thermostat at or below 70 degrees for heating, set thermostat at or above 78 degrees for cooling, clear area around vents, maintained heating and cooling system, changed furnace filter. (5) Refrigerator maintenance: Make sure refrigerator seals are tight, clean refrigerator coils, check refrigerator temperature, unplugged a second refrigerator for weeks to months.

** Significantly higher than control group at $p<0.05$.

^ Significantly higher than control group at $p<0.10$.

4.3 What energy saving behaviors did participants maintain from previous years?

Both electric and gas treatment groups are maintaining specific energy saving behaviors that were started in previous years.. In the survey we asked both treatment and control customers whether they took specific energy saving behaviors. If a behavior did not start or increase in frequency in the past year (behavior change), it was started in previous years and is now being maintained. These behaviors also may

contribute to 2014 program savings. The table below shows these results again by composite behavior category.

A very high percentage of respondents in both the treatment and control groups reported maintaining at least one energy saving behavior in each composite category, however lift was detected for the treatment group in key actions:

- **Gas treatment customers reported maintaining behaviors that save hot water (4% lift),** primarily due to fully loading dishwashers and reducing hot water temperatures.
- **Electric treatment customers reported reducing lighting use more than control customers (2% lift),** mainly through manually turning off lights.
- **When combining all fuel groups, hot water usage, lighting, and refrigerator maintenance behaviors also show lift (1.8%, 1.4%, and 6.2%, respectively)** over controls.

Table 7. Percentage of Households Maintaining at Least One Energy Saving Behaviors in 2014, by Composite Category

	Electric		Gas		Dual Fuel		All Fuels	
Measure	**% Control**	**% Treatment**	**% Control**	**% Treatment**	**% Control**	**% Treatment**	**% Control**	**% Treatment**
Behaviors Maintained								
Hot Water Usage	98.0	99.0	95.8	99.8**	98.2	98.0	97.4	99.2**
Lighting	97.9	99.9**	98.8	98.6	97.5	98.2	98.1	99.5**
Personal Electronics	98.5	99.6	99.3	98.7	99.2	99.3	98.8	99.3
HVAC and HVAC Maintenance	99.1	99.2	99.9	98.6^	100.0	99.5	99.4	99.1
Refrigerator Maintenance	75.0	78.3	70.3	84.3	75.5	72.6	73.7	79.9**

See Table 4 for behavior metric categories.
** Significantly higher than control group at p<0.05.
^ Significantly higher than control group at p<0.10.

4.4 Are the reports producing cross-fuel effects?

The survey analysis suggests that cross-fuel effects are occurring in a limited but impactful way. We assessed energy saving actions taken in the past year to determine whether customers receiving single-fuel reports (only gas or only electric) are taking actions that primarily save a different fuel. More specifically, the actions taken by customers receiving gas reports were reviewed to see if electric-saving actions were reported at significant levels over control groups. Similarly, for customers receiving electric reports[18], we reviewed actions reported to determine whether non-electric saving actions were also taken.

While some actions save only one fuel (for example, turning off the lights in unoccupied rooms), other actions may save two fuels (installing attic insulation, which reduces both heating and cooling loads). For

[18] Please note that for the purpose of this analysis, customers reporting electric heat were not included in the results.

the purpose of this analysis, we "assigned" one fuel to each measure based on the main fuel that is saved. This primarily affects building envelope measures, such as windows and insulation. For these measures, we assigned the primary fuel as non-electric (natural gas, propane, or oil) due to the higher number of heating days in Massachusetts compared to cooling days.

4.4.1 Electric Customer Cross-fuel Effects (non-electric heat)

Our analysis found that electric treatment customers with non-electric heat are installing building envelope measures at significant levels over controls, with a lift of 5%. This lift is primarily driven by the installation of storm windows and attic, ceiling, or wall insulation. This is an important cross-fuel effect, as building envelope measures such as insulation have long measure lives (25 years) resulting in a persistent stream of savings over time.

Table 8. Electric Customers with Non-Electric Heat: Non-Electric Actions Taken in 2014, by Composite Category (at least one action per category)

Measure Category	Electric with Non-Electric Heat	
	% Control (n=385)	% Treatment (n=248)
Non-Electric Measures (a)		
Heating (including low-cost measures and thermostats)	2.1	3.1
Hot Water (includes low-cost hot water)	11.6	13.6
Building Envelope	6.8	11.8^
Non-Electric Behaviors (b)		
Heating	10.9	11.1
Hot Water	9.0	9.3

(a) Non-Electric Measures Metric: Purchased or installed at least one energy efficient item in measure group in past year. Includes: (1) High Efficiency Heating: ES boiler, and ES furnace. (2) High Efficiency Hot Water: ES or front-load clothes washer, tank-less water heater, low-flow faucet aerator, low-flow showerheads, and water heater tank wrap or pipe wrap. (3) Building Envelope: ES double-paned or triple-paned windows, attic/ceiling/wall insulation, storm windows, weather-stripping, and duct-sealing or insulation.
(b) Non-Electric Behaviors Metric: Started or increased at least one of items in behavior group in past year. Includes: (1) Heating: Set thermostat at or below 70 degrees for heating, and changed furnace filter. (2) Hot water: Wash laundry in cold water, fully load clothes washer, fully load dishwasher, take shorter showers, and reduce water heater temperature.
^ Significantly higher than control group at $p<0.10$.

4.4.2 Gas Customer Cross-fuel Effects

Gas treatment customers demonstrated cross-fuel effects for lighting and advanced power strips. Lighting lift is mainly attributable to the installation of CFL and LED indoor lighting fixtures. It is also worth noting that the survey data suggests some lift in the number of indoor LED light bulbs installed between the treatment and control groups, although that effect was not statistically significant.

There is also some evidence indicating cross-fuel savings in the cooling category. Setting the thermostat at or above 78 degrees for during the cooling season seems to be the main behavior contributing to this trend.

Table 9. Gas Customers: Electric-Saving Actions Taken in 2014, by Composite Category

Measure Category	Gas	
	% Control (n=306)	% Treatment (n=216)
Electric-Saving Measures (a)		
Cooling (includes low-cost measures and thermostats)	1.00	0.90
Lighting and Advanced Power Strips	5.30	6.2**
Refrigerator Recycling	6.40	9.40
Electric-Saving Behaviors (b)		
Cooling	8.00	8.7^
Lighting, Advanced Power Strips & Electronic Devices	4.70	6.20
Refrigeration	4.10	5.10

(a) Electric Measures Metric: Purchased or installed at least one energy efficient item in measure group in past year. Includes: (1) Cooling: ES CAC or ASHP, ES room or wall AC, ES ductless mini-split heat pump, and ES dehumidifier. (2) Lighting and Power Strips: Indoor LED light bulbs, indoor CFL light bulbs, indoor LED or CFL light fixtures, outdoor LED or CFL light fixtures, motion sensors, and advanced power strips. (3) Refrigerator Recycling: Recycled second refrigerator.
(b) Electric Behaviors Metric: Started or increased at least one of items in behavior group in past year. Includes: (1) Cooling: Use portable window or ceiling fan, and set thermostat at or above 78 degrees for cooling. (2) Lighting, Power Strips & Electronic Devices: Turn off lights in unoccupied rooms, turn off outside lights by day, turn off computers at night/when not in use, put computer(s) to sleep, turn off TV(s) when no one is watching, turn off video game console(s) when not in use, switch off power strips, unplug devices when not in use, and turn off DVR and/or cable box when not watching TV. (3) Refrigeration: Made sure refrigerator seals are tight, cleaned refrigerator coils, increased refrigerator temperature, and unplugged a second refrigerator for weeks to months.
** Significantly higher than control group at $p<0.05$.
^ Significantly higher than control group at $p<0.10$.

4.5 How are the reports influencing measure installations compared to financial incentives?

Home energy reports often include information regarding incentives or rebates available and how to access them. To explore if the HERs are driving action in other programs, we asked both treatment and control customers whether any of the measures they purchased or installed in the past year received financial incentives, special pricing, or free offerings such as direct installation of low-cost measures during a home energy audit.

Our research indicates that the reports are directly causing electric treatment customers to install high efficiency measures without the use of incentives. As shown in the table below, a higher percentage of electric treatment customers reported purchasing a rebate eligible item than receiving a rebate as compared to their control counterparts. This indicates that while electric treatment customers purchased more rebate eligible items, they did not necessarily receive rebates for these items, suggesting that they may have purchased this equipment independently of energy efficiency programs. This is important, as it shows that

the reports appear to be generating measure savings above and beyond what the rebate programs are doing.

Conversely, a significant number of gas participants reported receiving a rebate for an equipment eligible item, suggesting that many of these participants may have participated in other energy efficiency programs.

Table 10. Respondents Purchasing Rebate-Eligible Items and Receiving Rebates or Special Offers

	Electric		Gas		Dual Fuel	
Purchase Category	**% Control**	**% Treatment**	**% Control**	**% Treatment**	**% Control**	**% Treatment**
Purchased any rebate-eligible item (as % of total n)	29.2	38.6**	25.4	29.6	28.4	31.5
Reported receiving a rebate (as % of total n)	12.7	17.9**	9.8	17.4**	13.2	17.7
Reported receiving a rebate (as % of people with an eligible purchase)	43.4	46.3	38.5	58.7**	46.4	56.3

Note: See Appendix C, question PE9 for a list of rebate-eligible items.
** Significantly higher than control group at p<0.05.
^ Significantly higher than control group at p<0.10.

