NAVIGANT

Home Energy Report Pilot Program Evaluation

FINAL REPORT

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Prepared for:
Eversource New Hampshire

EVERSOURCE

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Executive Summary

This report includes Navigant's evaluation analysis and findings from the Eversource New Hampshire (Eversource NH) Home Energy Report pilot program.

Program Description

Eversource NH designed the Home Energy Report (HER) pilot program to generate energy savings by providing residential customers with information about their specific energy use and related energy conservation suggestions and tips. The HER program launched in February 2014, with the first reports generated on February 1, 2014. The initial deployment of the program included 52,000 participants randomly selected from Eversource's residential electric customer base. These customers were randomly split into four groups of 13,125 customers: the normative treatment group, the normative control group, the rewards treatment group, and the rewards control group. Participant groups received mailed HERs with various information, including how their recent energy use compares to their energy use in the past as well as tips on how to reduce energy consumption, some of which target the customer's specific circumstances. The normative group also received information on how their energy use compares to that of neighbors with similar homes. The rewards group did not receive this comparison; instead, it earned rewards points for saving energy that participants could redeem for prizes. In other studies, the information received by normative groups has been shown to stimulate customers to reduce their energy use, creating average energy savings of 1% to 2%. The information received by the rewards group has not been previously studied by Navigant. Opower implemented this program.

Key Impact Findings

The HER pilot program savings are presented in Table 1. Findings include:

- Total verified net program savings, after adjusting for uplift, were 1,773 MWh. This broke down into 1,389 MWh for the normative group and 384 MWh for the rewards group.

- On average, participants in the normative group reduced their electricity usage by 1.32% and participants in the rewards group by 0.37%. This difference in savings is statistically significant at the 90% confidence level, implying that the normative group is saving more energy than the rewards group.

- Navigant's estimated savings were similar to, and not statistically distinguishable from, Opower's reported savings for each group. For the normative group, Navigant estimated 1.32% savings compared to Opower's reported savings of 1.50%. For the rewards group, Navigant estimated 0.37% savings compared to Opower's reported savings of 0.31%.

- The HER program also increased participation in (i.e., caused uplift in) Eversource NH's other energy efficiency (EE) programs. For the normative group, participation increased in the Appliance Recycling (AR) program, did not change for the Low Income (LI) program, and decreased slightly for the Home Performance with ENERGY STAR (HPwES) and Lighting programs. For the rewards group, participation increased in the AR and Lighting programs and decreased slightly for the HPwES and LI programs. Total savings from uplift are estimated at 7 MWh (2 MWh for the normative group and 5 MWh for the rewards group) and are excluded from the verified net program savings. Overall, savings from uplift account for 0.4% of the HER program's total electric savings. This breaks down into 0.16% of the normative group's total savings and 1.3% of the rewards group's total savings.

- Savings generated for the normative group by the HER program are within the typical range of first-year savings for residential HER programs, which typically range from 1% to 1.5%. The rewards group's savings are lower than typical savings for normative programs. However, as of this writing the evaluation team is not aware of any other studies that have evaluated the rewards component of the HER program; thus, we were unable to compare that aspect of the program to other rewards groups.

Table 1. Total Program Savings

Type of Statistic	Normative Group	Rewards Group
Number of Participants	13,125	13,125
Percentage Savings	1.32%	0.37%
Electric Savings Prior to Uplift Adjustment (MWh)	1,391	390
Electric Savings After Uplift Adjustment (MWh)	**1,389**	**384**

Source: Navigant analysis

Key Process Findings

Ultimately, the customer survey revealed many positive findings related to the HER pilot program as well as areas for attention, as highlighted below and in greater detail in the report.

- Overall satisfaction with the program ranged from 71% (normative) to 76% (rewards). This is in line with similar evaluations of programs implemented by Opower in other areas. The primary reasons for dissatisfaction cited by respondents were related to a lack of understanding of normative comparisons in the reports, though this group continues to see high savings and the difference in satisfaction for this group is not statistically significant at the 90% confidence interval. Details are explored in Section 5.3.

- A majority of all respondents read the reports at least some of the time, with many indicating that they read the reports all of the time (45% normative, 39% rewards).

- Although a majority of respondents from the normative group stated that the reports did not motivate them to save energy, it is not uncommon in these types of programs to have a disconnect between people saying they do not like receiving normative reports and the same people saving energy. This appears to be the case for respondents in this survey because the impact analysis shows that the normative group saves a significantly higher portion of savings compared to the rewards group at the 90% confidence level. A comment received from the stakeholder group suggested that perhaps the reports could include additional descriptors of how comparisons are made to increase acceptance of normative reports.

- For the rewards group, Navigant found low recall of program participation among participants who signed up to receive rewards points. Overall, respondents offered mixed opinions on the ease of the rewards program's processes; however, many cited a lack of time, lack of interest, or lack of awareness when it came to earning and redeeming points. Only 40% of rewards participants considered earning points to be a valuable opportunity.

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1. Introduction

1.1 Program Description

The Eversource New Hampshire (Eversource NH) Home Energy Report (HER) pilot program was designed to generate energy savings by providing residential customers with information about their specific energy use and related energy conservation suggestions and tips. The Eversource NH program included two different treatment groups that received different messaging: a normative group and a rewards group. Both groups received mailed HERs with various information, including how their recent energy use compares to their energy use in the past as well as tips on how to reduce energy consumption, some of which are tailored to the customer's circumstances. The normative group also received information on how their energy use compares to that of neighbors with similar homes. The rewards group did not receive this comparison; instead, it earned rewards points for saving energy that participants could redeem for prizes, such as gift cards to a local retailer. In other studies, the information received by normative groups has been shown to stimulate customers to reduce their energy use, creating average energy savings of 1% to 2%. The information received by the rewards group had not been previously studied. Opower implemented this program. An important feature of the program was that it was a randomized controlled trial (RCT). For this program, eligible customers were randomly assigned between the normative and rewards groups and between the treatment (participant) group and the control (non-participant) group for the purpose of estimating changes in energy use due to the program.

The HER program launched in February 2014, with the first reports generated on February 1, 2014. The initial deployment of the program included 52,000 participants randomly selected from Eversource's residential electric customer base. These customers were randomly split into four messaging groups of 13,125 customers: the normative treatment group, the normative control group, the rewards treatment group, and the rewards control group.

1.2 Evaluation Objectives

This section includes evaluation objectives for this assignment which were developed by Navigant in collaboration with Eversource NH.

1.2.1 Impact Objective

The primary objective of the impact analysis was to determine the extent to which participants in the HER program, separately for the normative and rewards groups, reduced their energy consumption due to the program.

1.2.2 Process Objectives

The objective of the customer telephone surveys was to compare responses of control and treatment households to determine whether the HER program affects changes in addition to energy savings. Issues explored in the customer telephone survey included the following:

- Exploration of customers' conservation actions, particularly as it relates to lighting and thermostat control
- Overall satisfaction with and perceptions of the program compared between the two treatment groups
- Degree of energy awareness
- The effect of the rewards program on customer engagement and ease of the rewards group's processes

2. Impact Evaluation Approach

The evaluation approach for the HER program relied on statistical analysis appropriate for an RCT. In this section, Navigant presents the evaluation approach for the following:

1. **Validation of randomization** identifies the approach used to confirm the program implementation was consistent with an RCT

2. **Statistical models used in the impact evaluation** identifies the model specifications used to estimate program impacts

3. **Accounting for uplift** identifies the method used to estimate savings that come from increased participation in other EE programs as a result of the HER program

4. **Net impact evaluation** explains that the evaluation team's analysis provides net estimates and so a net-to-gross adjustment is not necessary

5. **Data used in the impact analysis** describes the data used in the evaluation.

2.1 Validation of Randomization

The program implementer, Opower, implemented the HER program as an RCT. The study group for the HER program was randomly selected from Eversource's residential customer base. The customers in this study group were then randomly assigned to the normative and rewards group and to a treatment (participant) group and a control (non-participant) group. Navigant considered whether the selection of the study group was random compared to the rest of Eversource New Hampshire's customer base, whether the allocation into the normative group and rewards group was random, and whether the split of customers into the treatment and control groups within each messaging group, normative or rewards, was random. If the allocation of the households across two groups is truly random, the two groups should have the same distribution of energy usage for each of the 12 months before the start of the program. For this analysis, Navigant compared mean energy usage for the different groups for each of 24 months before the start of the program (January 2012 through December 2013). Navigant conducted this analysis before the start of the HER program, and the results, showing that the assignment of customers was consistent with an RCT, were delivered to Eversource via memo on January 16, 2014. For reference, this memo is provided in Appendix E.

2.2 Statistical Models Used in the Impact Evaluation

Navigant estimated program impacts using two approaches: a post-program regression (PPR) analysis with lagged controls and a linear fixed-effects regression (LFER) analysis applied to monthly billing data. Navigant uses PPR results for reporting total program savings and reports PPR results for two reasons. One, this model is more similar to the model used by the program implementer, which facilitates comparisons of the results. Two, although both the PPR and LFER models generate unbiased estimates of program savings, as an empirical matter—based on the evaluation team's past analyses and those in academic literature—estimated savings from the PPR model tend to have lower standard errors than those from the LFER model, though the differences are usually small.[1] The evaluation team runs both models as a robustness check. Although the two models are structurally

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[1] Allcott, Hunt and Todd Rogers. "The Short-Run and Long-Run Effects of Behavioral Intervention: Experimental Evidence from Energy Conservation. Forthcoming. *American Economic Review.*

different, assuming the RCT is well-balanced with respect to the drivers of energy use, in a single sample they generate similar estimates of program savings.

The PPR model combines both cross-sectional and time-series data in a panel data set. The PPR model controls for non-treatment differences in energy use between treatment and control customers using lagged energy use as an explanatory variable. In particular, the model frames energy use in calendar month *t* of the post-program period as a function of both the treatment variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between control and treatment customers will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Equation 2-1 shows the formal model.

Equation 2-1. PPR Model

$$ADU_{kt} = \beta_1 Treatment_k \cdot Normative_k + \beta_2 Treatment_k \cdot Rewards_k + \beta_3 Normative_k + \beta_4 Rewards_k + \sum_J \beta_{5j} Month_{jt} + \sum_J \beta_{6j} Month_{jt} \cdot ADUlag_{kt} + \varepsilon_{kt}$$

Where,

ADU_{kt}	is average daily consumption of kWh by household k in bill period t
$Treatment_k$	is a binary variable taking a value of 0 if household k is assigned to a control group and 1 if assigned to a treatment group
$Normative_k$	is a binary variable taking a value of 1 if household k is assigned to the normative group and 0 otherwise
$Rewards_k$	is a binary variable taking a value of 1 if household k is assigned to the rewards group and 0 otherwise
$Month_{jt}$	is a binary variable taking a value of 1 when j = t and 0 otherwise[2]
$ADUlag_{kt}$	is household k's energy use in the same calendar month of the pre-program year as the calendar month of month t
e_{kt}	is the cluster-robust error term for household k during billing cycle t; cluster-robust errors account for heteroskedasticity and autocorrelation at the household level.[3]

The coefficient β_1 is the estimate of average daily kWh energy savings due to the program for the normative group and β_2 is for the rewards group.

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[2] In other words, if there are *T* post-program months, there are *T* monthly dummy variables in the model, with the dummy variable *Month*ₜₜ the only one to take a value of 1 at time t. These are, in other words, monthly fixed effects.

[3] Ordinary Least Squares (OLS) regression models assume that the data are homoskedastic and not auto-correlated. If either of these assumptions is violated, the resulting standard errors of the parameter estimates are incorrect (usually underestimated). A random variable is heteroskedastic when the variance is not constant. A random variable is auto-correlated when the error term in one period is correlated with the error terms in at least some of the previous periods.

As with the PPR model, the LFER model combines both cross-sectional and time-series data in a panel data set. The regression essentially compares pre- and post-program billing data for participants and the control group to identify the effect of the program. The customer-specific fixed effect is a key feature of the LFER analysis and captures all customer-specific factors affecting electricity usage that do not change over time, including those that are unobservable. Examples include the square footage of a residence, the number of occupants, and thermostat settings. The fixed effect represents an attempt to control for any small, systematic differences between the treatment and control customers that might occur due to chance. The formal model is shown in Equation 2-2.

Equation 2-2. LFER Model

$$ADU_{kt} = \alpha_{0k} + \alpha_1 Post_t \cdot Normative_k + \alpha_2 Post_t \cdot Rewards_k + \alpha_3 Treatment_k \cdot Normative_k \cdot Post_t + \alpha_4 Treatment_k \cdot Rewards_k \cdot Post_t + \varepsilon_{kt}$$

Where,

$Post_t$ is a binary variable taking a value of 0 if month t is in the pre-treatment period and 1 if in the post-treatment period and all other variables are as defined in Equation 2-1.

Three observations about Equation 2-2 deserve comment. First, the coefficient α_{0k} captures all household-specific effects on energy use that do not change over time, including those that are unobservable. Second, α_1 and α_2 capture the average effect across all households in the normative and rewards groups, respectively, of being in the post-treatment period. Third, the effect of being both in the treatment group and in the post period—the effect directly attributable to the program—is captured by the coefficient α_3 for the normative group and α_4 for the rewards group. In other words, whereas the α_1 and α_2 coefficients capture the change in average daily kWh use across pre- and post-treatment for the control groups, the sums $\alpha_1 + \alpha_3$ and $\alpha_2 + \alpha_4$ capture this change for the normative and rewards treatment groups, respectively; therefore, α_3 is the estimate of average daily kWh energy savings due to the program for the normative group and α_4 is the same for the rewards group.

2.3 Uplift Analysis Methodology

The HERs sent to participating households in both messaging groups include energy-saving tips, some of which encourage participants to enroll in other Eversource NH EE programs. If participation rates in other EE programs are the same for HER participant and control groups, the savings estimates from the regression analysis are already net of savings from the other programs, as this indicates the HER program had no effect on participation in the other EE programs. However, if the HER program affects participation rates in other EE programs, then savings across all programs are lower than indicated by the simple summation of savings in the HER and EE programs. For instance, if the HER program increases participation in other EE programs, the increase in savings may be allocated to either the HER program or the EE program but cannot be allocated to both programs simultaneously.

Navigant used a post-only difference (POD) statistic to estimate uplift in other EE programs. This statistic generates an unbiased estimate of uplift when the baseline average rate of participation in the EE program is the same for the treatment and control groups, which can be assumed by random assignment. To calculate the POD statistic, Navigant subtracted the participation rates of the treatment and control groups for each messaging group during the evaluation period.

Navigant examined the uplift associated with four EE programs: Appliance Recycling, HPwES, Lighting, and Low Income. For each EE program, savings from uplift were calculated separately for the normative and rewards groups.