5. Customer Interest in Additional Energy Saving Support

As part of the process evaluation, the Navigant team also assessed how customer support and engagement might be enhanced, and through which types of services. We discuss our in-depth interview findings on this topic below.

5.1 How can customer engagement with their utility be enhanced?

Across all in-depth interview groups, customers could be better educated on the major contributors to their household consumption. Out of the 24 customers interviewed, several cited items that they plug-in first when discussing the items that use the most energy in their homes, with cooling (12) and heating (10) cited as often as clothes washers/driers (12) and refrigerators (10). Notably, building envelope measures were not cited at all. Other items mentioned more than once included lighting (4), television/DVR (3), water heater (3), pool pump (2), and computer (2).

Some customers asked for more detailed information on the drivers to their energy use, and were aware of their lack of knowledge on the subject.

- Two respondents wanted to receive more information on how much energy they use by end-use category, with one indicating "the breakdown of where electricity is being used" in his house so he knows what he should "be concerned about".
- Two respondents noted that energy audits would be helpful, and another respondent mentioned neighborhood visits from the utility, recalling that "when they come around the neighborhood to explain how people can save energy it is very helpful."

Notably, this type of diagnostic information could be valuable in identifying ways to save energy. As noted earlier, the home comparisons prompted one customer to seek out a home energy audit only to learn that his sump pump was not running properly.

When asked directly about ways to improve their engagement with the utility, half (12 of 24) could not cite improvements and the remaining suggestions were not consistent. Respondents were then asked, aside from the reports they receive, is there other information or solutions that their utility could provide that would help them to take energy saving actions. Half could not think of anything else that could be provided, while others mentioned included financial incentives, online home energy reports, more information on how rates are set, and utility bill discounts.

However, our interviews suggest that customers may benefit from smarter home appliances and automation. As part of our interviews, respondents were read a list of behaviors that they said, as a part of the survey effort, they did not do regularly in the past year. Of these, respondents were asked if they would like to perform any of the behaviors more often than they do now. The most frequently mentioned regular behaviors respondents would like to do more of were unplugging devices (5), and switching off power strips (3). Other actions mentioned once included turning off lights, turning the computer off or into sleep mode, and setting back the thermostat.

Notably, the inconveniences and barriers associated with plug load management were cited among multiple respondents. For example, one respondent indicated that they would be inconvenienced by turning off their smart power strips, noting that, "the cable box would have to be rebooted and it isn't worth the effort." Three respondents also said that they are unable to reach certain outlets or power strips, resulting in devices always being on or plugged in, while another respondent said that some of his family members have difficulty remembering to turn off lights and computers. Yet another respondent indicated that providing a device to turn off their television on a timer (such as a Tier 2 advanced power strip) would be valuable in managing plug load.

Wi-Fi thermostats are of great interest to some, but many customers are skeptical that this technology will save more energy than their existing programmable thermostats. In-depth interview respondents were also asked how helpful they think a Wi-Fi thermostat would be in making it easier or more compelling for them to save energy. Just over half of (13 out of 24) respondents believed that a Wi-Fi thermostat would be very helpful or somewhat helpful, and nine said that they could actually imagine themselves using it. Of those who said they could not imagine themselves using a Wi-Fi thermostat or did not think it would be helpful, some noted that they already have a programmable thermostat (7), that they don't use internet-connected devices (2), that they manually set or turn off their thermostat (2), and finally one respondent noted that Wi-Fi thermostats would be too expensive.

6. Discussion and Recommendations

The goal of this process evaluation was to follow-up on the last comprehensive process evaluation conducted on the Home Energy Report program, which was completed in 2012. Results from the previous study are similar to findings for the 2014 program year, with electric treatment groups taking a higher number of statistically significant energy saving actions over controls than gas treatment groups. Since the 2012 study, which evaluated the 2011 program year, the program has expanded to cover nearly all of National Grid and Eversource Energy's (formerly NSTAR and WMECo) service territories in Massachusetts. In this expansion, HER efforts moved beyond its standard high energy users to target and treat a wider range of customers, including customers with over-lapping service territories.

Customers are satisfied with the program. Our research found that customers are generally satisfied with the HER program and are taking impactful, energy saving actions as a result of their engagement. As noted in the report, just over half of customers find the reports useful and most want to maintain the current level of frequency with which they receive the reports. Fifty-eight percent of electric, 55% of gas, and 57% of dual fuel treatment customers think that the reports are useful overall (useful defined as a score of four or five on a five-point scale, where five is very useful). Participants found the personal usage comparison to be more useful than other report sections, with mean scores ranging from 3.5 to 3.9 depending on the fuel group (on a five point scale, five being very useful). These results are similar to other studies of HER programs. While most customers did not have suggestions for how to improve the reports, 13% wanted more information or customization for the similar homes comparison.

Further, 80% of dual fuel, 77% of electric, and 74% of gas participants indicated that they want the reports to be sent at "about the same" frequency. Interestingly, dual fuel customers are reading the reports more than other fuel groups. Seventy percent of dual fuel customers report reading all of the reports, while 59% of electric, 63% of gas, and 63% of cross-PA customers say the same.

Our data also suggested that the HER program is enhancing customer satisfaction among electric treatment groups, who are significantly more satisfied than control groups with the energy efficiency services received from their utility, giving mean scores of 3.6 and 3.4 respectively, on a five point scale where five is very satisfied. While statistically significant differences not found between treatment and control for gas or dual fuel groups, gas treatment groups reported the highest satisfaction out of all the treatment groups, reporting a mean score of 3.98 on the same five point scale.

In addition, PA concerns about the potentially redundant and burdensome treatment for those customers receiving reports from two different PAs (cross PA customers) was explored. Our research shows that receiving reports from more than one PA is not an issue for these customers, and they are satisfied with the frequency of their reports. Seventy-seven percent of cross PA customers (represents 1% of treatment customers) want to receive the reports at about the same frequency as they do now. Comparisons between cross PA and dual fuel customers were also drawn when reviewing how customers perceive the overall usefulness of the reports, and no statistically significant differences were found between the two groups.

The program is prompting a wide range of actions, including multi-year measures and cross-fuel savings. Treatment customers took a significantly higher number energy saving actions in 2014 across

several equipment (installed or purchased in the past year) and behavior change (started or increased in frequency in past year) categories compared to the control groups. Notably, several measures experiencing lift (significantly more treatment actions than control actions) have long measure lives, such as 25 years for insulation and 15 years for energy efficient furnaces[19].

In addition to installing measures, treatment customers are also maintaining several behaviors that they started in previous years at a significantly higher level as compared to control customers.[20] A significantly greater number of gas treatment customers reported maintaining behaviors that save hot water (4% lift), and electric treatment customers also maintained more behaviors that reduce lighting usage as compared to controls, with a 2% lift. Behaviors related to refrigerator maintenance also showed lift over controls (6.2%) when all fuel groups were reviewed together.

Further, the data suggest strongly that cross-fuel effects may be occurring. Our analysis shows that electric treatment customers who have non-electric heat installed building envelope measures at a significantly higher rate than the control groups (5% lift). Additionally, gas treatment groups installed lighting measures and advanced power strips (0.9% lift) and set back thermostat temperatures for cooling (0.7% lift) at significantly higher rates than the control groups.

Most of the high impact actions appear to be independent of other programs (i.e. received no financial incentives) for electric treatment customers, less so for gas. Electric customers report taking measure-based actions without the use of other program offers, though a greater proportion of gas customers report taking advantage of rebates.[21] While a significantly higher percentage of electric treatment customers reported purchasing a rebate eligible item over controls (38.6% vs. 29.2%), a significant difference was not seen in the number of electric treatment customers who reported receiving a rebate with an eligible purchase as compared to controls (46.3% vs. 43.4%). This suggests that they may have purchased the equipment independently of energy efficiency programs.

While program lift in energy saving actions is occurring, there appears to be room to better educate customers. Notably only half of interview participants cite the largest contributors to their household energy use when asked, indicating more education is needed. Further, some customers indicated a desire for more detailed information on the drivers to their energy use, aware of their lack of knowledge. Two respondents wanted to receive more information on how much energy they use by end-use category, and three respondents noted that energy audits would be helpful.

Our interviews suggest that customers may benefit from smarter home appliances and automation to help with conservation impacts, but these technologies should be better tested and explored with consumers. As part of our interviews, respondents were read a list of behaviors that they said, as a part of the survey effort, they did not do regularly in the past year. Of these, respondents were asked if they would like to perform any of the behaviors more often than they do now. The most frequently mentioned regular behaviors respondents would like to do more of were unplugging devices (5), and switching off

[19] Massachusetts Technical Reference Manual, 2013-2015 planning period.

[20] As a part of the survey we asked customers whether they regularly took specific behaviors in the past year. For behaviors that did not start or increase in frequency in the previous year, customers began these behaviors in previous years and are still maintaining them.

[21] We asked treatment and control customers whether they received rebates, financial incentives, or free offerings (such as during a home energy audit) for any of the measures they reported installing or purchasing in the past year.

power strips (3). Other actions mentioned once included turning off lights, turning computer off or into sleep mode, and setting back thermostat.

Wi-Fi thermostats are of great interest to some, but many customers are skeptical that this technology will save more energy than their existing programmable thermostats**.** Just over half of (13 out of 24) in-depth interview respondents believed that a Wi-Fi thermostat would be very helpful or somewhat helpful, the remaining could not imagine themselves using a Wi-Fi thermostat or did not think it would be helpful in saving energy.

Recommendations

We offer the following recommendations to the Massachusetts PAs to enhance their behavioral offerings:

Recommendation #1: *While the savings associated with other programs cannot be double-counted across the portfolio, the net benefit of cross-program promotion and participation is positive. The PAs and EEAC should consider mechanisms to balance the "costs" of cross-program effects to avoid undue burden on the HER program where cross-program savings are substantial. Options for consideration include prorating these benefit adjustments to all programs, or conducting joint benefit-cost tests across the affected energy-efficiency and behavior-based programs.*

Recommendation #2: *Overall, feedback from cross PA customers is positive and similar to most other fuel groups. Therefore, PAs should continue with the current treatment for these customers without concern of negative customer satisfaction side effects.*

Recommendation #3: *The PAs should consider conducting more comprehensive exploratory research, such as in-home ethnography, to identify the potential for home automation solutions to target plug load. Across the interviews, this was the most commonly cited end use where customers were interested in additional support and solutions. Further, customers admit that actions like unplugging appliances and switching off power strips are too burdensome to take on a regular basis. It is important to note that this research is currently underway in in Massachusetts and follow-up research has been proposed for 2016.*

Appendix A. Home Energy Report Customer Counts, Cohorts, and Start Dates

The following table displays the number of treatment and control customers in the program for each PA by fuel type. Additionally, the table provides the names and start dates of the cohorts in each program.

Table 11. Home Energy Report Customer Counts, Cohorts, and Start Dates by PA and Fuel Type

Program Administrator	Fuel Type	Number of Treatment Customers in 2014	Number of Control Customers in 2014	Cohort Names (Waves)	Start Month and Year
National Grid	Elec	658,237	149,056	ngma_200910_e	October 2009
				ngma_201002_e	January 2010
				ngma_201012_e	November 2010
				ngma_201102_e	January 2011
				ngma_201111_e	November 2011
				ngma_201201_e	December 2011
				ngma_201301_e	November 2012
				ngma_201301_e_email	January 2013
				ngma_201404_e	April 2014
	Gas	333,910	68,210	ngma_200910_g	October 209
				ngma_201010_g	October 2010
				ngma_201102_g	January 2011
				ngma_201111_g	September 2011
				ngma_201201_g	November 2011
				ngma_201301_g	November 2012
				ngma_201409_g*	September 2014
	Duel Fuel	10,295	10,666	ngma_201201_d	December 2011
NSTAR	Elec	222,887	58,965	nstr_201203_e	January 2012
				nstr_201206_e	May 2012
				nstr_201304_e	July 2013
				nstr_201304_e_drop	July 2013
				nstr_201404_e	April 2014
	Gas	44,094	24,853	nstr_201309_g	September 2013
				nstr_201009_g	August 2010
				nstr_201102_g	January 2011
	Duel Fuel	36,997	32,014	nstr_201009_g**	August 2010
				nstr_201102_g**	January 2011
				nstr_201309_g_drop	September 2013
WMECO	Elec	101,874	9,012	wmco_201402_e	February 2014

*Note: This cohort was not included in the survey as only a few months had passed since reports began when the survey was administered. Customer counts are not included in the treatment or control totals.

**These two cohorts include customers receiving gas reports who were dual fuel eligible. Dual fuel reports started in 2014.

Appendix B. Energy Saving Actions Taken by PA Fuel Group at the Measure-Level

The following tables show the detailed results for measure and behavior actions taken by treatment and control group across the different PA groups and fuel types. In the first column, each heading displays the name of the composite category, with the measures or behaviors comprising that category reported below. In our composite tables, respondents who had taken at least one action in the composite category were counted towards the total percentage of respondents reporting having taken action in that category.

Table 12. Energy Saving Actions Taken (Measures Installed or Purchased in 2014)

	Ngrid Electric		Ngrid Gas		Ngrid Dual Fuel		NSTAR Electric		NSTAR Gas		NSTAR Dual Fuel		WMECO	
Measure	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment
Heating & Cooling														
CAC or ASHP (ES)	0.6	1.1	0.6	1.3	2.0	0.7	1.3	1.4	0.7	1.6	0.7	1.5	0.0	0.0
Room or Wall AC (ES)	1.3	2.3	1.9	0.0^	3.3	3.7	2.0	0.1^	2.0	1.6	0.7	3.1	2.0	4.6
Ductless Mini-split Heat Pump (ES)	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.7	0.7	0.7	0.0
Boiler (ES)	0.6	1.1	0.6	0.0	1.3	0.7	0.0	0.0	1.3	2.3	1.3	3.5	0.7	0.7
Furnace (ES)	0.6	4.4**	2.6	0.0**	2.0	1.4	0.7	1.5	2.0	1.6	1.3	2.1	3.3	0.7^
Appliances														
Clothes Washer (ES or front-load)	6.5	11.3	4.5	8.4	8.7	7.8	6.6	2.2^	5.3	7.9	9.3	4.4	8.0	9.7
Heat Pump Water Heater (ES)	0.6	5.4**	1.3	0.0	0.0	3.3**	0.0	1.5	0.0	2.5**	0.0	0.7	0.0	1.9^
Tankless Water Heater	0.6	2.1	0.6	1.1	0.7	0.0	0.0	0.0	0.7	2.1	0.0	1.4	0.7	1.3
Dehumidifier (ES)	1.3	0.0	0.0	1.1	3.3	0.4^	0.0	0.0	0.7	0.6	0.7	2.1	1.3	0.7
Light Fixtures														
Indoor light bulbs - LED	17.4	27.7**	22.1	26.1	30.7	25.3	26.3	28.3	23.0	24.3	18.5	30.1**	21.3	30.6^
Indoor light bulbs - CFL	31.0	35.4	42.2	40.1	36.0	30.8	38.8	36.7	25.7	34.9^	40.4	37.5	37.3	43.9
Indoor light fixtures (LED or CFL)	3.2	4.3	4.5	9.0	9.3	6.1	3.9	1.4	2.0	5.4	4.0	5.7	5.3	7.2
Outdoor light fixtures (LED or CFL)	2.6	6.6^	3.9	5.2	6.7	5.4	3.3	4.0	3.9	5.1	1.3	4.4	6.0	8.4
Building Envelope														
Double-paned or Triple-paned Windows (ES)	0.6	3.3^	1.3	1.4	1.3	1.4	0.7	0.0	1.3	2.1	1.3	2.2	0.7	2.6
Attic, Ceiling, or Wall Insulation	0.6	4.4**	0.6	1.4	4.0	2.9	1.3	0.0	0.7	2.6	0.0	2.1^	1.3	3.9

Storm windows	1.3	0.0	2.6	0.0**	0.7	0.0	1.3	0.0	1.3	0.9	0.0	0.7	0.0	0.0
Refrigerator Recycling														
Recycled Second Refrigerator	3.9	12.1**	5.8	8.3	6.0	9.4	6.6	6.4	4.6	9.1	7.9	12.3	9.3	8.0
Low-cost Measures														
Weather-stripping	6.5	5.5	6.5	3.7	8.7	4.3	3.3	2.0	4.6	7.3	4.0	6.3	5.3	6.0
Low-flow faucet aerators	1.9	2.2	0.6	0.0	4.0	0.7^	0.7	1.0	1.3	0.7	1.3	4.3	2.7	6.0
Low-flow showerheads	3.2	5.5	2.6	3.8	6.7	2.9	5.3	1.0**	2.0	4.4	0.7	4.2**	3.3	6.0
Water heater tank wrap or pipe wrap	3.2	2.2	1.9	1.2	2.7	1.4	2.0	0.1^	0.7	2.6	1.3	2.2	3.3	1.4
Motion sensors (e.g. for lighting)	1.3	2.3	1.3	2.2	2.0	0.7	1.3	0.0	1.3	1.8	0.7	2.8	2.0	2.0
Programmable or WiFi Thermostat	5.2	4.8	2.6	2.5	6.7	2.8	4.6	3.4	2.0	3.3	2.6	7.2^	4.7	2.7
Advanced Power Strips	4.5	6.0	3.2	5.2	8.7	4.3	5.3	3.4	3.9	6.8	2.0	3.0	4.7	6.0
Duct sealing or insulation	1.3	4.4	1.3	0.0	0.7	1.4	1.3	0.0	1.3	1.1	1.3	1.4	0.0	0.7

** Significantly higher than control group at p<0.05.

^ Significantly higher than control group at p<0.10.