2.4 Net Impact Evaluation

A key feature of the RCT design of the HER program is that the analysis inherently estimates net savings because there are no participants who otherwise might have received the individualized reports in the absence of the program. While some customers receiving reports may have taken energy-conserving actions or purchased high efficiency equipment anyway, the random selection of program participants (as opposed to voluntary participation) implies that the control group of customers not receiving reports is expected to exhibit the same degree of energy-conserving behavior and purchases. Thus, there is no free ridership, and no net-to-gross adjustment is necessary. Therefore, Navigant applied a net-to-gross ratio of 1.0.

2.5 Data Used in Impact Analysis

In preparation for the impact analysis, Navigant cleaned the data provided by the HER program implementer, Opower. The implementer targeted 52,500 customers for the program, 13,125 customers in each of the four groups: normative participants, normative controls, rewards participants, and rewards controls. The dataset received by Navigant included 13,125 customers in each control group, 13,130 in the normative treatment group, and 13,134 in the rewards treatment group. The dataset contained 1,432,171 observations. All of these customers were used in the calculation of total program savings.

To estimate average per customer per day savings from the regression analysis, Navigant removed the following data points from the analysis, which contain insufficient data or are suspected of being incorrect reads:

- Observations outside of the 12-month pre-program period or the program period of 2/1/2014 to 2/28/2015 (151,410 observations)

- Observations of usage that occurred after a customer's account became inactive (2 observations)

- Observations with less than 20 or more than 40 days in the billing cycle (3,638 observations)

- Outliers, defined as observations with average daily usage at least 10 times larger or 10 times smaller than the median usage (14,495 observations)[4]

- For the PPR model, observations in the evaluation period that did not have a corresponding value for the ADClag variable, described in Section 2.2 (3,430 observations).

The dataset used for the PPR model contained 12,942 normative participants, 12,944 normative controls, 12,933 rewards participants, and 12,939 rewards controls. In all, the regression analysis included 98.6% of the customers in the HER program.

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[4] The median usage was 17.89 kWh per day. Observations with usage greater than 178.9 kWh or less than 1.789 kWh per day were excluded from the analysis.

3. Process Evaluation Approach

As part of the analysis of Eversource's HER pilot program, Navigant conducted a telephone survey with both a participant group and a control group. The primary objective of the survey was to determine the effect of receiving an HER on customers' interaction with and knowledge of EE in their homes. Secondary objectives included measuring customer satisfaction with the HERs and identifying differences in energy-saving behavior and satisfaction between participant normative and rewards groups. Navigant wrote the survey and contracted with The Dieringer Research Group (The DRG) to field it. Upon receiving the completed survey design from Navigant, The DRG programmed and administered the survey using the sample provided by Navigant, which originated from Opower. The DRG collected the data and sent the survey results to Navigant for analysis and reporting.

3.1 Survey Sample Size

Based on prior studies performed by Navigant, the expected value of answers to the proposed survey questions, and a desired confidence/precision of 90/10 on binary questions, Navigant targeted 600 completed surveys divided roughly into thirds between participant normative (190), participant rewards (210), and control (200) households. The focus on the difference in responses between program and control households reflects the understanding that it is this difference that indicates the effect of the HER program on respondent behaviors and attitudes. Similarly, differences found in responses between normative and rewards groups speaks to the effect of the different engagement strategies.

Navigant further divided the rewards group into sub-categories for the purposes of exploring differences between those participants who engaged with the rewards point opportunities and those who did not. Table 3-1 presents the target completes for each category.

Table 3-1. Participant and Control Survey Targets

Primary Category	Type	Target
Control group	Control	200
Normative group	Normative	190
Rewards group	Signed up, earned, and redeemed	70
	Signed up but did not redeem	70
	Did not sign up to redeem points	70

Source: Navigant

3.2 Survey Response Rates

Upon receiving the sample, The DRG fielded the survey between August 5, 2015 and September 29, 2015. Navigant restricted calling hours to the weekdays between 4 p.m. and 8 p.m. in order to limit unknown variables for the live audit section of the surveys, which examined real-time energy usage

in the home. Due to a lack of available sample for rewards participants who redeemed points through the program as well as for those who signed up but did not redeem points, the survey yielded fewer completes for these groups than the original targets. In reviewing the information, Navigant and Eversource NH agreed that, although fewer than originally targeted, the number of completes was sufficient to conduct an analysis for this assignment. Table 3-2 provides a summary of the completion outcome.

Table 3-2. Customer Survey Completion Summary

Group	Type	Target	Actual	Amount of Sample Provided	Total Number of Customers	Percent of Target
Control group	Control	200	203	6,000	26,250	102%
Normative participant group	Normative	190	192	5,700	13,125	101%
Rewards participant group	Signed up, earned, and redeemed	70	20	284	297	29%
	Signed up but did not redeem	70	52	863	914	74%
	Did not sign up to redeem points	70	70	2,100	11,914	100%

Source: Navigant

3.3 Survey Weighting

As described in Section 3.2, the evaluation team created three sub-categories for the rewards group's respondents based on engagement with the program. For the purposes of comparing the rewards group as a whole against the control and normative groups, Navigant weighted the results of the rewards group based upon their presence in the program population. Table 3-3 presents the weighting scheme applied to each respondent. Navigant applied this weight to all questions except for those asked only of the rewards group, which did not require additional weighting.

Table 3-3. Weighting Scheme for Rewards Group

Group	Population	n	Sample %	Population %	Weighting Factor per Respondent
Signed up, earned, and redeemed	284	20	14%	9%	0.621
Signed up but did not redeem	863	52	37%	27%	0.726
Did not sign up to redeem points	2,100	70	49%	65%	1.312
Total	3,247	142	100%	100%	

Source: Navigant

4. Impact Evaluation Results

Program savings from February 2014 to February 2015, excluding savings from uplift, were 1,773 MWh. The normative group had total savings of 1,389 MWh and the rewards group had total savings of 384 MWh.

4.1 Impact Parameter Estimates

Parameter estimates for the treatment effects for the estimated models are presented in Table 4-1 for the normative group and Table 4-2 for the rewards group. Key findings include the following:

- Both models estimate a statistically significant treatment effect at the 90% confidence level for the normative group, and the two models are not statistically different from one another.

- Both models estimate a statistically insignificant treatment effect at the 90% confidence level for the rewards group, and the two models are not statistically different from one another.

- The normative group has statistically higher savings than the rewards group at the 90% confidence level in both models.

Table 4-1. Normative Group Treatment Effect Parameter Estimates

Variable	Coefficient*	Standard Error	90% Confidence Interval
PPR treatment effect	-0.28	0.05	[-0.36, -0.20]
LFER treatment effect	-0.28	0.05	[-0.36, -0.20]

A negative coefficient indicates a decrease in average daily energy usage and thus a positive estimate of program savings.

Source: Navigant analysis

Table 4-2. Rewards Group Treatment Effect Parameter Estimates

Variable	Coefficient*	Standard Error	90% Confidence Interval
PPR treatment effect	-0.08	0.05	[-0.16, 0.00]
LFER treatment effect	-0.09	0.05	[-0.16, 0.01]

A negative coefficient indicates a decrease in average daily energy usage and thus a positive estimate of program savings.

Source: Navigant analysis

4.2 Uplift of Savings in Other EE Programs

Regression estimates of program savings include savings resulting from the uplift in participation in other EE programs caused by the HER program. To avoid double-counting of savings, program savings due to this uplift must be counted toward either the HER program or the other EE programs but not both programs. The uplift of savings in other EE programs was a small proportion of the total savings: 7 MWh or 0.4%.

Table 4-3 and Table 4-4 present the details of the calculation of the savings due to uplift in other EE programs for the normative group and rewards group, respectively. The programs included in the uplift analysis were Appliance Recycling, HPwES, Lighting, and Low Income.

The rewards group produced more uplift in other EE programs than the normative group, and the savings from uplift are higher. The normative group had savings from uplift of 2.2 MWh, or 0.16% of that group's savings. The rewards group had savings from uplift of 5.2 MWh, or 1.3% of that group's savings.

Table 4-3. Estimated Savings from Uplift in Other EE Programs, Normative Group

	Appliance	HPwES at 50%	Lighting	Low Income
Average program savings (annual kWh per participant)	114	421	69	1,011
Number of treatment households	13,130	13,130	13,130	13,130
Rate of treatment participation	3.06%	0.21%	6.55%	0.07%
Number of control households	13,125	13,125	13,125	13,125
Rate of control participation	2.87%	0.21%	6.58%	0.07%
POD statistic	0.19%	-0.01%	-0.03%	0.00%
Change in program participation due to HER program	25	-1	-3	0
Statistically significant at the 90% confidence level?	No	No	No	No
Savings attributable to other programs (MWh)	2.8	-0.4	-0.2	0.0

Source: Navigant analysis

Table 4-4. Estimated Savings from Uplift in Other EE Programs, Rewards Group

	Appliance	HPwES at50%	Lighting	Low Income
Average program savings (annual kWh per participant)	114	500	69	1329
Number of treatment households	13,134	13,134	13,134	13,134
Rate of treatment participation	3.30%	0.14%	7.16%	0.07%
Number of control households	13,125	13,125	13,125	13,125
Rate of control participation	3.04%	0.14%	6.51%	0.09%
POD statistic	0.26%	-0.01%	0.65%	-0.02%
Change in program participation due to HER program	34	-1	85	-3
Statistically significant at the 90% confidence level?	No	No	Yes	No
Savings attributable to other programs (MWh)	3.8	-0.5	5.9	-4.0

Source: Navigant analysis

The estimate of savings from uplift is almost certainly an overestimate because it presumes participation in the other EE programs occurs at the start of the program year. Under the more reasonable assumption that participation occurs at a uniform rate throughout the year, the estimate of savings from uplift would be approximately 3.5 MWh, half the estimated value of 7 MWh. The upshot is that savings from uplift in other Eversource EE programs does not appear to be a significant issue for the HER program at this time.

4.3 Verified Program Impact Results

Table 4-5 presents verified savings results from the HER program. On average, normative group participants reduced their usage by 1.32%, and rewards group participants reduced their usage by 0.37%. Total verified program savings after adjusting for uplift were 1,773 MWh: 1,389 MWh from the normative group and 384 MWh from the rewards group.

Table 4-5. Total Program Savings

Type of Statistic	Normative Group	Rewards Group
Number of participants	13,125	13,125
Number of controls	13,125	13,125
Sample size, participants	12,942	12,933
Sample size, controls	12,944	12,939
Percentage savings	1.32%	0.37%
	0.23%	*0.23%*
Average annualized savings per customer (kWh)	102	28
	18	*18*
Electric savings, prior to uplift adjustment (MWh)	1,391	390
	247	*246*
Savings uplift in other EE programs (MWh)	2	5
Electric savings, after uplift adjustment (MWh)	**1,389**	**384**

*Standard errors are provided in italics

Source: Navigant analysis

4.4 Comparison to Opower Results

Figure 4-1 shows Navigant's estimated savings with 90% confidence bounds and Opower's estimated savings for each messaging group. For the normative group, Navigant's estimated savings were 1.32% with 90% confidence bounds from 0.93% to 1.71%. Reported savings from Opower were 1.5% for this group, which is well within the 90% confidence bounds on Navigant's estimate. For the rewards group, Navigant's estimated savings were 0.37% with 90% confidence bounds from -0.01% to 0.76%. Report savings from Opower were 0.31% for this group, which is similar to Navigant's estimates and well within the 90% confidence bounds.

Figure 4-1. Navigant to Opower Savings Comparisons

Navigant Estimated Savings   — Confidence Interval   ■ Opower Reported Savings
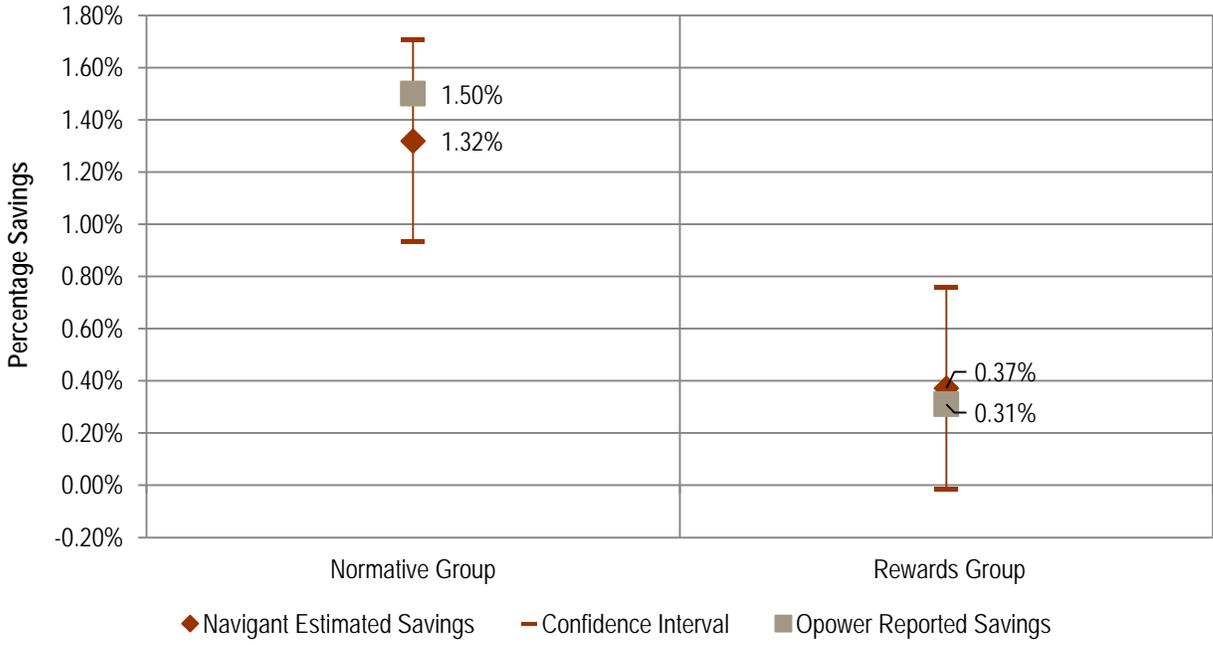
Source: Navigant analysis

5. Process Evaluation Findings

The evaluation team designed a survey of the two treatment groups and control customers to indicate the following:

- Customers' real-time use of energy-efficient lighting and thermostat settings in the home

- Overall satisfaction with the HER program and differences between the two treatment groups

- The degree of energy awareness

- The effect of the rewards program on customer engagement with the program

Section 4.2 provides a discussion of results concerning the first objective. This section discusses the findings relevant to the other four objectives.

5.1 Live Audit Findings

Based on regression analysis of the live audit questions, customers in the rewards group demonstrate a greater affinity for light-emitting diode (LED) lighting.

As part of the treatment and control surveys, Navigant asked all respondents a series of questions designed to explore the types of energy-efficient bulbs they have in their home, as well as how many lights are turned on in their home and what temperature to which their thermostat is set. Navigant conducted a regression analysis on the results, controlling for time of day, room within the home, and number of bulbs turned on based on question dependency.

This revealed that participants in the rewards group have a higher tendency to have LED lighting in the home (see Figure 5-1). Looking at the number of light bulbs turned on in their home at the time of the survey, the control group had 0.44 less LEDs turned on compared to the rewards group. Similarly, the control group had 0.46 more CFLs turned on compared to the rewards group. In the room surveyed, the rewards group had 0.49 more LEDs in sockets compared to the normative group, suggesting an overall higher tendency toward LEDs for reward group participants.

Figure 5-1. Live Audit Findings
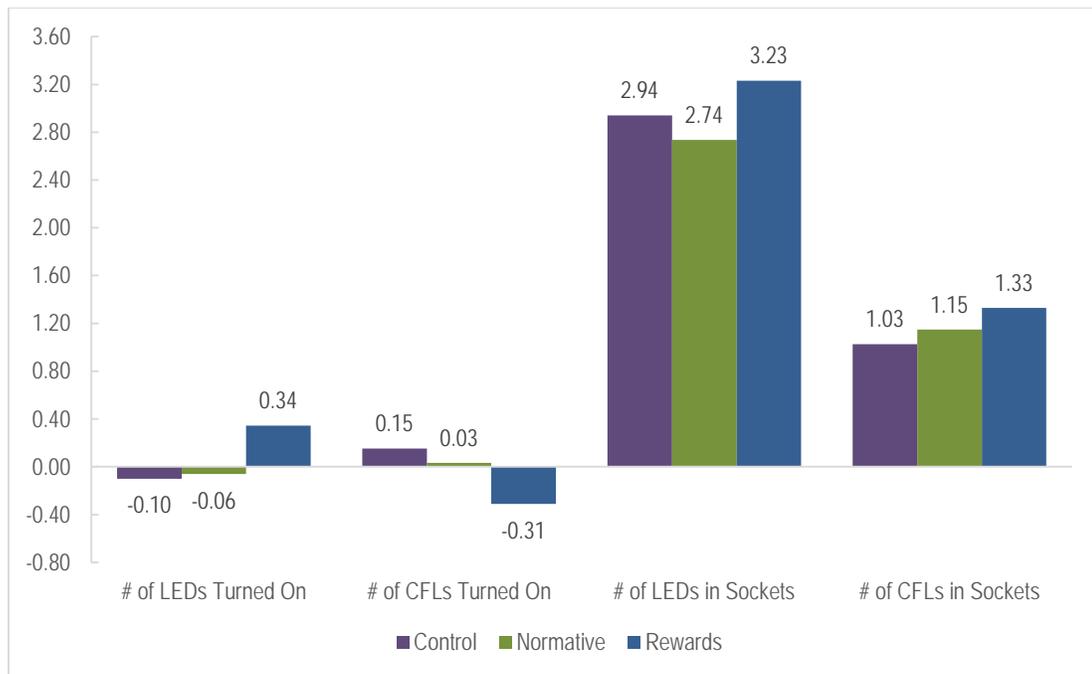
Control n=203; Normative n=192; Rewards n=70

The live audit battery was asked only of rewards participants in the "did not sign up to redeem points" category due to difficulty meeting targets for the other two categories with small sample sizes.

Source: Customer survey; L2a, L2b, L4a, L4b

For thermostats, 58% of all respondents reported that they did not have their thermostat turned on at the time of the survey. For those using their thermostat, the average user had the temperature set between 64.5 and 66 degrees Fahrenheit. The actual temperature of respondents' homes, including those not using their thermostats, ranged from 73 to 76 degrees Fahrenheit. During the survey period, the average daily high temperature for New Hampshire ranged between 81 degrees in August and 73 degrees in September[5]. Based on these findings, the evaluation team found no significant difference between participant or control groups related to thermostats.

5.2 Energy Efficiency Awareness and Attitudes

The evaluation team asked all respondents a series of questions designed to explore their energy habits in the home and to determine whether there exist differences between participant and control groups. The following section presents findings based on analysis of the customer surveys. Regardless of participation status, most respondents expressed high awareness and intention related to energy issues in their homes. For a series of statements related to energy in the home, Navigant asked respondents to rate their level of agreement on a scale from zero to 10. As shown in Figure 5-2 below, approximately 90% of all respondents agreed with the statement "I understand how action taken in my household results in higher or lower energy use." Fewer respondents agreed that "It would make me proud to have one of the most energy-efficient homes in my neighborhood," ranging between 66% and 72% of respondents. Despite minor differences in agreement, the evaluation team

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[5] Source: US Climate Data for Concord, New Hampshire

found no significant variance at the 90% confidence level among respondent groups for the given statements.

Figure 5-2. Respondent Relationship to Energy in the Home
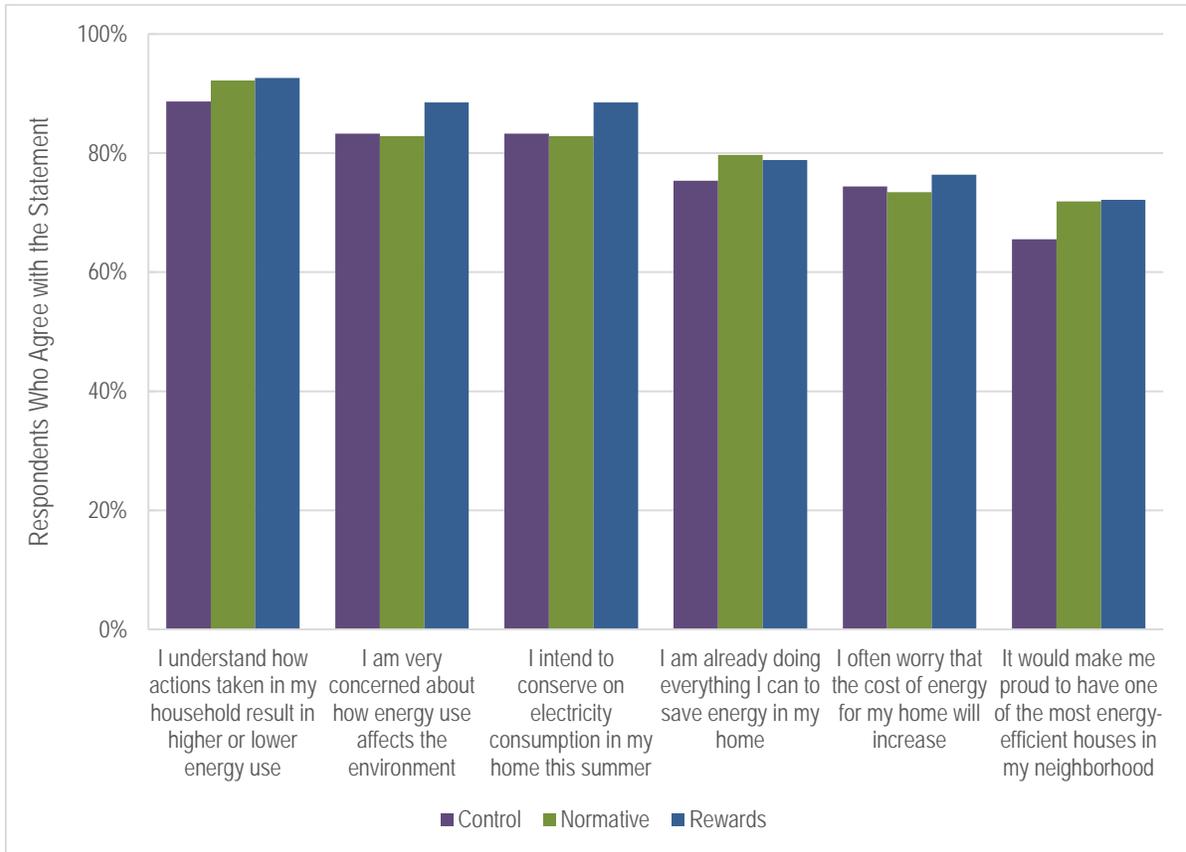
Control n=203; Normative n=192; Rewards n=142
Agreement is equated with a rating of a 6 or higher on a zero to 10 scale
Source: Customer survey; EA1

The evaluation team asked an additional battery of questions to gauge the degree of respondent agreement, with the findings broken out in Figure 5-3 below. The majority of all respondents agreed that improving their home's efficiency is a worthwhile investment; however, only half indicated that their bill was noticeably lower when they made an extra effort to conserve.

Figure 5-3. Respondent Relationship to Energy in the Home

Control n=203; Normative n=192; Rewards n=142

Agreement is equated with a rating of a 6 or higher on a zero to 10 scale

Source: Customer survey; EA2

All respondents expressed similar satisfaction with their home's energy use, ranging between 67% for the control and normative groups and 68% for the rewards group. In spite of these similarities, participants in the program showed higher rates of extreme satisfaction and extreme dissatisfaction, as shown in Figure 5-4. Extreme satisfaction is characterized by a rating of nine or 10, while extreme dissatisfaction is characterized by a rating of zero or one. This finding suggests that participants are made more aware of their home's energy use through the reports and are, therefore, more likely to have an extreme reaction in either the positive or negative direction.
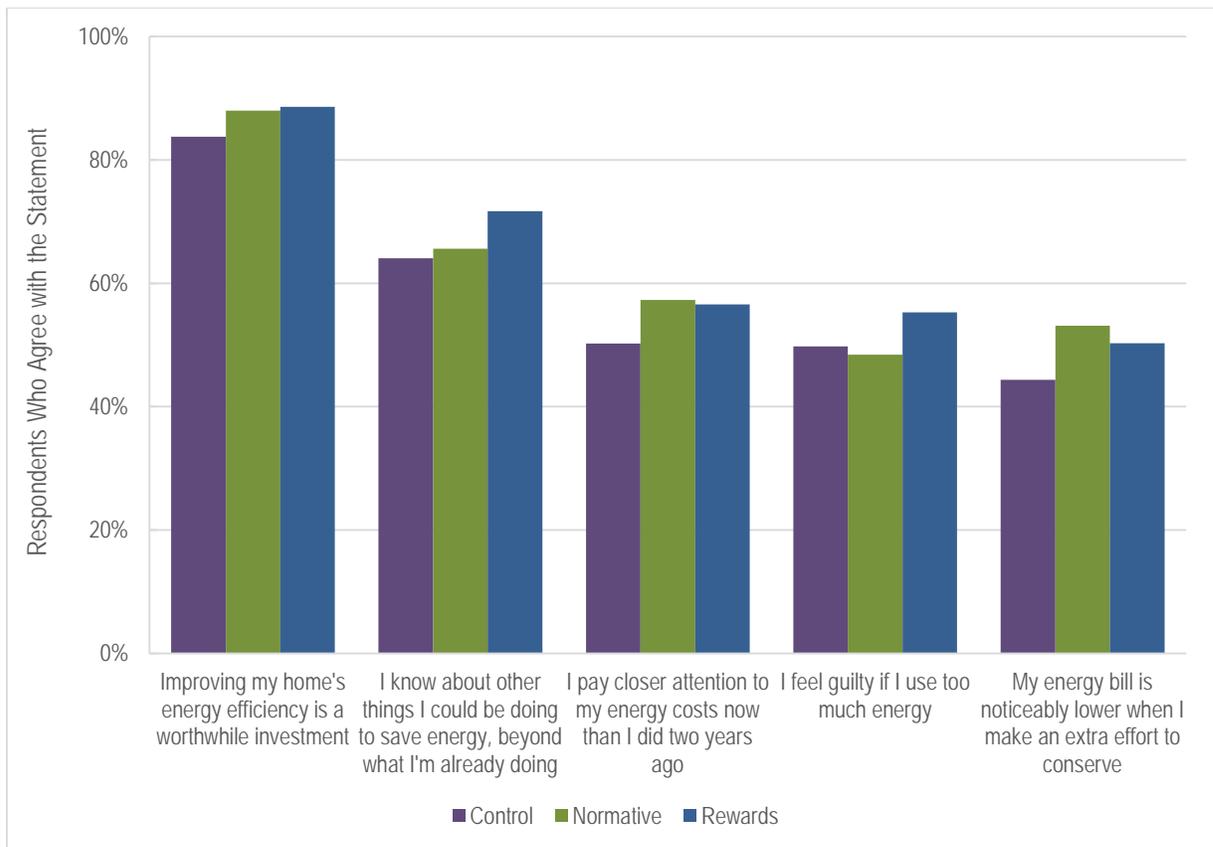
Figure 5-4. Respondent Satisfaction with Home's Energy Usage
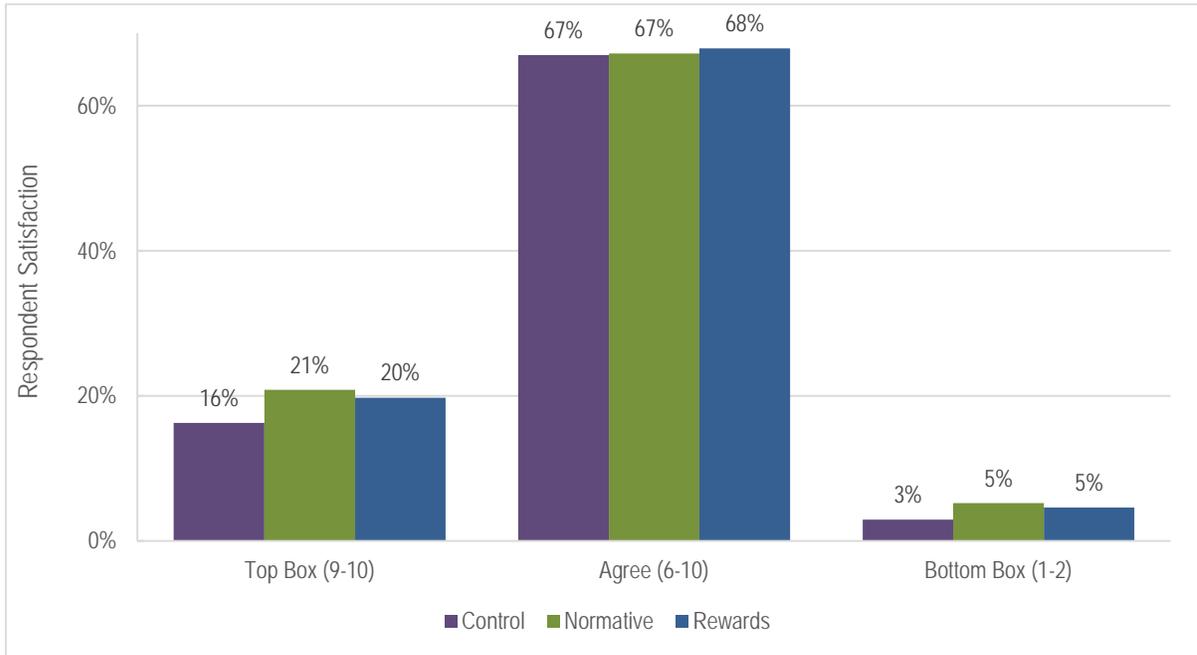
Control n=203; Normative n=192; Rewards n=142

Agreement is equated with a rating of a 6 or higher on a zero to 10 scale; Top Box with 9 or higher; bottom box with one or lower

Source: Customer survey; EA3

The majority of respondents indicated that they had conversations with members of their household to discuss reducing energy usage. Rewards participants were more likely to have these discussions, with 64% of respondents indicating that they discussed this topic, compared to only 54% of the control group (see Figure 5-5 below).