Table 13. Energy Saving Actions Taken (Behaviors Started or Increased in Frequency in 2014)

	Ngrid Electric		Ngrid Gas		Ngrid Duel Fuel		NSTAR Electric		NSTAR Gas		NSTAR Duel Fuel		WMECO	
Measure	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment
Hot water usage														
Wash laundry in cold water	12.9	9.2	8.4	6.3	9.3	13.0	8.6	6.1	11.8	11.6	9.9	14.0	12.7	10.6
Fully load clothes washer	4.5	11.4**	3.9	10.8**	9.3	11.5	3.9	3.8	9.2	5.9	6.6	7.1	6.7	7.2
Full load dishwasher	7.1	6.9	3.2	10.0**	6.0	5.6	4.6	5.1	4.6	6.4	4.0	5.0	3.3	5.9
Take shorter showers	7.7	7.1	3.9	7.4	7.3	8.8	5.9	2.0^	9.2	7.1	7.3	10.2	10.7	8.0
Reduced the water heater temperature	3.2	3.7	2.6	3.8	2.7	2.8	2.0	1.5	2.6	2.7	0.7	2.3	2.7	1.9
Lighting														
Turn off lights in unoccupied rooms	15.5	13.6	14.3	14.7	12.7	19.6	11.2	15.3	15.1	11.4	10.6	11.6	14.7	13.2
Turn off outside lights by day	7.1	10.2	5.2	12.5**	6.0	11.0	5.3	3.0	7.2	8.9	4.0	4.9	5.3	9.1
Personal Electronics														
Turn off computers at night/when not in use	8.4	5.5	4.5	8.4	4.7	10.9**	5.3	4.3	8.6	7.3	5.3	7.4	7.3	11.8
Put computer(s) to sleep	8.4	4.4	4.5	8.5	3.3	5.4	7.2	4.9	6.6	4.0	4.6	6.1	6.7	7.8
Turn off TV(s) when no one is watching	10.3	7.8	7.8	11.1	10.0	12.2	5.9	4.4	9.2	7.6	6.6	8.0	13.3	10.5
Turn off video game console(s) when not in use	3.2	7.9^	2.6	3.5	2.7	4.4	3.9	1.9	4.6	3.8	2.6	5.6	2.7	4.5

Switch off power strips	5.2	4.4	5.8	12.3**	6.0	5.7	3.3	4.7	2.6	3.2	2.0	2.3	8.7	7.2
Unplug devices when not in use (phones, chargers, TVs, stereos, etc.)	6.5	6.7	3.9	7.1	6.0	5.8	2.0	7.7**	5.9	4.2	6.0	5.8	8.7	7.8
Turn off DVR and/or cable box when not watching TV	6.5	5.7	2.6	4.9	6.7	8.7	3.3	3.4	5.9	7.4	4.6	7.3	6.0	5.9
HVAC														
Use a portable window or ceiling fan	9.0	8.3	5.8	9.1	5.3	7.9	4.6	2.0	5.9	5.5	4.6	4.2	8.7	7.3
Set thermostat at or below 70 degrees for heating	9.7	8.1	9.1	9.8	7.3	10.5	6.6	11.4	13.2	9.1	7.9	11.3	10.7	9.9
Set thermostat at or above 78 degrees for cooling	1.3	1.4	1.3	5.9**	2.7	3.2	3.9	2.5	3.9	0.8**	2.6	2.2	4.7	0.6**
Clear area around vents	7.7	8.5	3.9	8.8^	7.3	7.2	7.2	1.1**	5.3	5.4	5.3	5.2	8.0	4.6
Maintained heating and cooling system	3.9	4.8	1.3	4.7^	1.3	1.4	0.7	0.1	3.3	2.5	2.0	1.4	3.3	0.7.0^
Changed furnace filter	3.2	4.8	1.3	1.1	1.3	0.7	0.7	0.1	1.3	1.6	0.7	3.0	2.0	0.7
Refrigeration														
Made sure refrigerator seals are tight	5.2	4.5	2.6	5.6	2.7	3.2	2.0	1.3	6.6	3.7	0.7	1.4	2.0	0.6
Cleaned refrigerator coils	2.6	3.4	2.6	4.3	2.0	2.6	2.0	0.0^	3.9	2.6	0.7	1.4	2.7	1.9
Increased refrigerator temperature	0.0	0.0	0.6	1.3	1.3	0.7	0.0	1.0	0.7	1.5	0.0	1.4	0.7	0.6
Unplugged a second refrigerator for weeks to months at a time	1.9	0.0^	0.6	2.1	0.7	0.0	0.7	0.0	0.0	0.7	0.7	0.0	0.7	0.7

** Significantly higher than control group at p<0.05.
^ Significantly higher than control group at p<0.10.

Table 14. Energy Actions Taken (Behaviors Maintained from Previous Years)

	Ngrid Electric		Ngrid Gas		Ngrid Duel Fuel		NSTAR Electric		NSTAR Gas		NSTAR Duel Fuel		WMECO	
Measure	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment	% Control	% Treatment
Hot water usage														
Wash laundry in cold water	71.6	78.6	63.6	67.0	67.3	84.1**	69.7	69.7	71.1	66.1	69.5	68.8	70.0	74.6
Fully load clothes washer	74.8	86.2**	77.9	84.9	85.3	84.6	84.9	88.6	80.9	86.2	73.5	81.1	83.3	83.6
Full load dishwasher	64.5	74.2^	60.4	74.1**	62.0	56.0	76.3	85.3**	69.1	69.5	70.2	77.8	65.3	65.2
Take shorter showers	68.4	70.0	61.0	66.4	69.3	73.0	66.4	71.7	73.0	74.6	64.2	67.6	72.0	75.6
Reduced the water heater temperature	18.7	27.7^	25.3	27.9	26.7	29.7	19.7	13.0	28.9	21.3^	23.2	23.3	19.3	20.3
Lighting														
Turn off lights in unoccupied rooms	91.6	97.5**	96.8	96.3	96.0	94.8	96.7	96.5	96.1	96.3	95.4	96.1	96.0	93.5
Turn off outside lights by day	76.8	81.4	78.6	84.1	83.3	85.4	77.6	73.5	84.9	86.7	78.8	78.7	86.7	85.7

Personal Electronics														
Turn off computers at night/when not in use	62.6	65.3	58.4	71.1**	64.0	65.7	63.2	72.1^	61.8	69.8	56.3	63.6	66.7	71.2
Put computer(s) to sleep	60.0	63.1	68.8	65.9	56.0	48.7	65.8	68.5	60.5	67.9	68.9	67.2	63.3	60.8
Turn off TV(s) when no one is watching	91.0	93.8	94.2	96.0	92.0	92.4	94.7	94.3	90.1	96.2**	92.1	91.7	98.0	92.6**
Turn off video game console(s) when not in use	25.2	31.1	24.0	30.5	25.3	26.8	36.8	36.0	30.9	30.3	27.8	28.1	28.0	32.2
Switch off power strips	31.0	30.4	28.6	38.1^	32.7	33.7	27.6	27.9	28.3	32.0	23.8	26.0	35.3	32.3
Unplug devices when not in use (phones, chargers, TVs, stereos, etc.)	42.6	44.7	36.4	37.9	35.3	40.1	28.3	45.2**	39.5	42.9	39.7	43.5	42.0	37.3
Turn off DVR and/or cable box when not watching TV	58.1	50.6	55.2	49.7	60.0	57.6	49.3	60.2^	64.5	64.6	52.3	53.0	56.0	58.7
HVAC														
Use a portable window or ceiling fan	65.8	75.4^	66.2	64.0	70.7	69.5	61.2	60.0	61.2	64.9	70.2	65.4	70.7	68.1
Set thermostat at or below 70 degrees for heating	78.1	84.4	87.7	91.6	84.7	89.5	84.2	91.2^	90.1	82.2**	89.4	90.8	91.3	85.2^
Set thermostat at or above 78 degrees for cooling	18.7	17.7	22.7	23.6	20.7	21.2	23.0	23.1	18.4	19.4	20.5	22.9	19.3	20.4
Clear area around vents	71.6	75.8	74.0	80.5	73.3	82.3^	73.0	75.9	78.9	70.7^	76.2	74.6	81.3	70.5**
Maintained heating and cooling system	73.5	78.1	74.7	73.8	76.0	75.7	77.0	75.6	78.3	76.7	72.8	75.8	81.3	78.0
Changed furnace filter	44.5	46.9	47.4	47.6	42.0	43.0	38.2	39.6	48.7	44.0	48.3	40.9	54.0	46.1
Refrigeration														
Made sure refrigerator seals are tight	65.2	68.2	58.4	71.7**	67.3	65.2	56.6	64.2	73.0	63.2**	61.6	63.5	66.7	67.7
Cleaned refrigerator coils	41.3	46.2	40.9	47.0	44.7	45.0	38.8	44.7	44.1	44.1	41.1	32.1	54.7	52.6
Increased refrigerator temperature	9.0	7.7	7.1	9.0	10.7	9.3	5.9	13.6**	5.3	10.6^	4.6	8.3	10.7	8.6
Unplugged a second refrigerator for weeks to months at a time	5.2	13.3**	6.5	6.0	10.7	8.4	10.5	6.0	10.5	5.2^	9.9	5.0	10.0	12.5

Appendix C. Participant and Control Group Survey

Sample Variables

The following **sample variables will be used to administer the survey**

Variable	Definition
ELEC_PA	Electric program administrator (blank if they are not treatment or control for electric)
ELEC_PA_2	Second read-in for WMECo or NSTAR customers, known as Eversource Energy as of Feb. 2, 2015.
GAS_PA	Electric program administrator (blank if they are not treatment or control for gas)
GAS_PA_2	Second read-in for WMECo or NSTAR customers, known as Eversource Energy as of Feb. 2, 2015.
UTILITY	Read-in for PA through which they are receiving reports. If they are Cross-PA, please randomly-select read-in (either electric or gas PA name)
UTILITY_2	Second read-in for WMECo or NSTAR customers, now Eversource Energy.
PARTICIPANT	1=Participant for either electric or gas (or both); could still be control for one fuel. 0=Control in both fuels (or control for dual fuel)
ELEC_TYPE	T=Treatment, C=Control, NA=Not Assigned
GAS_TYPE	T=Treatment, C=Control, NA=Not Assigned
DUAL_FUEL	1=Same PA for both electric and gas (either treatment or control) 0=Different PA for both electric and gas (either treatment or control)
CROSSPA	1=Different PA for both electric and gas (treatment for both types) 0=All other customers
MULTIYEAR	1=Participant or control for two or more years of report delivery (consider implementing as 22 months+) (If they are in two cohorts with different durations, preference (a) the cohort in which they receive treatment (if they are T in one and C in another), and then (b) the cohort with the longer duration (if they are treatment in both, or control in both) 0=Participant or control for less than two years

Survey Introduction

Hello, my name is _____ with Bellomy Labs. I am calling on behalf of [UTILITY], [IF UTILITY_2=WMECO, NSTAR: "formerly known as [UTILITY_2]"]. We are conducting a study to understand your home energy use to help improve [UTILITY's] energy efficiency program offerings.

Before we begin the survey, I need to ask a few questions about your household to see if you qualify. The survey will take about 15 minutes to complete.

Screener Questions

[INCLUDE S2-S7 IN DAILY DISPO REPORT]

S1. Are you, or is anyone in your household, an employee of an electric or gas utility?

1. (Yes) [THANK & TERMINATE]
2. (No)
98. (Don't Know) [THANK & TERMINATE]
99. (Refused) [THANK & TERMINATE]

[ASK IF PARTICIPANT=1, ELSE SKIP TO S4]

S2. Do you recall receiving a Home Energy Report [IF CROSSPA=1 "from [ELEC_PA]"; and IF ELEC_PA_2=NSTAR,WMECO, also say "formerly know as [ELEC_PA_2]"]? This is a mailer sent to your home that provides a description of your household's [IF CROSSPA=0: energy; if CROSSPA=1: electricity] usage in comparison to similar homes, with tips on how to save energy in your home.

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF CROSSPA=1]

S2g. Do you recall receiving a Home Energy Report [IF CROSSPA=1, "from [GAS_PA]"; and IF GAS_PA_2=NSTAR also say "formerly know as NSTAR"]? This is a mailer sent to your home that provides a description of your household's natural gas usage in comparison to similar homes, with tips on how to save energy in your home.

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF (CROSSPA=0 & S2=2,98,99) OR (CROSSPA=1 & (S2=2,98,99 AND S2g=2,98,99)]

S3. Is there someone else in your household I could speak with who may be aware of the Home Energy Report?

1. (Yes)
2. (No) [THANK AND TERMINATE]
98. (Don't know) [THANK AND TERMINATE]
99. (Refused) [THANK AND TERMINATE]

[LOOP TO S2 IF S3=1]

[Once participant who is aware of report(s) is identified, ask following questions]

[ASK IF ELEC_TYPE=T,C]

S4. Are you responsible for paying your electric utility bill?

1. (Yes)
2. (No)
98. (Don't know)

99. (Refused)

[ASK IF GAS_TYPE=NA]

S5. What is the name of your natural gas utility?

1. (National Grid)
2. (NSTAR)
3. (Columbia Gas)
4. (Berkshire Gas)
5. (Unitil)
6. (Liberty Utilities)
7. (Blackstone Gas Company)
8. (Eversource Energy)

00. Other [SPECIFY]

96. (Don't have a gas utility)

98. (Don't Know)

99. (Refused)

[ASK IF GAS_TYPE=T,C]

S6. Are you responsible for paying your natural gas utility bill?

1. (Yes)
2. (No)

98. (Don't know)

99. (Refused)

S7. According to our records, your address is [READ IN <street_addr> <unit> <city>]. Is this still your primary address?

1. (Yes)
2. (No)

98. (Don't know)

99. (Refused)

[THANK AND TERMINATE IF: S1=1, 98, 99; S4 =2, 98, 99; S6=2, 98, 99; OR S7=2, 98, 99]

Demographics

[INCLUDE DE1-DE3 IN DAILY DISPO REPORT]

DE1. Do you rent or own your home?

1. (Own)
2. (Rent)

00. (Other: Specify_____)

98. (Don't know)

99. (Refuse)

DE2. What is your age? [Interviewer note: Read ranges if respondent is uncomfortable giving a number]

1. (24 yrs or younger)

2. (25 to 34 yrs)
3. (35 to 44 yrs)
4. (45 to 54 yrs)
5. (55 to 64 yrs)
6. (65 years and over)
98. (Don't Know)
99. (Refused)

DE3. Respondent Gender? (Observation – Do not ask)
1. (Male)
2. (Female)

NS1. Thank you. The goal of this study is to learn about energy use in selected homes in [UTILITY]'s service territory.

Satisfaction with Utility Services Received to Help Save Energy

Many energy service providers in Massachusetts offer energy efficiency programs, rebates, and tips to help customers save energy and money.

[ASK IF ELEC_TYPE=T,C]
NA1. On a scale of 1 to 5 where 1 is very dissatisfied and 5 is very satisfied, how satisfied are you with the services that your electricity provider offers to help you save electricity? [RECORD NUMBER 1-5; 96=NOT AWARE OF THESE SERVICES; 98=DON'T KNOW; 99=REFUSED]

[ASK IF GAS_TYPE=T,C]
NA2. On a scale of 1 to 5 where 1 is very dissatisfied and 5 is very satisfied, how satisfied are you with the services that your natural gas provider offers to help you save natural gas? [RECORD NUMBER 1-5; 96=NOT AWARE OF THESE SERVICES; 98=DON'T KNOW; 99=REFUSED]

Energy Efficient Equipment

Now I am going to list equipment or appliances that might be in your home.

PE1. Does your home have a… [ROTATE; MULTIPLE RESPONSE; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
a. Central air conditioning unit or Air Source Heat Pump			
b. Room or wall air conditioning unit			
c. Clothes washing machine			
d. Clothes dryer			
e. Dishwasher			

	Yes (1)	No (2)	Don't know (98)
f. Television			
g. Computer			
h. Video game console			
i. Ductless Mini-split Heat pump [IF NEEDED: SAY, these are usually mounted to your ceiling or wall and connect to an outdoor unit. There are no ducts.]			
j. Boiler			
k. Furnace			
l. Refrigerator			
m. Attic, ceiling or wall insulation			
n. Heat pump water heater [IF NEEDED: SAY, these use electricity and take the heat from surrounding air and transfer it to an enclosed storage tank]			
o. tank-less water heater [IF NEEDED, SAY: also known as an on-demand water heater; it does not have a large storage tank to hold heated water, which saves energy]			
p. Double-paned or triple-paned windows[IF NEEDED, SAY: These windows have energy efficient features, like glazing and are much thicker than older windows]			
q. Dehumidifier			

[ASK IF PE1c=1]

PE2. Is your washing machine front-load or top-load?

1. Front load
2. Top load
98. (Don't Know)
99. (Refused)

[ASK if any PE1a-q=1]

PE3. Did you purchase or install any of the equipment or appliances we just discussed in the last year?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF PE3=1]

PE4. Did your household purchase or install [INSERT EACH PE1a-q=1] in the past year? [MULTIPLE RESPONSE; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
PE4a. Central air conditioning unit or Air Source Heat Pump			
PE4b. Room or wall air conditioning unit			
PE4c. Clothes washing machine			
PE4d. Clothes dryer			
PE4e. Dishwasher			
PE4f. Television			
PE4g. Computer			
PE4h. Video game console			
PE4i. Ductless Mini-split Heat pump			
PE4j. Boiler			
PE4k. Furnace			
PE4l. Refrigerator			
PE4m. Attic, ceiling or wall insulation			
PE4n. Heat pump water heater			
PE4o. tank-less water heater			
PE4p. Double-paned or triple-paned windows			
PEq. Dehumidifier			

PE5. Has your household recycled a second refrigerator or freezer within the last year?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

PE5a. Do you currently have a second refrigerator or freezer?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF PE4a-q=1 where noted]

(NOTE: Excludes items that are (a) energy efficient by definition: heat pumps and HPWH; insulation; on-demand and tank-less water heaters, or (b) where market share is predominately ENERGY STAR already: dishwashers, computers, refrigerators, or televisions, or (c) where there is no ENERGY STAR certification (clothes dryers, video game consoles)).