Figure 5-5. Respondents Who Speak to their Household about Reducing Energy Usage
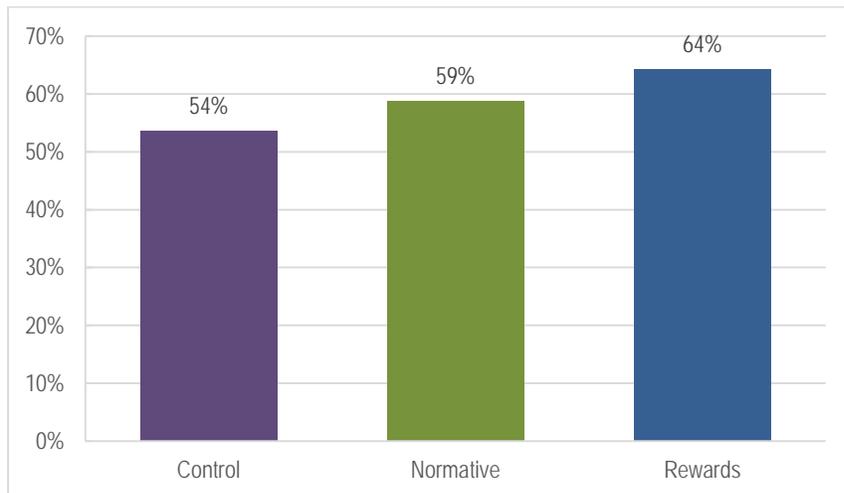
Control n=203; Normative n=192; Rewards n=142

Source: Customer survey; EA7

Although more participants reported having these conversations, members of the control group reported that they were significantly more likely to take action based on conversations related to energy at the 90% confidence level. Figure 5-6 shows the disparity in these findings, with 52% of the control group indicating that they have taken action compared to only 36% of normative respondents and 42% of rewards respondents. This figure additionally shows the percentage of respondents who plan to continue taking energy-saving steps that they began during the HER program, asked only of participants. Rewards participants report higher intention to continue the energy-saving steps they took under the HER program, compared to the normative group. While these differences are significant at the 90% confidence level, respondents' perception of their energy-saving behavior does not match results from the impact analysis, which shows significantly higher savings for the normative group. This trend is common throughout the process findings and is discussed further in the below sections.

In addition to asking participants about their plans to continue energy-saving behavior, the evaluation team asked respondents how likely they are to make additional EE improvements to their home in the future. Similar to the results shown above, the rewards group reported higher likeliness to make improvements, with 67% rating their likelihood as a 6 or higher (out of 10), compared to 59% of normative respondents and 60% of the control group.

Figure 5-6. Respondents Energy-Saving Behavior
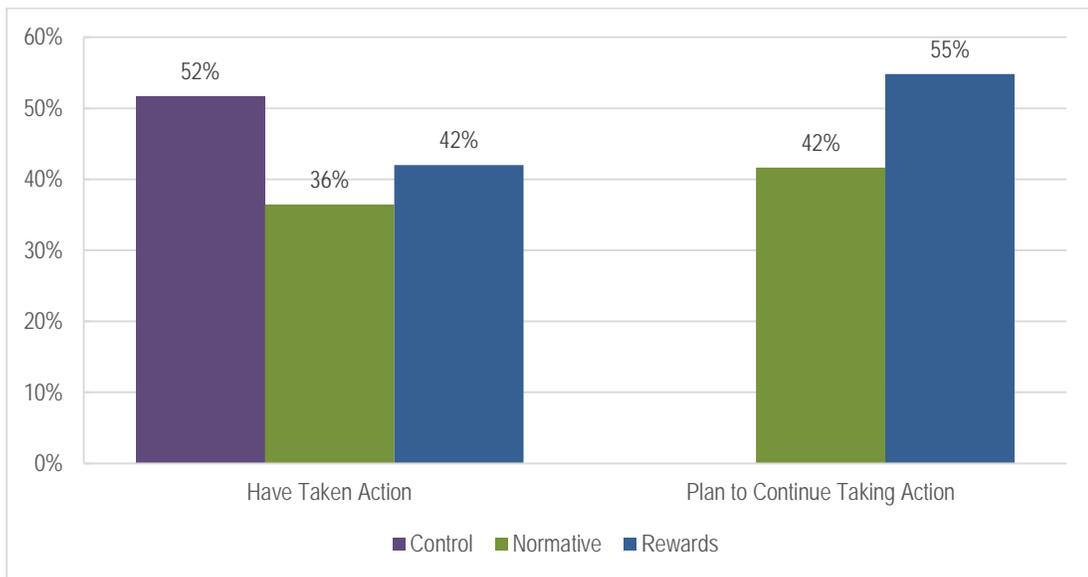
Control n=203; Normative n=192; Rewards n=142
Source: Customer Survey, EA7a & E10

The most common action taken by respondents was to turn off lights not in use, followed by using or upgrading to energy-efficient lighting options. Figure 5-7 shows the top seven most common actions by respondent type. Less common actions included: sealing windows and doors, purchasing new doors, opening windows and doors, washing clothes in cold water, controlling the thermostat or installing a programmable thermostat, and putting shades on windows.

Figure 5-7. Energy-Efficient Action Taken
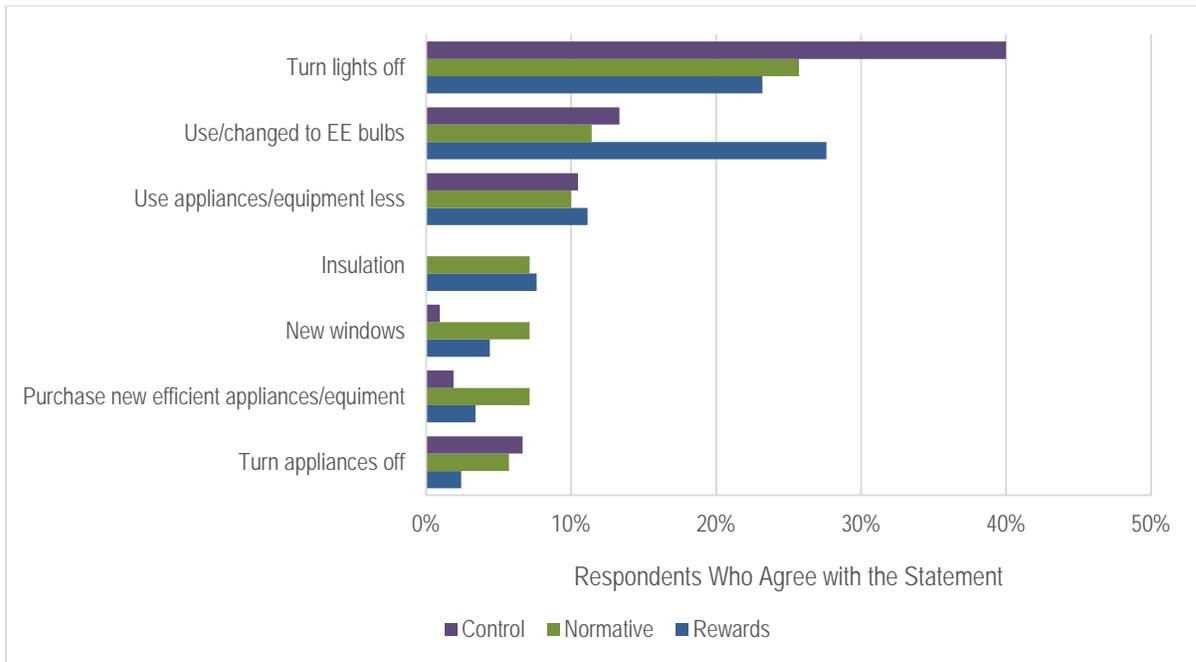
Control n=105; Normative n=70; Rewards n=59.7[6]

Confidence precision not calculated for this question.

Source: Customer survey; EA7b

5.3 Program Satisfaction

The program did a good job of grabbing attention and getting the HERs in front of participants. The majority of participants indicated that they read their HERs at least some of the time, with 45% of normative respondents and 39% of rewards respondents reporting that they always read the reports. Only 14% of normative and 12% of rewards respondents indicated that they never read the reports.

Overall, respondents reported high satisfaction with the program itself. As shown in Figure 5-8 below, 71% of normative respondents and 76% of rewards respondents rated their satisfaction as a 6 or higher. While slightly higher for rewards respondents, this difference was not significant at the 90% confidence level using a Chi-square test. Looked at another way, the average satisfaction rating on a scale from zero to 10 was 7.15 for the normative group and 7.26 for the rewards group.

Navigant asked respondents to share the reason for their satisfaction rating. Common responses associated with dissatisfied respondents included the following:

- Lack of understanding of how report comparisons are made

- Wanting more information in the reports

- General lack of engagement with the reports

- Concern about high bills and utility resources spent on reports

---

[6] This question involved a subset of rewards respondents, and as an outcome of weighting for this group the number of respondents does not come out as a whole number.

- General negative feelings in regard to their energy services overall

This is typical of opt-out HER programs, where people receive reports who have little interest in them and who may be receiving negative messages about their energy use. Unlike similar programs, extreme satisfaction with the reports is low for both messaging groups, as characterized by a satisfaction rating of 9 or higher.

Figure 5-8. Satisfaction with the HERs
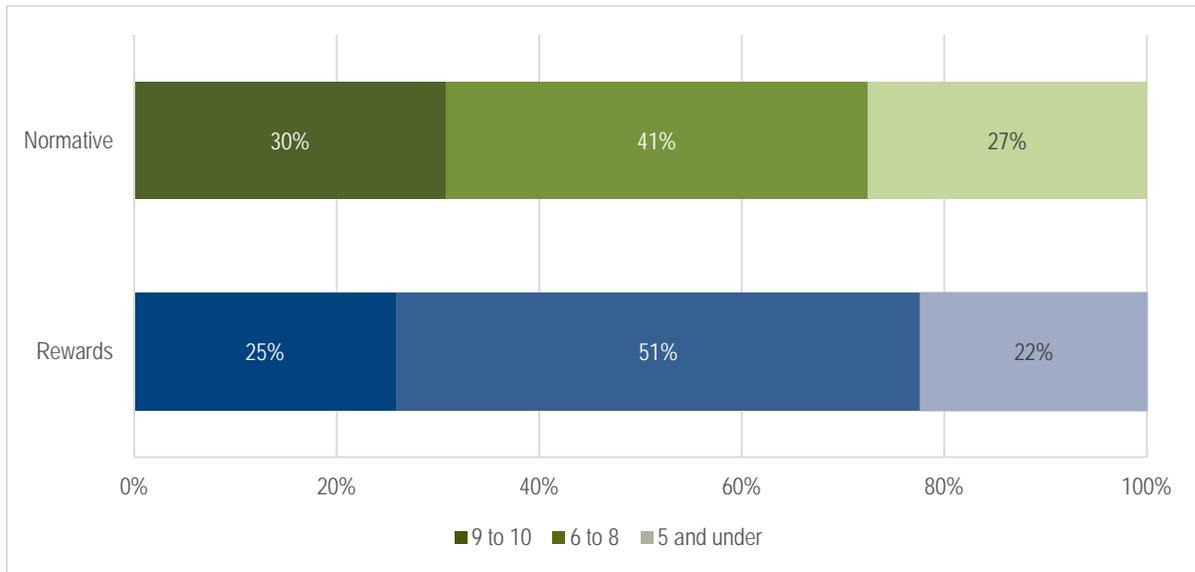
Normative n=192; Rewards n=142
Source: Customer survey; PS2

Compared to the normative group, rewards participants found the reports to be more relevant and useful related to their energy needs. The evaluation presented a series of statements and asked to what degree respondents agreed. Figure 5-9, Figure 5-10, Figure 5-11, and Figure 5-12 show that a higher portion of rewards respondents agreed with the following statements:

1. The HERs helped me better understand my energy use
2. The tips in the HERs are relevant to me
3. The HERs helped me better understand ways to save energy
4. The HERs help me save money on my energy bills

Apart from higher rates of agreement, the survey revealed that a higher portion of normative respondents strongly disagree with the statements, as indicated by those who rate their agreement at a zero or one on a scale through 10 (bottom box). The difference in frequency for bottom box between participant groups is significant at the 90% confidence level for all four questions. The text above each figure presents a deeper look at the findings from each particular question.

Figure 5-9 presents findings on the degree to which participants agree that the HERs help them better understand their energy use. Rewards respondents report higher levels of agreement with the statement, as shown in the "Top Box" and "Agree" categories. The "Bottom Box" category looks at

those respondents who rated their agreement at a one or lower, or in other words those who strongly disagree with the statement. Normative respondents expressed significantly higher levels of strong disagreement that the reports help them to better understand their energy use, compared to responses from the rewards group.