PE6. To the best of your knowledge, is/are the [INSERT EACH PE4a-q=1 NOTED BELOW] you purchased in the last year ENERGY STAR qualified? [MULTIPLE RESPONSE; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
PE6a. Central air conditioning unit or Air Source Heat Pump			
PE6b. Room or wall air conditioning unit			
PE6c. Clothes washing machine			
PE6i. Ductless Mini-split Heat Pump			
PE6j. Boiler			
PE6k. Furnace			
PE6p. Double-paned or triple-paned windows			
PE6q. Dehumidifier			

LI1. Now I want to ask about the type of lighting that you have in your home. Does your home have any of the following types of light bulbs? [MULTIPLE RESPONSE]

2. Incandescent or Halogen [IF NEEDED: These are traditional, globe shaped light bulbs that can be used throughout your home. Halogen and incandescent bulbs look very similar.]
3. Compact Fluorescent Light bulbs, also known as CFLs [IF NEEDED: The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling a soft-serve ice cream, and fits in a regular light bulb socket.]

5. Fluorescent bulbs other than CFLs [IF NEEDED: For example, these can be long, linear bulbs in garages or basements, or U-shaped or circular bulbs used for specialty applications.]

4. LEDs, other than holiday bulbs[IF NEEDED: LED bulbs have only been widely available for the past few years. They can be used in the same type of fixtures as incandescents or CFLs, but may be shaped differently. We are NOT referring to holiday lights or night lights.]
98. (Don't Know)
99. (Refused)

[ASK IF LI1 = 1-5]
LI2. Did you purchase or install any of these light bulbs in the past year? [IF NEEDED: Installing could include replacing bulbs in your home with bulbs you purchased in previous year. IF NEEDED: This could include bulbs installed during a home energy audit/assessment.]

1. (Yes)
2. (No)
98. (Don't Know)

99. (Refused)

[ASK IF LI2 = 1]

LI3. What types of bulbs did you purchase or install? [MULTIPLE RESPONSE; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
LI3b. [READ IF LI1=2] Incandescent or Halogen bulbs			
LI3c. [READ IF LI1=3] Compact Fluorescent Light bulbs			
LI3d. [READ IF LI1=4] LED bulbs			
LI3e. [READ IF LI1=5] Fluorescent bulbs other than CFLs			

LI4. Does your home have outdoor light fixtures?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

LI5. Did you purchase or install any indoor [(IF LI4=1): "or outdoor"] light fixtures in the past year? (IF NEEDED: Here I'm asking about the fixture itself rather than the bulb or lamp that goes in the fixture)

1. (Indoor)
2. (Outdoor)
3. (Both)
98. (Don't know)
99. (Refused)

[ASK IF LI5=1,3]

LI6. What type of bulbs are your new indoor fixtures designed for? [multiple response]

2. Incandescent or Halogen bulbs [IF NEEDED: These are traditional, globe shaped light bulbs that can be used throughout your home. Halogen and incandescent bulbs look very similar.]

3. Compact Fluorescent Light bulbs, also known as CFLs [IF NEEDED: The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling a soft-serve ice cream, and fits in a regular light bulb socket.]

5. Fluorescent bulbs other than CFLs [IF NEEDED: For example, these can be long, linear bulbs in garages or basements, or U-shaped or circular bulbs used for fish tanks or indoor plantings.]

4. LEDs, other than holiday bulbs [IF NEEDED: LED bulbs have only been widely available for the past few years. They can be used in the same type of fixtures as incandescents or CFLs, but may be shaped differently. We are NOT referring to holiday lights or night lights.]

98. (Don't Know)

99. (Refused)

[ASK IF LI5=2,3]

LI7. What type of bulbs are your new outdoor fixtures designed for? [multiple response]

1. Incandescent or Halogen bulbs [IF NEEDED: These are traditional, globe shaped light bulbs that can be used throughout your home. Incandescent and halogen bulbs look very similar.]
2. Compact Fluorescent Light bulbs, also known as CFLs [IF NEEDED: The most common type of compact fluorescent bulb is made with a glass tube bent into a spiral, resembling a soft-serve ice cream, and fits in a regular light bulb socket.]

5. Fluorescent bulbs other than CFLs [IF NEEDED: For example, these can be long, linear bulbs in garages or basements, or U-shaped or circular bulbs used for fish tanks or indoor plantings.]

3. LEDs, other than holiday bulbs [IF NEEDED: LED bulbs have only been widely available over the past few years. They can be used in the same type of fixtures as incandescents or CFLs, but may be shaped differently. We are NOT referring to holiday lights or night lights.]

98. (Don't Know)

99. (Refused)

Other energy saving equipment

PA1. Does your home have…? [Rotate; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
a. Weather stripping or caulking around windows and/or doors			
b. Low-flow shower heads [IF NEEDED, say: uses water more efficiently so less is used]			
c. Low-flow faucet aerators [IF NEEDED, say: uses water more efficiently so less is used]			
d. Water heater tank wrap or pipe wrap			
f. Motion sensors (e.g., for lighting)			
g. Storm windows			
i. Programmable thermostat [IF needed: This could include a WiFi thermostat, like Nest, Honeywell Lyric or Ecobee]			
j. Energy Saving or Advanced power strips			
k. Duct sealing or duct insulation			

[ASK IF PA1a-j = 1]

PA2. Did you purchase or install any of the items we just discussed in the last year?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF PA2=1]

PA2a-l. Did your household purchase or install [INSERT EACH PA1=1] in the past year? [1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
PA2a. Weather stripping or caulking around windows and/or doors			
PA2b. Low-flow shower heads			
PA2c. Low-flow faucet aerators			
PA2d. Water heater tank wrap or pipe wrap			
PA2f. Motion sensors (e.g., for lighting)			
PA2g. Storm windows			
PA2i. Programmable thermostat			
PA2j. Advanced power strips			
PA2k. Duct sealing or duct insulation			

PA3. Have you ever had a home energy assessment or audit, where someone from MassSave or another organization came to your house and assessed your home's energy use?

1. Yes, within the past year
2. Yes, more than 1 year ago
3. No
98. (Don't Know)
99. (Refused)

Financial assistance for measures installed in past year

PE9i. For the equipment or items that you installed in the past year, did you receive any special pricing or rebates, or receive an item for free?

1. Yes
2. No
98. (Don't know)

99. (Refused)

[IF PE9i=1, ASK PE9]
[ASK FOR EACH where PE4=1 or where PE5a=1 or where LI3c-e=1 or LI6=3,4,5,98 or LI7=3,4,5,98or where PA2=1]
For each item that I list, please let me know if you received a rebate, other special pricing or discounts, or if you received it for free (IF NEEDED for free items, as part of a home energy audit or assessment).
PE9/PA4/LI6. Did you receive a rebate or other special pricing for the…? [INSERT EACH ELIGIBLE ITEM] [1=Rebate, 2=(Other special pricing mentioned), 3=(Received for free), 4=(None of these / no special pricing), 98=(Don't know), 99=(Refused)]

	Rebate (1)	Other special pricing (2)	Received for free (3)	None of these (4)	Don't Know (98)
PE9a. [ASK IF PE4a=1] Central air conditioning unit or Air Source Heat Pump					
PE9b. [ASK IF PE4b=1] Room or wall air conditioning unit					
PE9c. [ASK IF PE4c=1] Clothes washing machine					
PE9d. [ASK IF PE4d=1] Clothes dryer					
PE9i. [ASK IF PE4i=1] Ductless Mini-split Heat pump					
PE9j. [ASK IF PE4j=1] Boiler					
PE9k. [ASK IF PE4k=1] Furnace					
PE9l. [ASK IF PE4l=1] Refrigerator					
PE9m. [ASK IF PE4m=1] Attic, ceiling or wall insulation					
PE9n. [ASK IF PE4n=1] Heat pump water heater					
PE9o. [ASK IF PE4o=1] tank-less water heater					
PE9q. [ASK IF PE4q=1] Dehumidifier					
PE9t. [ASK IF PE5a1=1] Refrigerator or freezer you recycled					
LI6c. [ASK IF LI3c=1] Compact Fluorescent Light bulbs					
LI6d. [ASK IF LI3d=1] LED bulbs					
LI7a. [ASK IF LI6=3,4,5,98] Indoor Fixtures					

	Rebate (1)	Other special pricing (2)	Received for free (3)	None of these (4)	Don't Know (98)
LI7b. [ASK IF LI7=3,4,5,98] Outdoor Fixtures					
PA4b. [ASK IF PA2b=1] Low-flow shower heads					
PA4c. [ASK IF PA2c=1] Low-flow faucet aerators					
PA4d. [ASK IF PA2d=1] Water heater tank wrap or pipe wrap					
PA4i. [ASK IF PA2i=1] Programmable thermostat					
PA4j. [ASK IF PA2j=1] Advanced power strips					
PA4k. [ASK IF PA2k=1] Duct sealing or duct insulation					

Behavioral Actions Taken

Next I'm going to ask a few questions regarding actions that you may take in your home. For each one that I list, please tell me if you regularly (IF NEEDED: Most of the time) do them.