Figure 5-9. Participant Agreement that the HERs helped them Better Understand Their Energy Use
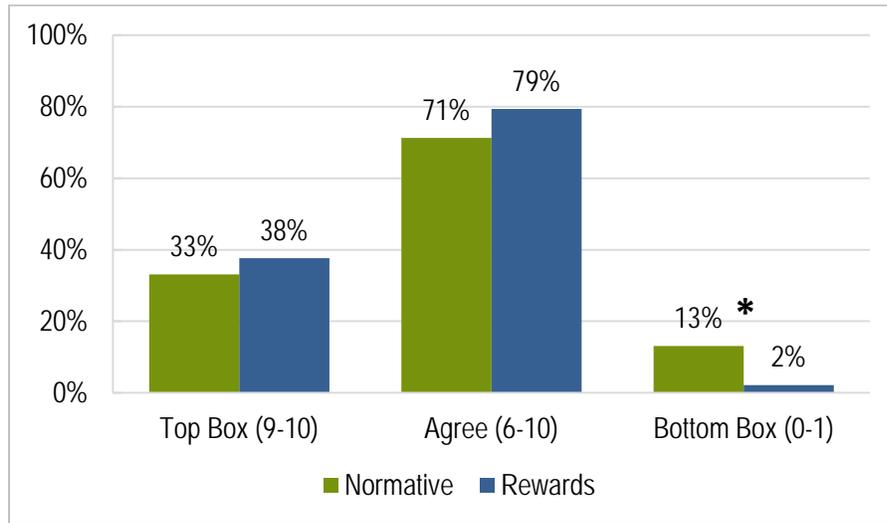
Normative n=192; Rewards n=142
Note: An asterisk (*) indicates statistical significance at the 90% confidence level.
Source: Customer survey; PS4a

Along the same lines, rewards respondents showed significantly higher agreement that the tips in the HERs are relevant to them, as shown in Figure 5-10. Fifty percent of normative respondents rated their agreement at a 6 or higher, compared to 68 percent of the rewards group. The difference between those who expressed strong disagreement with the statement is also significant between the two groups, with 18 percent of normative respondents indicating that they strongly disagree, compared to just six percent of rewards respondents.

Figure 5-10. Participant Agreement that the Tips in the HERs are Relevant to Them

Normative n=192; Rewards n=142

Note: An asterisk (*) indicates statistical significance at the 90% confidence level.

Source: Customer survey; PS4b

Figure 5-11 shows the same trend as for the previous two figures. Rewards respondents show significantly higher levels of agreement that the reports help them better understand ways to save energy, with 74 versus 54 percent agreeing with the statement. Again, normative respondents also expressed higher levels of strong disagreement.

Figure 5-11. Participant Agreement that the HERs Helped Them Better Understand Ways to Save Energy

Normative n=192; Rewards n=142

Note: An asterisk (*) indicates statistical significance at the 90% confidence level.

Source: Customer survey; PS4e

This pattern of engagement holds true for the final engagement-related statement in the participant survey – agreement that the reports help participants save money on their bills. Figure 5-12 also shows that agreement levels with this statement are low overall compared to the other statements, indicating that participants across the program are less confident that their participation in the program has resulted in lower electricity bills.

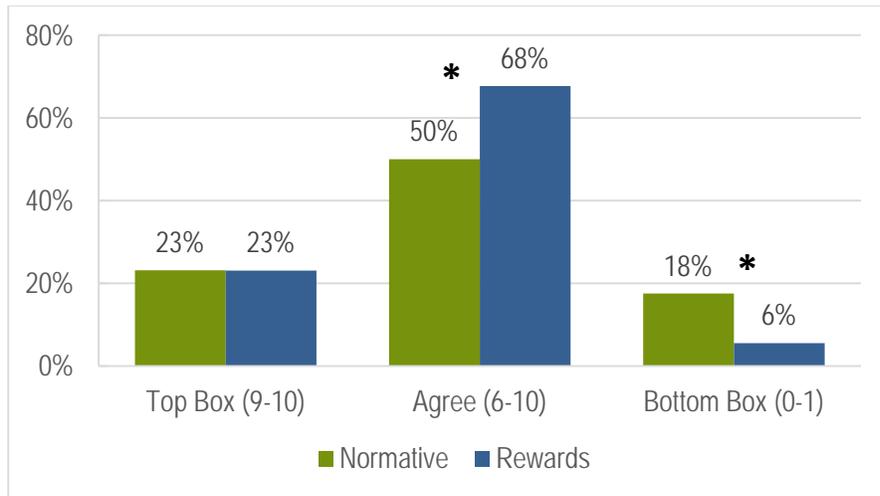**Figure 5-12. Participant Agreement that the HERs Help Them Save Money on Their Bills**
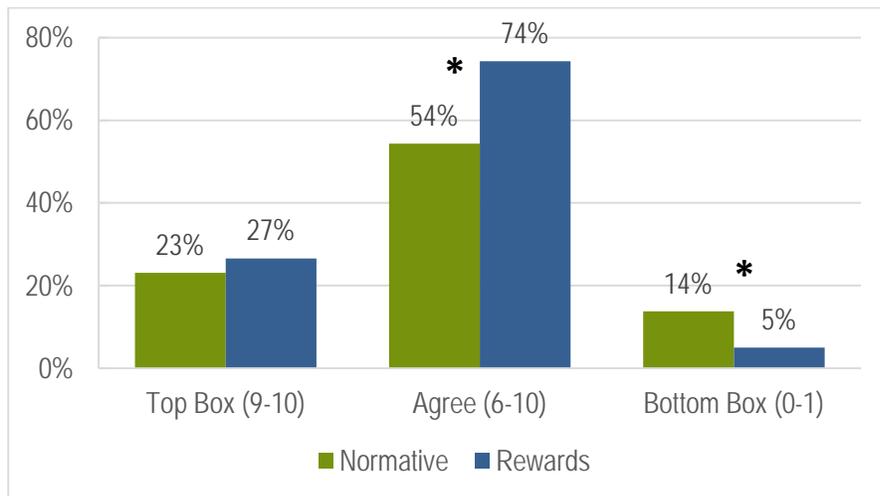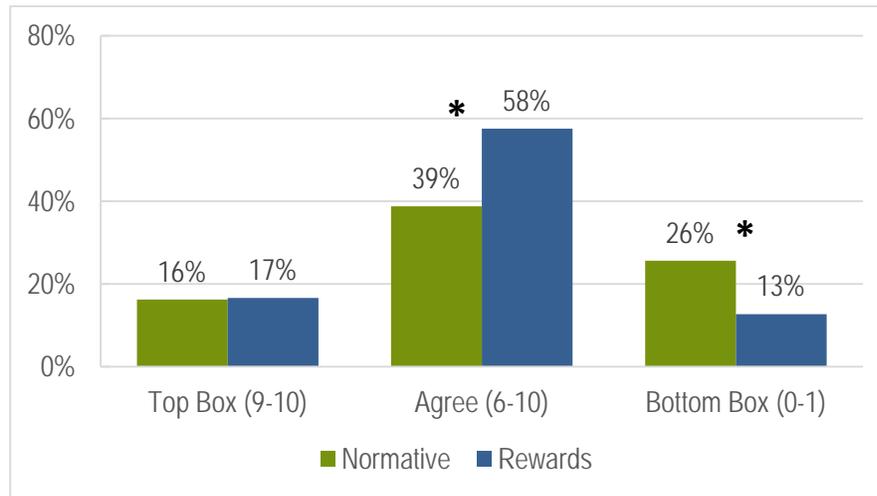

Normative n=192; Rewards n=142
Note: An asterisk (*) indicates statistical significance at the 90% confidence level.
Source: Customer survey; PS4f

For the normative group, all participants received HERs that included a section comparing their energy use to that of their neighbors. A majority of respondents indicated that this comparison did not motivate them to use less energy in their home, with 60% rating their agreement with this statement at a 5 or lower (as shown in Figure 5-13). Only 8% of respondents indicated that the neighbor comparisons motivated them to use more energy. Two possible reasons why HERs could be considered by respondents as ineffective in motivating participants to reduce their energy consumption. First, individual respondents may compare favorably against their neighbors, removing the incentive to save energy. For other participants, a comparison against neighbors can be unwelcome and may cause participants to respond negatively, as evidenced by responses to program satisfaction. These negative feelings may cause participants to ignore report messaging and decline to take action in regard to their energy use.

These survey responses, however, run contrary to impact findings that show the normative group saves a significantly higher portion of savings compared to the rewards group at the 90% confidence level. A disconnect between people saying they do not like receiving normative reports and the same people saving more energy is not uncommon in these types of programs. This appears to be the case for respondents in this survey.

Figure 5-13. Effect of Neighbor Comparisons on Energy Use
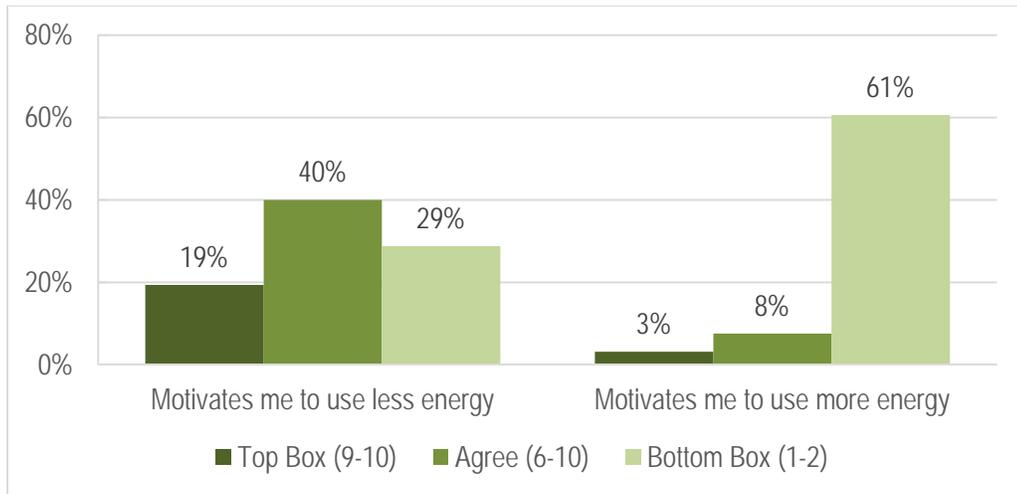
n=192

Source: Customer survey; PS4 c,d

Looking across participant groups, rewards participants perceived the comparison of their home's historical energy use as more valuable than the normative group's comparison of energy use against neighboring homes, 89% and 68% respectively. Figure 5-14 shows this breakdown. This finding is supported by previous findings that show that rewards participants connect more strongly to the reports overall.

Additionally, a majority of respondents found value in the energy-saving tips in the reports, while approximately half found value in the personalized saving goals. A unique component of the rewards group is the opportunity to earn and redeem rewards points by taking energy-saving actions. As shown in Figure 5-14, only 40% of respondents found value in this component of the report.

Figure 5-14. Respondents Who Consider the Report Component to be Valuable
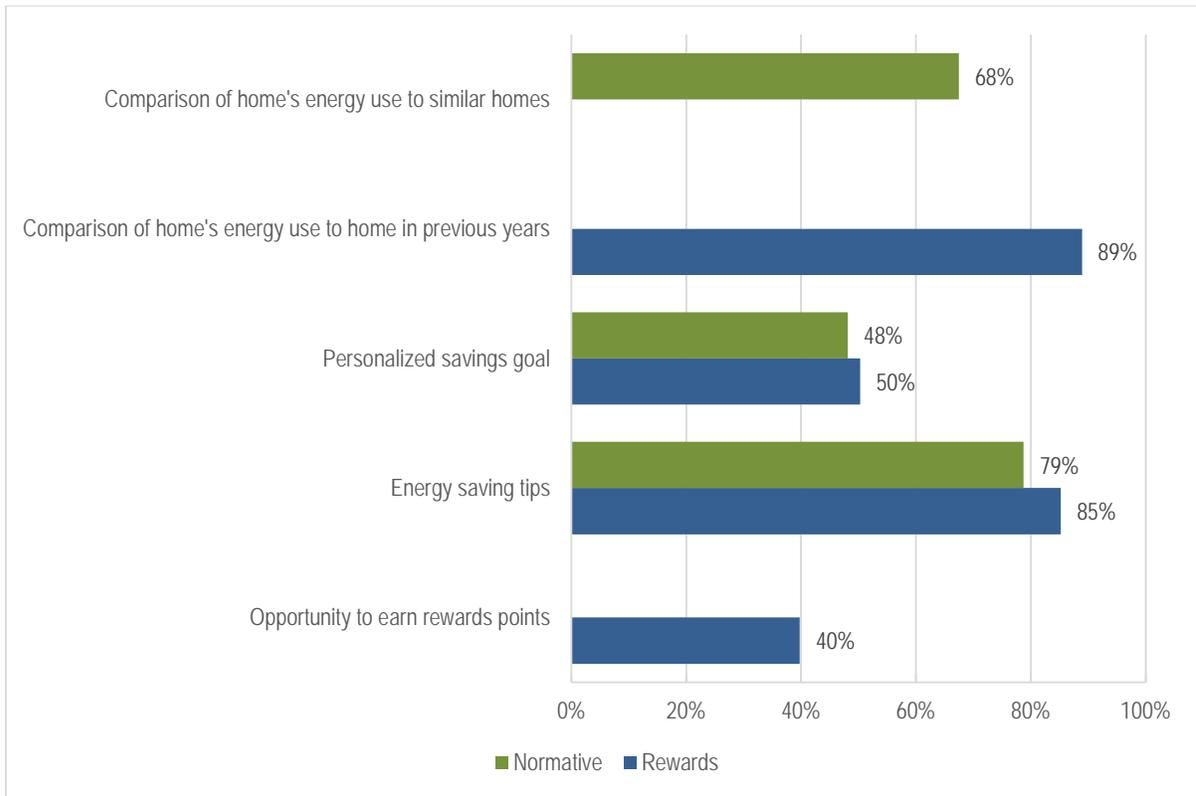
Normative n = 192; Rewards n = 142; percentage represents those who responded "Yes"
Source: Customer survey; PS5a-e;

5.4 Rewards Groups Engagement

As part of the rewards group, Eversource offered participants the opportunity to earn rewards points based on energy-saving actions and to redeem those points for prizes through a web portal. Navigant divided this group of participants into three categories: those who redeemed points through the program, those who signed up to earn points but did not redeem any, and those who did not sign up to earn points. Through the participant survey, the evaluation team explored differences among the three groups to better understand how the rewards component functions. The following section explores participant engagement with this program component and ease of sign-up processes.

Signing up to receive rewards points was not a memorable experience for the majority of respondents. Respondents who redeemed points through the program were more engaged, with 50% of respondents indicating that they recalled signing up to redeem points compared to just 25% of those respondents who redeemed no points (see Figure 5-15). Additionally, of the 20 respondents surveyed who redeemed points through the program, only 25% could recall doing so. When asked about the ease of signing up to earn points through the program, one-fifth of respondents indicated that they had difficulty, suggesting that the process would benefit from additional clarity and simplification.

Figure 5-15. Participants Who Recall Signing Up to Receive Reward Points
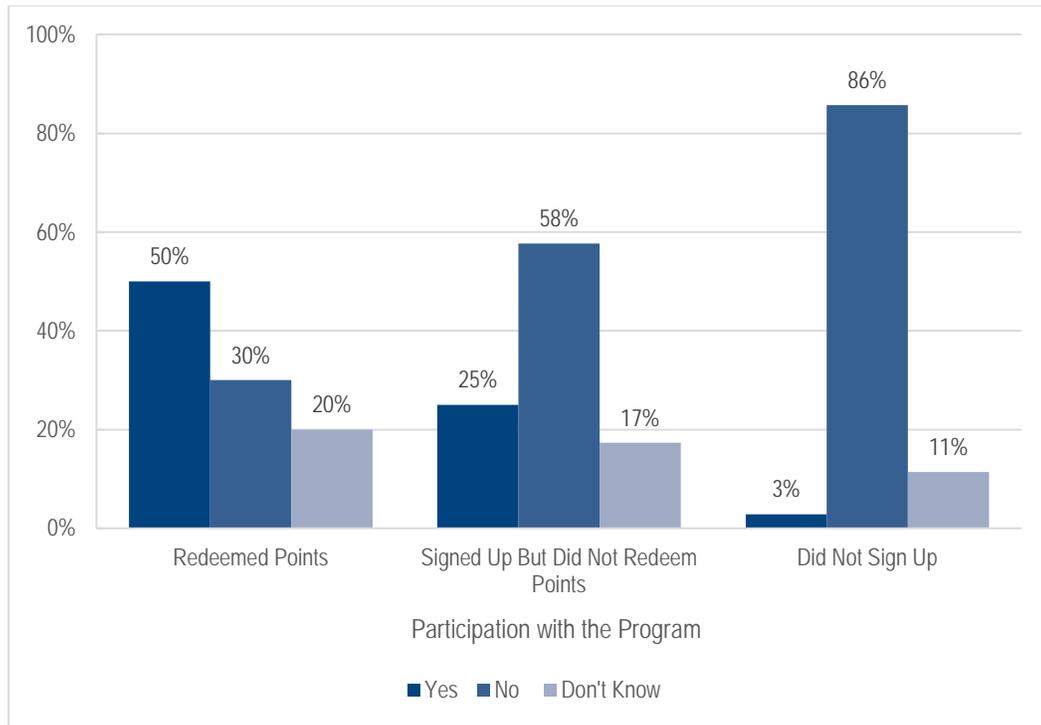
Redeemed Points n=20; Signed Up But Did Not Redeem n=52; Did Not Sign Up n=70
Source: Customer survey; R1

Because only five respondents could recall redeeming points through the program and one respondent answered "Don't Know," the evaluation team's understanding of program processes is limited. When asked about ease of redeeming and earning points and the likelihood of recommending the program, participant feedback varied considerably, as shown in Figure 5-16. Four of the six respondents indicated that it was easy to earn and redeem points, while two respondents felt that this process could be simplified. Of the five respondents who remembered redeeming points through the program, only one indicated that the reward options motivated them to earn points.

Figure 5-16. Ease of Interacting with and Likelihood of Recommending the Program
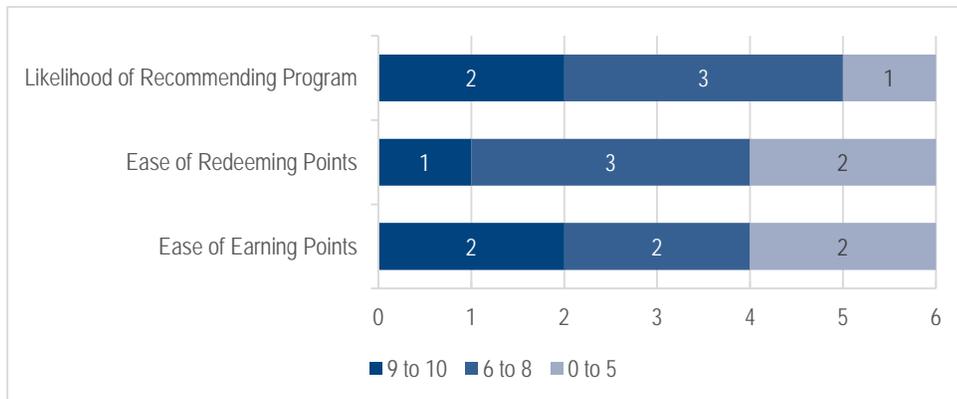
n=6
Source: Participant survey; R5, R6, R7;

Of the 19 respondents who remembered signing up to earn points but who did not redeem them, four cited a lack of time as a primary reason for not doing so. Several respondents indicated that they were unable to figure out how to redeem points, while others simply forgot to do so. Figure 5-17 provides a full summary of responses.

Figure 5-17. Reason for Not Redeeming Points through the Program
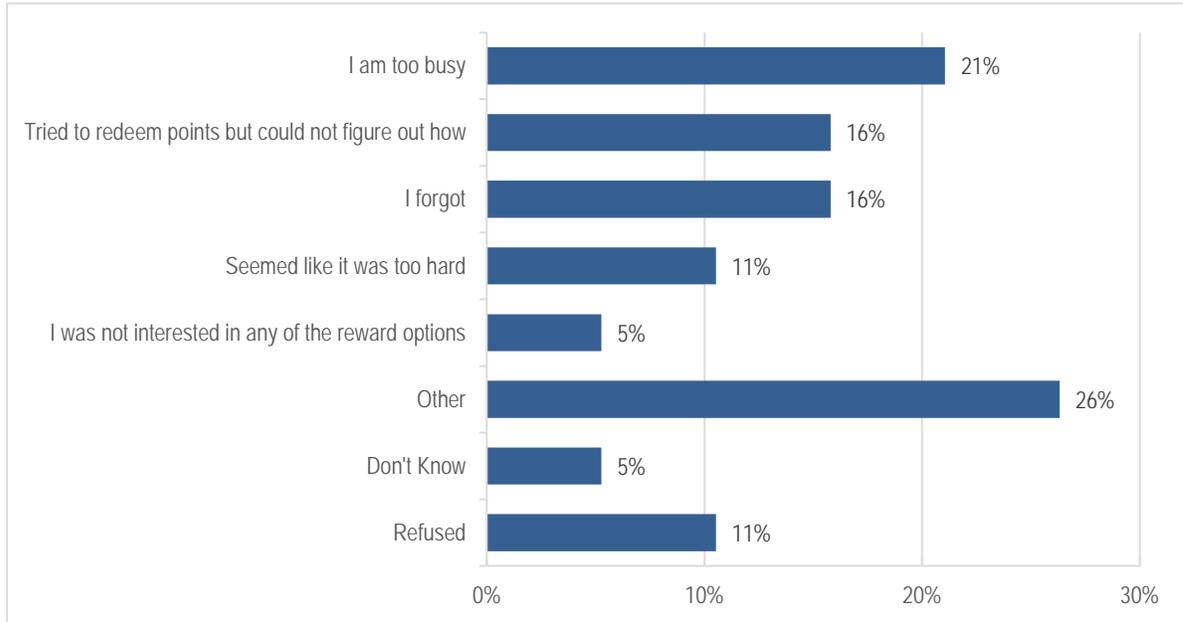
n = 19; multiple responses allowed.

Note: While the "Other" category appears to be a high portion of respondents, due to small sample size, it represents only five respondents.

Source: Customer survey; participant survey; R8

For those participants who did not sign up to earn points, 23% cited a lack of awareness of the opportunity, followed by 21% who stated that they did not believe the opportunity would be rewarding. Only 2% of respondents indicated that they attempted to create an account but could not figure out how, suggesting that despite the difficulty experienced by several participants, the sign-up process is not a true barrier to the point program component. Figure 5-18 provides a full summary of responses.

Figure 5-18. Reason for Not Signing Up to Receive Points through the Program

Reason	Percentage
I am too busy	14%
Did not think it would be rewarding	11%
I was not interested in any of the reward options	9%
Signing up looked like it took too much time	6%
Signing up seemed like it was too hard	5%
Did not know enough about it	4%
I forgot	3%
Tried to create an account but could not figure out how	2%
Other	7%
Don't Know	21%
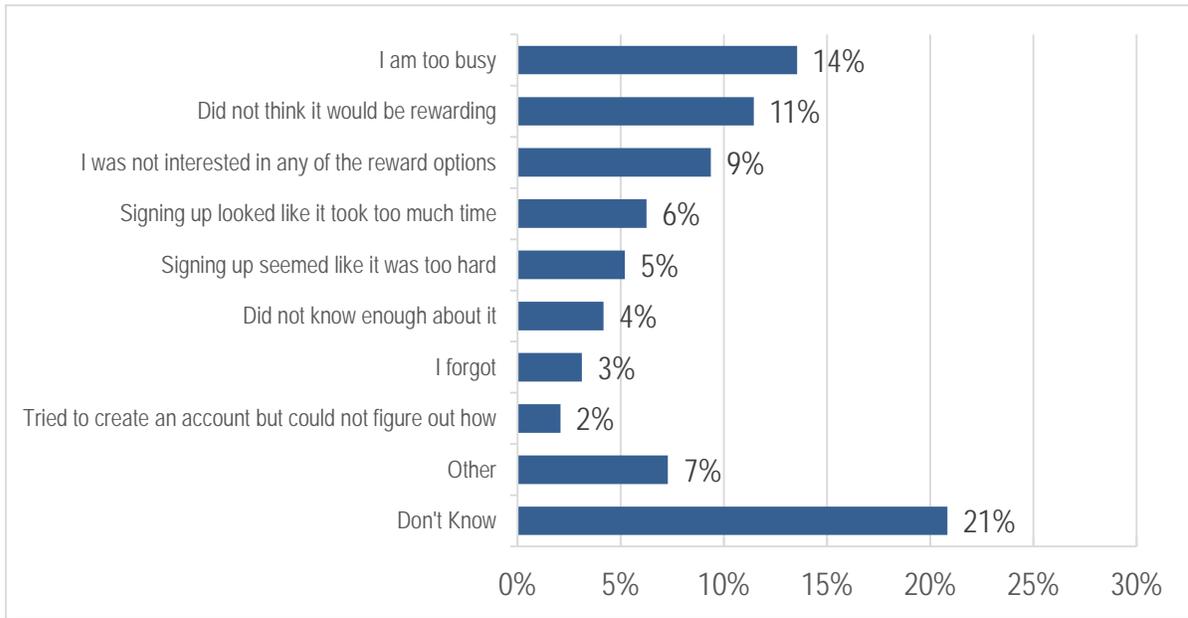
n=96; multiple responses allowed
Source: Participant survey; R9

5.5 Demographics

In the demographics section of the survey, Navigant asked respondents a series of questions designed to explore their home characteristics. Overall, there were no significant differences found between the participant and control groups.

The vast majority of respondents reported that they own their home and over 75% live in a single-family detached house. Table 5-1 presents a summary of the average size of respondent homes, number of full-time residents, and age of respondent. The rewards group had a slightly larger average home size as well as younger average age. Navigant did not run comparison metrics to determine the significance of these differences.

Table 5-1. Demographic Summary for Home Size, Full-Time Residents, and Age

	Average Square Feet of Home	Average Number of Full-Time Residents	Average Age of Respondent
Normative	2,181.27	2.31	61.49
Rewards	2,671.64	2.51	55.89
Control	1,946.87	2.25	61.24

Findings presented as the mean excluding DK and REF responses
Source: Customer survey; HC3, D1, D2

As shown in Figure 5-19, respondent groups were closely matched in regard to their education, with approximately half of all respondents reporting that they have either a college or post-graduate degree.

Figure 5-19. Highest Level of Education Achieved
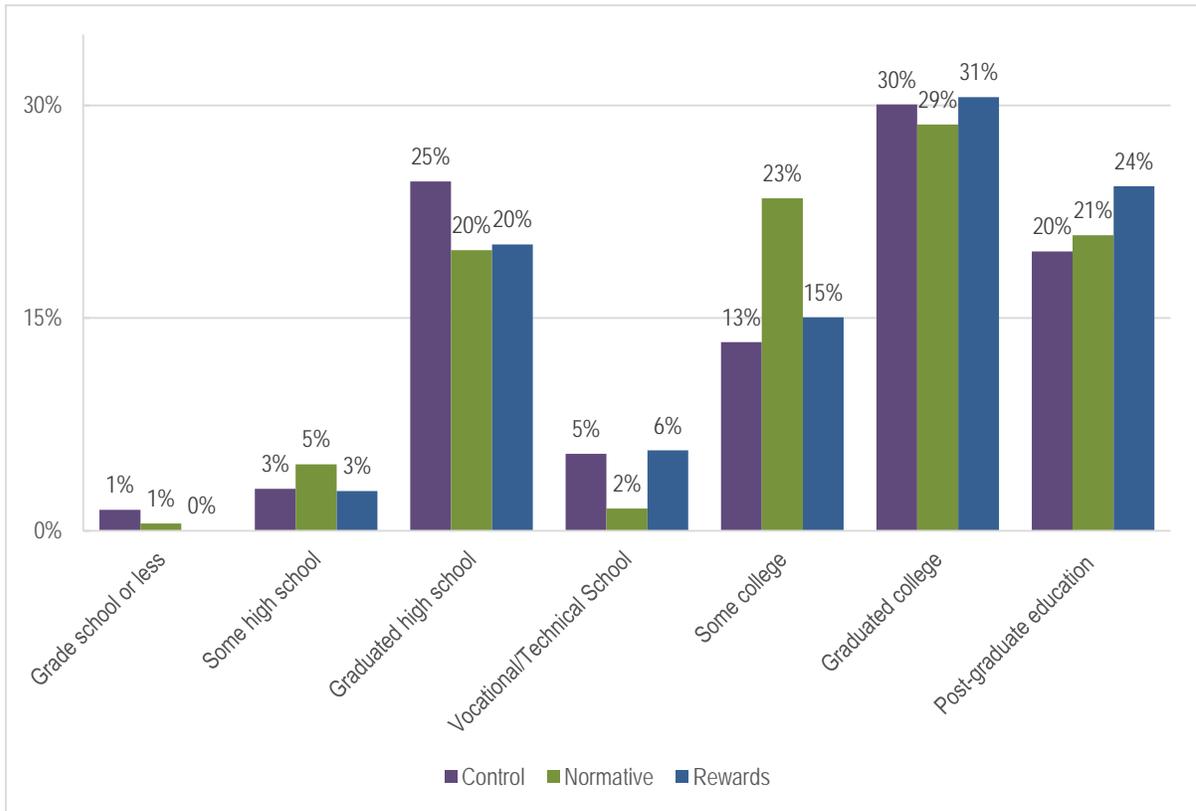
Control n=203; Normative n=192; Rewards n=142

DK and REF responses not shown

Source: Customer survey; D3

Overall, the rewards group respondents reported marginally higher incomes as defined by an annual household income of $100,000 or more; however, this difference was not statistically significant. Additionally, many respondents opted to keep this information private; therefore, those results are not shown in Figure 5-20. A majority of respondents had a household income greater than $50,000 annually.