BA1. Do you regularly… [INSERT EACH BA1a-s] [MULTIPLE RESPONSE; 1=Yes, 2=No, 96=Not Applicable, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Not Applicable (96)	Don't know (98)
b. Wash laundry in cold water				
c. [ASK IF PE1c=1] Fully load washing machine				
d. [ASK IF PE1e=1] Fully load dishwasher				
e. Turn off lights in unoccupied rooms				
f. [ASK IF LI4=1] Turn off outside lights by day				
g. [ASK IF PE1g=1] Turn off computers at night/when not in use				
h. [ASK IF PE1g=1] Put computer(s) to sleep				

	Yes (1)	No (2)	Not Applicable (96)	Don't know (98)
i. [ASK IF PE1f=1] Turn off TV(s) when no one is watching it				
j. [ASK IF PE1h=1]Turn off video game console(s) when not in use				
k. Switch off power strips				
l. Unplug devices when not in use (phones, chargers, TVs, stereos, etc.)				
n. Take short showers				
o. Use a portable window fan or ceiling fan				
p. Clear the area around vents				
q. Set the thermostat at or below 70 degrees for heating				
r. [IF PE1a=1 OR PE1b=1 OR PE1i=1] Set thermostat at or above 78 degrees for cooling				
s. [ASK IF PE1f=1] Turn off DVR and/or cable box when not watching TV				

[ASK IF ANY BA1=1]

BA2. Did you start taking any of the actions we just discussed in the past year?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF BA2=1]

BA3a-s. Did you start [INSERT EACH BA1a-s=1] within the past year? [MULTIPLE RESPONSE; 1=Yes, 2=No, 98=(Don't Know), 99=(Refused)

	Yes (1)	No (2)	Don't know (98)
BA3b. Washing laundry in cold water			
BA3c. Fully loading washing machine			
BA3d. Fully loading dishwasher			
BA3e. Turning off lights in unoccupied rooms			
BA3f. Turning off outside lights by day			

	Yes (1)	No (2)	Don't know (98)
BA3g. Turning off computers at night/when not in use			
BA3h. Putting computer(s) to sleep			
BA3i. Turning off TV(s) when no one is watching it			
BA3j. Turning off video game console(s) when not in use			
BA3k. Switching off power strips			
BA3l. Unplugging devices when not in use (phones, chargers, TVs, stereos, etc.)			
BA3n. Taking short showers			
BA3o. Using a portable window fan or ceiling fan			
BA3p. Clearing the area around vents			
BA3q. Setting the thermostat at or below 70 degrees for heating			
BA3r. [IF PE1a=1 OR PE1b=1 OR PE1i=1] Setting thermostat at or above 78 degrees for cooling			
BA3s. Turning off DVR/cable box when not watching TV			

Preface to BA8: The next set of questions is about the actions you've been taking for more than a year.

[ASK IF (BA1a-s=1 except IF BA3a-s=1)]
BA8. Did you [INSERT each BA1a-s=1 EXCEPT IF BA3a-s=1] more or less frequently in the past year compared with previous years? [1=Increased Frequency, 2=Decreased Frequency, 3=No change in frequency, 98=(Don't Know), 99=(Refused)]

	Increased Frequency (1)	Decreased Frequency (2)	No change in frequency (3)	Don't Know (98)
BA8b. Wash laundry in cold water				
BA8c. Fully load washing machine				
BA8d. Fully load dishwasher				
BA8e. Turn off lights in unoccupied rooms				
BA8f. Turn off outside lights by day				
BA8g. Turn off computers at night/when not in use				

	Increased Frequency (1)	Decreased Frequency (2)	No change in frequency (3)	Don't Know (98)
BA8h. Put computer(s) to sleep				
BA8i. Turn off TV(s) when no one is watching it				
BA8j. Turn off video game console(s) when not in use				
BA8k. Switch off power strips				
BA8l. Unplug devices when not in use (phones, chargers, TVs, stereos, etc.)				
BA8n. Take short showers				
BA8o. Use a portable window fan or ceiling fan				
BAp. Clear the area around vents				
BAq. Set the thermostat at or below 70 degrees for heating				
BAr. [IF PE1a=1 OR PE1b=1 OR PE1i=1] Set thermostat at or above 78 degrees for cooling				
BAs. Turn off DVR/cable box when not watching TV				

BA4. Have you taken any of the following actions within the past year?---Have you--- [INSERT EACH BA4a-h]…within the past year? [ROTATE MULTIPLE RESPONSE; 1=Yes, 2=No, 96=(Not Applicable), 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Not applicable (96)	Don't know (98)
a. Maintained your heating and cooling system				
b. [ASK IF PE1k=1] Changed the furnace filter				
d. Reduced the water heater temperature				
e. Make sure refrigerator seals are tight				
f. Clean refrigerator coils				

	Yes (1)	No (2)	Not applicable (96)	Don't know (98)
g. Increase refrigerator temperature				
h. [ASK IF PE5a=1]Unplug a second refrigerator for weeks to months at a time				

[ASK IF ANY BA4a-h=1]

BA5. Did you start taking any of the actions we just discussed in the past year?

1. (Yes)
2. (No)
98. (Don't Know)
99. (Refused)

[ASK IF BA5=1]

BA6a-h. Did you start…[INSERT EACH BA4a-h=1] within the past year? [1=Yes, 2=No, 98=(Don't Know), 99=(Refused)]

	Yes (1)	No (2)	Don't know (98)
BA6a. Maintaining your heating and cooling system			
BA6b. Changing the furnace filter			
BA6d. Reducing the water heater temperature			
BA6e. Making sure refrigerator seals are tight			
BA6f. Cleaning refrigerator coils			
BA6g. Increase refrigerator temperature			
BA6h. Unplugging a second refrigerator for weeks to months at a time			

Home Energy Report Questions

[ASK FOR ALL PARTICIPANT=1]

The next set of questions is about the Home Energy Report. This is a mailer sent to your home that provides a description of your household's energy usage in comparison to similar homes, with tips to save energy in your home.

P1. About how many of the Home Energy Reports have you read in the past year?

1. None
2. Some
3. All

98. (Don't Know)
99. (Refused)

[ASK IF MULTIYEAR=1]
P2. Compared to previous years, do you think you have read the reports more, less, or with about the same frequency this past year?

1. (More)
2. (Less)
3. (About the same)
98. (Don't know)
99. (Refused)

[ASK IF P2=2]
P2a. Why did you read the reports less in the past year compared to previous years?

1. (I don't need them anymore/I've learned what I can)
2. (I've already done all that I can)
00. (OTHER: SPECIFY)
98. (Don't know)
99. (Refused)

P3. Would you like to receive the reports at more, less, or about the same frequency as you do now?

1. More
2. Less
3. About the same
98. (Don't know)
99. (Refused)

[ASK P4-P7c IF (P1=2,3 OR P1e=2,3)]
P4. The reports include a comparison of your energy usage from the previous month to similar homes in your area. On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the usefulness of the comparison to similar homes? [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

P5. The reports also include a weather-adjusted comparison of your household's current energy usage to your energy usage during the same time the previous year. On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the usefulness of this personal comparison? [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

P6. The Home Energy Reports have tips on different ways to save energy in your home. Again on a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the usefulness of the energy saving tips provided? [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

P7. On a scale of 1 to 5, where 1 is not at all useful and 5 is very useful, how would you rate the usefulness of the Home Energy Reports overall? [RECORD NUMBER 1-5, 98=Don't know, 99=Refused]

P8. What, if anything, could make the Home Energy Reports more useful? [NOTE TO INTERVIEWER: PROBE FOR 3 RESPONSES IF POSSIBLE]; [MULTIPLE RESPONSE, SELECT UP TO 3]

1. (Receive more reports)
2. (Receive fewer reports)
3. (More tips)
4. (More detailed tips)
5. (More information about rebates/discounts)
6. (More information about how my home is being compared to similar homes)
7. (Provide similar homes comparisons that are more specific to my home/situation)
8. (Provide tips that are more specific to my home/situation)
9. (Receive information on my monthly bill instead of a separate report)
10. (Receive information online instead of a paper report)
11. Receive information by email instead of a paper report)
12. (Less detailed information in general)
13. (More detailed information in general)
14. (Stop receiving reports)
15. (In general, more information on how to lower my energy bill)
16. (Nothing/No change needed)

00. (OTHER: SPECIFY)
98. (Don't know)
99. (Refused)

We have just a few more questions about you and your household.

Additional Demographics and Fuel Questions [ALL CUSTOMERS]

[ASK IF GAS_TYPE=NA]

DE4. What type of fuel do you primarily use to heat your home?

1. Electricity
2. Heating fuel oil
3. Propane
4. Wood

00. (Other) [Specify:_____]
98. (Don't know)
99. (Refused)

DE5. How is your water heated?

1. Electricity
2. Natural gas
3. Propane
4. Heating fuel oil

00. Other [SPECIFY]
98. (Don't Know)
99. (Refused)

DE6. Do you have any children in your household under the age of 18?

1. (Yes)
2. (No)

98. (Don't know)
99. (Refused)

DE7. What is the highest level of education you have completed?