Figure 5-20. Annual Household Income

Control n=203; Normative n=192; Rewards n=142

DK and REF responses not shown

Source: Customer survey; D3

6. Key Findings and Recommendations

6.1 Key Impact Findings and Recommendations

The HER pilot program savings are presented in Table 1. Findings include:

- Total program savings, after adjusting for uplift, were 1,773 MWh. This broke down into 1,389 MWh for the normative group and 384 MWh for the rewards group.

- On average, participants in the normative group reduced their electricity usage by 1.32% and participants in the rewards group by 0.37%. This difference in savings is statistically significant at the 90% confidence level, implying that the normative group is saving more energy than the rewards group.

- Navigant's estimated savings were similar to, and not statistically distinguishable from, Opower's reported savings for each group. For the normative group, Navigant estimated 1.32% savings compared to Opower's reported savings of 1.50%. For the rewards group, Navigant estimated 0.37% savings compared to Opower's reported savings of 0.31%.

- The HER program also increased participation in (i.e., caused uplift in) Eversource New Hampshire's other EE programs. For the normative group, participation increased in the Appliance Recycling program, did not change for the Low Income program, and decreased slightly for the HPwES and Lighting programs. For the rewards group participation increased in the Appliance Recycling and Lighting programs and decreased slightly for the HPwES and Low Income programs. Total savings from uplift are estimated at 7 MWh (2 MWh for the normative group and 5 MWh for the rewards group) and are excluded from the verified net program savings. Overall, savings from uplift account for 0.4% of the HER program's electric savings. This breaks down into 0.16% of the normative group's savings and 1.3% of the rewards group's savings.

- Savings generated for the normative group by the HER program are within the typical range of first-year savings for residential HER programs, which typically range from 1% to 1.5%. The rewards group's savings are lower than typical savings for normative programs. However, as of this writing the evaluation team is not aware of any other studies of the HER rewards program; thus, we cannot conclude how they compare to other rewards groups.

Table 6-1. Total Program Savings

Type of Statistic	Normative Group	Rewards Group
Number of Participants	13,125	13,125
Percentage Savings	1.32%	0.37%
Electric Savings Prior to Uplift Adjustment (MWh)	1,391	390
Electric Savings After Uplift Adjustment (MWh)	1,389	384

Source: Navigant analysis

6.2 Key Process Findings and Recommendations

This section summarizes the key process findings and recommendations.

- Ultimately, the customer survey revealed many positive findings related to the HER pilot program as well as areas for attention, as highlighted below and in greater detail in the report.

- Overall satisfaction with the program ranged from 71% (normative) to 76% (rewards). This is in line with similar evaluations of programs implemented by Opower in other areas. The primary reasons for dissatisfaction cited by respondents were related to a lack of understanding of normative comparisons in the reports, though this group continues to see high savings and the difference in satisfaction for this group is not statistically significant at the 90% confidence interval. Details are explored in Section 5.3.

- A majority of all respondents read the reports at least some of the time, with many indicating that they read the reports all of the time (45% normative, 39% rewards).

- Although a majority of respondents stated that the reports did not motivate them to save energy, it is not uncommon in these types of programs to have a disconnect between people saying they do not like receiving normative reports and the same people saving energy. This appears to be the case for respondents in this survey because the impact analysis shows that the normative group saves a significantly higher portion of savings compared to the rewards group at the 90% confidence level. A comment from the stakeholder group included that perhaps the reports could include additional descriptors of how comparisons are made to increase acceptance of normative reports.

- For the rewards group, Navigant found low recall of participation among participants who signed up to receive rewards points as well as those who signed up and redeemed points through the program. Overall, respondents offered mixed opinions on the ease of the rewards program's processes; however, many cited a lack of time, lack of interest, or lack of awareness when it came to earning and redeeming points. Only 40% of rewards participants considered earning points to be a valuable opportunity.

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Residential Home Energy Reports (HER) Program Evaluation

Preliminary Results - DRAFT

EVERSOURCE
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June 10, 2015

Navigant Reference: 167764

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Introduction >> Evaluation Objectives and Activities

Today's presentation will focus on the impact evaluation.

Evaluation Objectives

- Validate that the program design is consistent with a Randomized Controlled Trial (RCT)
- Estimate program energy savings
- Estimate jointly-produced savings
- Estimate customer satisfaction with the program

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Navigant estimated savings using a PPR[1] and an LFER[1] model, both of which produce unbiased estimates of savings because the HER program was designed as an RCT. We report out savings from the PPR model.

PPR Model

$$ADU_{kt} = b_1 TreatmentN_k + b_2 TreatmentR_k + b_3 ADUlag_{kt}$$

$$+ \sum_J b_{4j} Month_{jt} + \sum_J b_{5j} Month_{jt} \times ADUlag_{kt} + e_{kt}$$

ADU_{kt}	average daily electricity usage by household k in bill period t
$TreatmentN_k$	a binary variable taking a value of 1 if household k is assigned to the normative treatment group and 0 otherwise
$TreatmentR_k$	a binary variable taking a value of 1 if household k is assigned to the rewards treatment group and 0 otherwise
$ADUlag_{kt}$	household k's electricity usage in the same calendar month of the pre-program year as the calendar month of month t
$Month_{jt}$	a binary treatment variable taking a value of 1 when j=t and 0 otherwise, in other words monthly fixed effects
ε_{kt}	the cluster-robust error terms for household k during bill period t

[1] Post-Program Regression (PPR) and Linear Fixed Effects Regression (LFER)

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Jointly-produced savings are estimated using the post-only difference in participation in other energy efficiency programs between participants and controls.

» Jointly-produced savings are those savings that occur in other energy efficiency programs because the HER program caused HER participants to participate in those programs at a higher rate than they otherwise would have.

» To avoid double counting these joint savings they must be subtracted from either the HER program or the other energy efficiency program. Standard industry practice is to subtract them from the behavioral program, i.e. HER.

» Because participation in other energy efficiency programs was only available for the post HER program period the jointly-produced savings are estimated using the simple post-only difference.
  – This is just the difference in participation in other energy efficiency programs by HER participants and controls.
  – This post-only difference is an unbiased estimate of jointly-produced savings.

» Jointly-produced savings were estimated separately for the normative and rewards groups.

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Estimated Program Savings >> Percentage Savings

Estimated per participant program savings were 1.32% for the Normative Group and 0.37% for the Rewards Group.

» At the 90% confidence level, the Normative Group had statistically significant estimated per participant savings of 1.32%.

» At the 90% confidence level, the Rewards Group had estimated per participant savings of 0.37% but this value was not statistically significant.

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Estimated Program Savings >> Total Program Savings
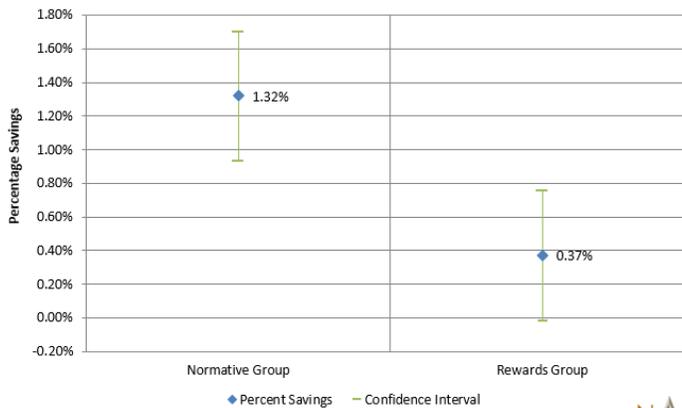
Navigant estimated total program savings of 1,391 MWh for the Normative Group and 390 MWh for the Rewards Group.

» At the 90% confidence level, the Normative Group had statistically significant estimated total savings of 1,391 MWh.

» At the 90% confidence level, the Rewards Group had estimated total savings of 390 MWh but this value was not statistically significant.
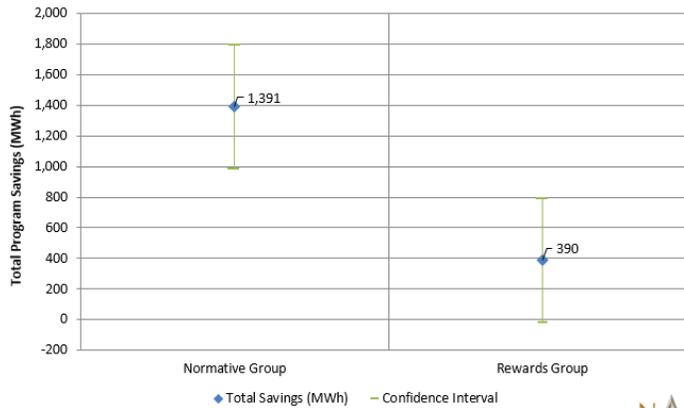
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Jointly-Produced Savings >> Estimates of Uplift and Joint Savings

The rewards program is more effective at channeling participants into other energy efficiency programs than the normative program.

Uplift

	Normative Group	Rewards Group	
Appliance Recycling	25	34	
HPwES	-1	-1	
Lighting	-3	85	*
Low Income	0	-3	
TOTAL	**21**	**115**	

Jointly-Produced Savings (MWh)

	Normative Group	Rewards Group	
Appliance Recycling	2.8	3.8	
HPwES	-0.4	-0.5	
Lighting	-0.2	5.9	*
Low Income	0.0	-4.0	
TOTAL	**2.2**	**5.2**	

Uplift is the number of people channeled into another energy efficiency program by the HER program.

Jointly-produced savings are the amount of savings in other energy efficiency programs that would not exist if the HER program had not been run.

Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

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Jointly-Produced Savings >> Adjustments to Percentage and Total Savings

Jointly-produced savings account for 0.016% of total savings for the Normative Group and 1.3% of total savings for the Rewards Group. These values are too small to change the percentage savings estimates.

	Percentage Savings	Adjusted Percentage Savings	Total Savings (MWh)	Adjusted Total Savings (MWh)
Normative Group	1.32%	1.32%	1,391	1,389
Rewards Group	0.37%	0.37%	390	385

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Realization Rates >> Compare Percentage Savings

Opower's reported percentage savings fall well within the 90% confidence bounds of Navigant's estimated savings for both groups.
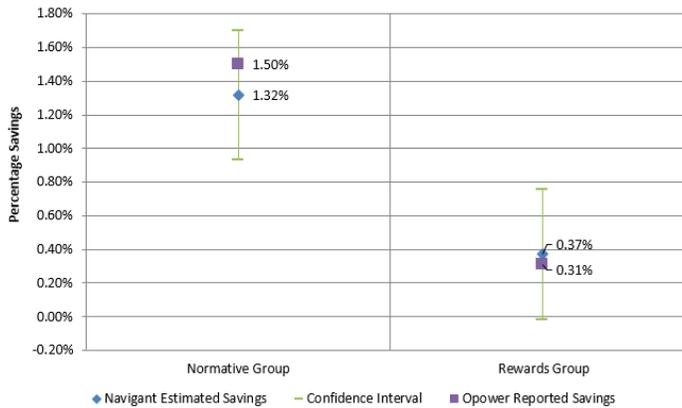
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Conclusion >> Key Findings

The evaluation revealed several key findings.

» Total savings after adjusting for jointly produced savings are 1,389 MWh for the Normative Group and 385 MWh for the Rewards Group.

» The Normative Group saved considerably more than the Rewards Group.
- Normative Group savings were statistically significant at 1.32% per participant.
- Rewards Group savings were not statistically significant at 0.37% per participant.

» Navigant's estimated savings are not statistically different from Opower's reported savings.

» The Rewards program was more successful at channeling customers into other energy efficiency programs than the Normative program.
- Jointly produced savings accounted for 0.016% of Normative Group savings.
- Jointly produced savings account for 1.35% of Rewards Group savings.

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Appendix B. Early Findings—Survey Results

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Residential Home Energy Reports (HER) Program Evaluation

Preliminary Results – PROCESS - DRAFT

EVERSOURCE ENERGY

October 8, 2015

Navigant Reference: 157764

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Content of Report

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October 8, 2015

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Introduction >> Evaluation Objectives and Activities

Today's presentation will focus on process evaluation results, exploring customer satisfaction, energy awareness, and engagement with the HERs.

Evaluation Objectives

- Explore overall customer satisfaction with the program
- Determine if customer satisfaction is different for the two treatment groups
- Explore energy awareness and determine if it is different between control and participant groups
- Explore Rewards-specific program interaction

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Introduction >> Program Description

The HER program included a normative and rewards group both of which received regularly mailed Home Energy Reports (HERs).

Normative Group

» Received Opower's standard HER, including the neighbor comparison

Efficient Neighbors — 252 kWh*

YOU — 397

All Neighbors — 490

* kWh: A 100-Watt bulb burning for 10 hours uses 1 kilowatt-hour.

Rewards Group

» Received a HER without a neighbor comparison

» Had the opportunity to earn rewards for energy savings that could be redeemed for prizes

Have you claimed your 150 bonus points?

Redeem your 150 bonus points when you sign up for the Public Service of New Hampshire rewards program. Start earning points for every kWh you save.

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Navigant contracted with Dieringer Research Group to conduct participant and non-participant surveys.

		Completes		Sample	Completion Rate
	Type	Target	Actual	Amount of sample provided	Percent of Target
Control Group	Control	200	203	6,000	102%
Rewards Participant Group	Normative	190	192	5,700	101%
	Signed up, earned and redeemed	70	20	284	29%
	Signed up, but did not redeem	70	52	863	74%
	Did not sign up to redeem points	70	70	2100	100%

Due to limited available sample, DRG was unable to meet the target completes survey categories, as shown in red in the table.

To increase completes for this group, Navigant instructed DRG to call outside of the pre-designated calling hours and removed the Live Audit section of the survey as these results would not be comparable to the other surveys.

Navigant weighted results from Rewards customers to accurately reflect their portion of program sample data.

Group	Population	N	Sample %	Population %	Weighting Factor per Respondent
Reward Redeemed	284	20	14%	9%	0.621
Reward Signed Up	863	52	37%	27%	0.726
Reward Did Not Sign Up	2100	70	49%	65%	1.312
Total	3247	142	100%	100%	

For instances of comparing Rewards group respondents against Normative or Control respondents, the evaluation team weighted results to accurately reflect their presence in the program data.

No weight was applied to results for comparison amongst the three Rewards group types.

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Live Audit >> Impact of Program on Participant Behaviors

Based on regression analysis of the "live audit" questions, customers in the Rewards Group demonstrated a greater affinity for LED lighting.