1. (Less than high school)
2. (High school graduate or equivalent)
3. (Some college, no degree)
4. (Associate's degree)
5. (Bachelor's degree)
6. (Graduate or professional degree)
98. (Don't know)
99. (Refused)

DE8. Please stop me when I get to the range of your household's total annual income before taxes:

1. Less than $25,000
2. $25,000 - $34,999
3. $35,000 - $49,999
4. $50,000 - $74,999
5. $75,000 - $99,999
6. $100,000 - $149,000
7. $150,000 - $199,999
8. $200,000 or more
98. (Don't know)
99. (Refused)

DE9. What kind of home do you live in? Is it…(READ LIST)?

1. A single-family detached residence
2. A single-family attached residence (for example, a townhouse)
3. An apartment or condominium in a building with 2-4 units
4. An apartment or condominium in a building with 5 or more units
5. A mobile home
6. Other (Please specify)

98. (DO NOT READ) Don't know
99. (DO NOT READ) Refused

DE10. What is the approximate square footage of your home? **[NUMERIC UP TO 5 DIGITS, 98=Don't know, 99=Refused]**

[IF DE10 = 98 OR 99, CONTINUE. OTHERWISE SKIP TO DE13.]

DE11. How many <u>bedrooms</u> are in your home?

1. 1
2. 2
3. 3
4. 4

5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 or more

98. Don't know
99. Refused

[IF DE10 = 98 OR 99, CONTINUE. OTHERWISE SKIP TO DE13.]

DE12. How many bathrooms are in your home?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10 or more

98. Don't know
99. Refused

DE13. In what year was your home built?

1. Before 1900
2. 1900 - 1939
3. 1940 - 1959
4. 1960 - 1979
5. 1980 - 1989
6. 1990 - 1999
7. 2000 - 2004
8. 2005 - 2009
9. 2010 or later

98. Don't know
99. Refused

That completes the Home Energy Use survey! Thank you for your participation. [UTILITY] values your opinion. Your responses have been recorded and will be kept confidential. Thank you again for your time.

Appendix D. Participant In-depth Interview Guide

Interview Introduction

Hi, my name is _____ with [Human Dimensions/ILLUME Advising]. Could I please speak with [SURVEY PARTICIPANT NAME]? I am calling on behalf of [UTILITY] to ask you a few follow-up questions to a survey that you recently completed concerning your home energy use. The goal of today's questions is to gain a better understanding of your energy decisions and to help [UTILITY] to improve their energy efficiency program offerings. This will take about 10 to 15 minutes of your time. [IF NEEDED: This is not a sales call]

Is it ok with you if I record our conversation? This is just in case I miss something while taking notes. All of your responses will remain confidential.

Overview

OV1. I'd like to begin by asking you to characterize your level of motivation to reduce energy consumption in your home. Would you say that you are…

1) Very motivated
2) Somewhat motivated
3) Not very motivated or
4) Not at all motivated
98) Don't know
99) Refused

OV2. And how knowledgeable do you feel about ways to reduce energy consumption in your home? Would you say that you are …

1) Very knowledgeable
2) Somewhat knowledgeable
3) Not very knowledgeable or
4) Not at all knowledgeable
98) Don't know
99) Refused

Interview Section 1 – Drivers of Energy Savings: How are the reports driving (or not driving) energy saving actions? (2-3 min.)

Now I'd like to ask you some questions about your experiences with the Home Energy Reports that you've been receiving from [UTILITY]. *(IF NEEDED: Home Energy Reports are the mailers sent to your home that provide a description of your household's energy usage in comparison to similar homes, with tips on how to save energy in your home.)*

1a. When these reports arrive in the mail, would you say that you typically:

1) Read the report on the same day that it arrives?
2) Read it sometime during the next few days?
3) Take more than a few days to read it? or

4) Are unlikely to read it at all. [SKIP TO Q1e]
98) Don't know
99) Refused

1b. Which of the following statements best describes the amount of time that you typically spend reading the Home Energy Reports? Would you say that you usually…

1) Just scan the report?
2) Spend up to 5 minutes reading the report? or
3) Spend more than 5 minutes reading the report?
4) Don't read the reports [SKIP TO Q1e]
98) Don't know
99) Refused

1c. How frequently would you say that Home Energy Reports are successful in getting you to take *some* action to reduce your energy consumption? Would you say…

1) Very frequently,
2) Somewhat frequently,
3) Somewhat infrequently,
4) Very infrequently, or
5) Never. [SKIP TO Q1f]
98) Don't know
99) Refused

1d. What is it about the Home Energy Reports that have prompted you to take action? (PROMPT: Are there any aspects of the Reports that you have found to be particularly helpful? Particularly compelling?)

1e. Other than the Home Energy Reports, are there other sources of information that you have used to understand your energy use or ways to save energy? [MULTIPLE RESPONSE, UP TO 3]

a. (Utility website)
b. (Home Energy Reports web portal)
c. (Internet searches, in general)
d. (None/haven't sought out any other sources)
e. (Other: specify _____)

Interview Section 2 – Sustained Action: What factors play into participants' ability and willingness to take energy saving actions and sustain those actions over time? (5-7 min.)

Some energy saving behaviors require repeated action. As part of the earlier survey you participated in, you reported that you regularly take certain actions, like… [Insert one or two behaviors that respondent reported performing regularly.]

2a. Now I'm going to read a list of each action you said you regularly take. For each one, please tell me on a scale of 1 to 5, where 1 is very difficult and 5 is very easy, how difficult it was to start taking each of

these actions on a regular basis? [Go through the list; only behaviors that were taken as indicated by survey results.]

Regular Behaviors	Very Difficult			Very Easy		
	1	2	3	4	5	DK
1. Wash laundry in cold water						
2. Fully load washing machine						
3. Fully load dishwasher						
4. Turn off lights in unoccupied rooms						
5. Turn off outside lights by day						
6. Turn off computers at night/when not in use						
7. Put computer(s) to sleep						
8. Turn off TV(s) when no one is watching it						
9.Turn off video game console(s) when not in use						
10. Switch off power strips						
11. Unplug devices when not in use (phones, chargers, TVs, stereos, etc.)						
12. Take short showers						
13. Use a portable window fan or ceiling fan						
14. Clear the area around vents						
15. Set the thermostat at or below 70 degrees for heating						
16. Set thermostat at or above 78 degrees for cooling						
17. Turn off DVR and/or cable box when not watching TV						

2b. For the energy saving behaviors we just discussed, what helped you to remember to take these actions on a regular basis? (PROMPT: things that you might have done to help yourself remember to do things differently or make it easier for you to do things differently?) [List up to three.]

2c. Now I'd like you to think about how helpful the Home Energy Reports were in helping you to establish these new patterns of behavior. Would you say they were…

1) Very helpful,
2) Somewhat helpful,

3) Not very helpful
4) Not helpful at all
98) Don't know
99) Refused

In the earlier survey, you also reported that you don't regularly… [Insert behaviors that the respondent reported NOT performing regularly.]

2d. Are there any behaviors on this list that you would prefer to do more regularly but – for whatever reason – have found it difficult to do so? [List up to three.]

2e. Could you describe some of the difficulties that you've faced? [List up to three.]

Interview Section 3 – Additional Information or Solutions: What information or solutions could be provided to make behavioral programs more effective at engaging customers and driving energy savings? (5 min.)

3a. Now I would like you to think about what uses the most energy in your home. Please name the top two or three things in your home that you think use the most energy. [List up to three.]

1. _____
2. _____
3. _____
98. Don't know
99. Refused

3b. For the areas that you just said use the most energy in your home, have you tried to reduce your energy use in these areas? If so, how? [List up to three.]

1. _____
2. _____
3. _____
98. Don't know
99. Refused

3c. Again, for the areas that you said your household uses the most energy, what barriers stand in the way from allowing you to reduce your energy use [even more than you already have]? [List up to three.]

1. _____
2. _____
3. _____
98. Don't know
99. Refused

3d. Apart from the Home Energy Reports that you've been receiving, are there other types of information or solutions that [UTILITY] could provide that would make it easier or more compelling for you to engage in the types of energy saving actions that we've been discussing today? (Prompt for up to three ideas.)

[For each idea noted, probe to understand why the information/solution should be provided. For example: Why do you suggest this? How would it be helpful to you?]

Now I'd like to get your feedback on the potential usefulness of one specific technology that is increasingly becoming available to households, called a Wi-Fi thermostat.

3e. **Wi-Fi thermostats** are internet-connected devices that are responsible for controlling a home's heating and air conditioning. These thermostats allow the user to adjust heating or cooling settings from other internet-connected devices such as smartphones or tablets. They also allow users to easily switch off the heating or AC from remote locations when the house is empty.

3e1. How helpful do you think Wi-Fi thermostats would be for making it easier or more compelling for YOU to engage in the energy saving actions discussed today? Do you think they would be…

1) Very helpful,
2) Somewhat helpful,
3) Not very helpful [SKIP to Q3e3]
4) Not helpful at all [SKIP to Q3e3]
98) Don't know
99) Refused

3e2. Is this a technology that you could imagine yourself using? YES / NO

3e3. [Ask if 3e2=NO] Could you elaborate on why you **don't** think this particular technology would be helpful?

Conclusion and Thank you

That completes our discussion! Thank you for your participation. [UTILITY] values your opinion. Your responses have been recorded and will be kept confidential. Thank you again for your time.