» Compared to the Rewards Group, the Control Group had:
   – X _more_ CFLs turned on in their home
   – X _less_ LEDs turned on in their home
» In the room surveyed, the Rewards Group had 0.5 more LEDs compared to the Normative Group
» 58% of all respondents reported that they did not have their thermostat turned on.

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Energy Awareness>> Agreement with Energy-Related Statements

Regardless of participation status, most respondents express high awareness and intention related to energy issues in their homes.

Respondents Who Agree with the Given Statements - Part 1

EA1: Control n = 203; Normative n = 192; Rewards n = 142
Agreement is equated with a rating of a 6 or higher on a 0-10 scale
Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

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The majority of all respondents agree that improving their home's efficiency is a worthwhile investment; Rewards participants are more likely to feel guilty if they use too much energy.
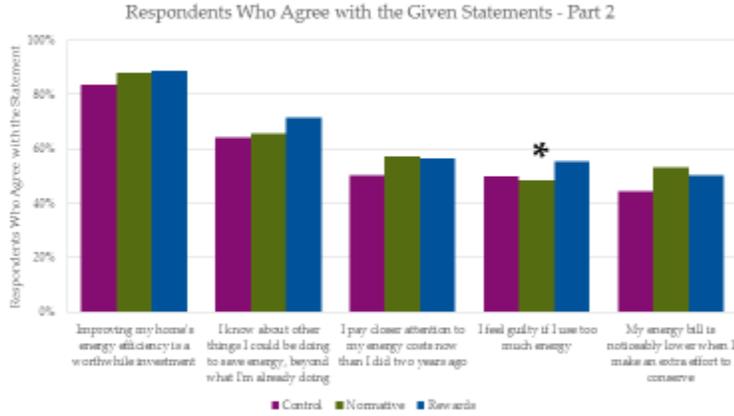
Respondents Who Agree with the Given Statements - Part 2

EA2; Control n = 203; Normative n = 192; Rewards n = 142
Agreement is equated with a rating of a 6 or higher on a 0-10 scale
Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

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All respondents expressed similar satisfaction with their home's energy use; however, participants reported higher extreme satisfaction and extreme dissatisfaction.

	Overall Satisfaction with Energy Consumption	Extremely Satisfied	Extremely Dissatisfied
Control	67%	16%	3%
Normative	67%	21%	5%
Rewards	68%	20%	5%
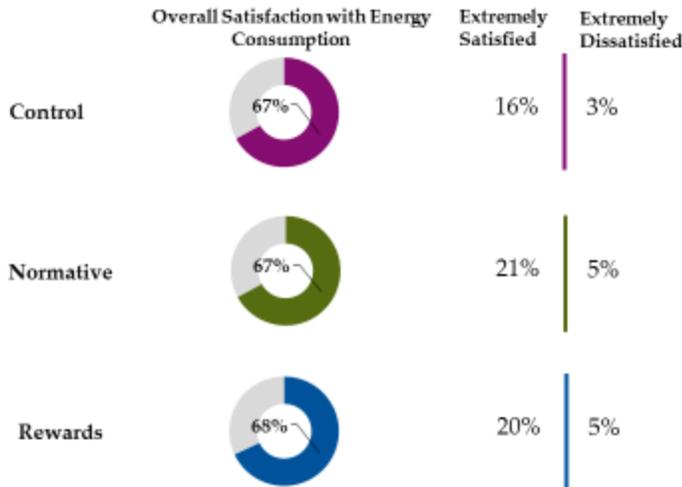
EA3; Control n = 203; Normative n = 192; Rewards n = 142
Agreement is equated with a rating of a 6 or higher on a 0-10 scale; top box with 9 or higher; bottom box with 1 or lower

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More participants speak to their household about reducing energy usage; however, respondents in the Control group are more likely to have taken action based on those conversations.
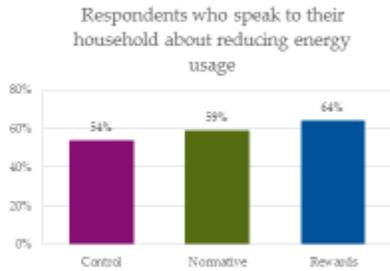
Respondents who speak to their household about reducing energy usage

EA7; Control n = 203; Normative n = 192; Rewards n = 142
Note: An asterisk (*) indicates statistical significance at the 90% confidence level.

Respondents who have taken EE action based on reports/conversations about energy? *

EA7a; Control n = 203; Normative n = 192; Rewards n = 142
Note: An asterisk (*) indicates statistical significance at the 90% confidence level.

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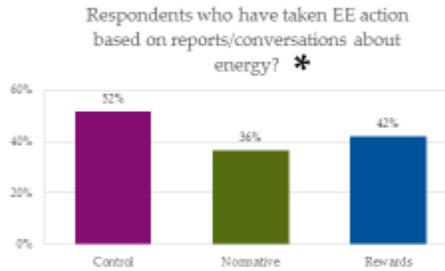
Rewards participants are more likely to continue the energy saving steps they took under the pilot program; a high portion of respondents reported that they do not currently participate.

Do You Plan to Continue Energy Saving Actions? *

■ Normative ■ Rewards

EA10; Normative n = 192; Rewards n = 142
Note: An asterisk (*) indicates statistical significance at the 90% confidence level.

A significant portion of respondents from both participant groups indicated that they do not participate in the program. This response was given based on question phrasing, which asked if the respondent planned to continue energy saving actions taken under their participation in the pilot program.

Navigant will continue to explore this issue.

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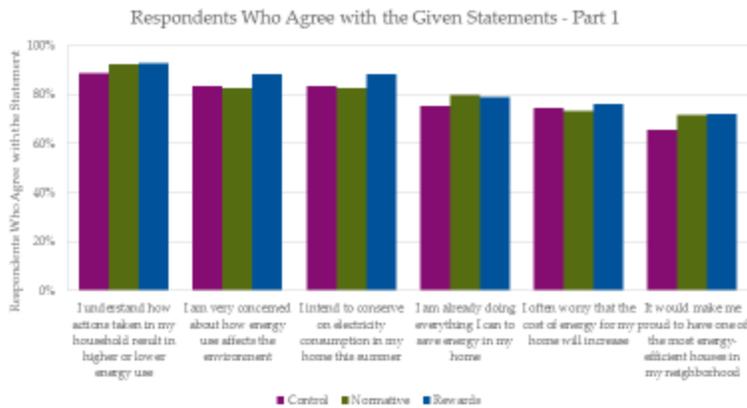©2015 Navigant Consulting, Inc.
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Program Satisfaction>> Length of Time Spent with Reports

Over 80% of participants report that they read their reports at least some of the time, with approximately 40% reporting that they always read them.

How often do you read the HERs?
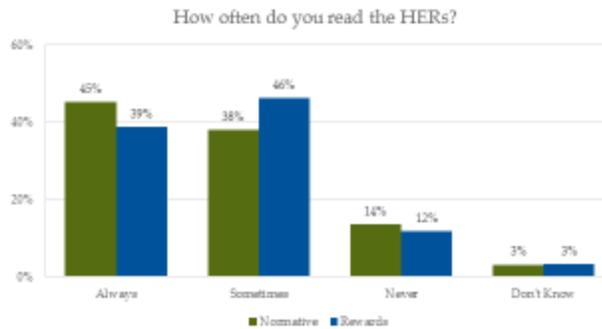
PS1; Normative n = 192; Rewards n = 142
Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

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Overall respondents are satisfied with the program, with ratings comparable to similar Opower programs.

Satisfaction with the HERs

Normative — 7.15 - average — 30% | 41% | 27% — 71%

Rewards — 7.26 - average — 25% | 51% | 22% — 76%

■ 9 to 10 ■ 6 to 8 ■ 5 and under
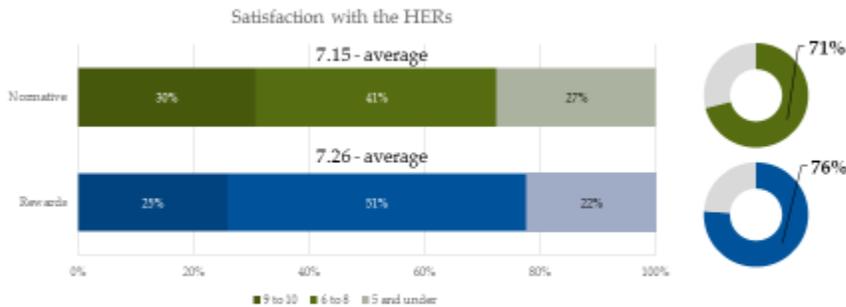
PS2; Normative n = 192; Rewards n = 142
Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

Common reasons for dissatisfaction include:
» Lack of understanding of how report comparisons are made
» Wanting more information in the reports
» General lack of engagement with the reports
» Concern about high bills and resources spent on reports
» General negative feelings towards Eversource

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Compared to the Normative group, Rewards participants find the reports to be more relevant and useful related to their energy needs.

The HERs helped me better understand my energy use
- Top Box (9-10): 33% / 38%
- Agree (6-10): 71% / 79%
- Bottom Box (1-2): 13% / 2% *

The tips in the HERs are relevant to me
- Top Box (9-10): 23% / 23%
- Agree (6-10): 50% / 68% *
- Bottom Box (1-2): 18% / 6% *

The HERs helped me better understand ways to save energy
- Top Box (9-10): 23% / 27%
- Agree (6-10): 54% / 74% *
- Bottom Box (1-2): 14% / 5% *

The HERS help me save money on my bills
- Top Box (9-10): 16% / 17%
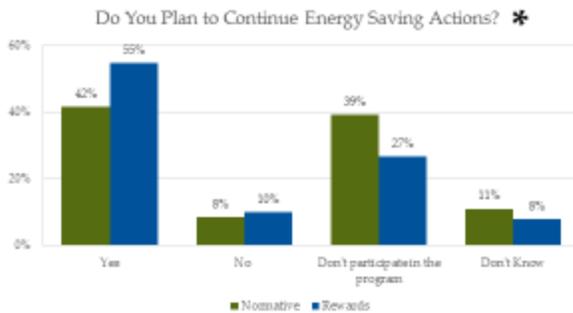- Agree (6-10): 39% / 58% *
- Bottom Box (1-2): 26% / 13% *
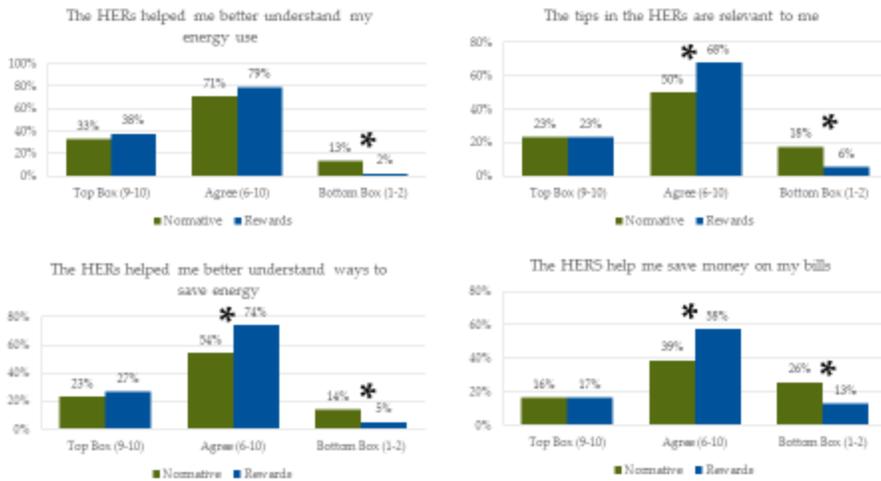
■ Normative ■ Rewards

PS4a,b,e,f; Normative n = 192; Rewards n = 142
Note: As asterisk (*) indicates statistical significance at the 90% confidence level.

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A majority (60%) of respondents indicate that being compared to their neighbors does not motivate them to use less energy.

There are two primary reasons why the HERs may not motivate participants to use less energy.

1) Individual respondents may compare favorably against their neighbor, removing the incentive to save.
2) Some people do not like being compared to their neighbors and respond negatively to the reports.

Being compared to my neighbors...

- Top Box (9-10)
- Agree (6-10)
- Bottom Box (1-2)

PS4c,d; Normative n = 192

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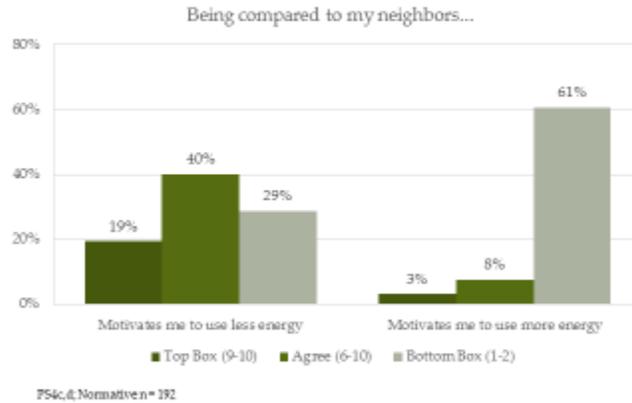
Comparison of a home's historical energy use is perceived as more valuable than a comparison of energy use to similar homes. Only 40% of Rewards participants believe the rewards system is valuable.
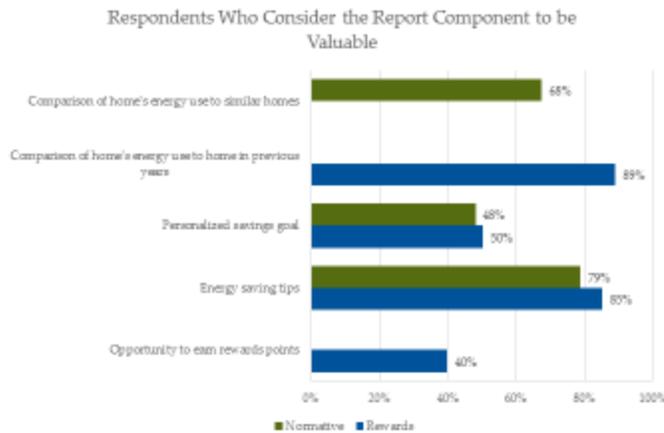
Respondents Who Consider the Report Component to be Valuable

- Comparison of home's energy use to similar homes: 68%
- Comparison of home's energy use to home in previous years: 89%
- Personalized savings goal: 48% / 50%
- Energy saving tips: 79% / 85%
- Opportunity to earn rewards points: 40%

- Normative
- Rewards

PS5a-e; Normative n = 192; Rewards n = 142; percentage represents those who responded "Yes"

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Rewards Group>> Recollection of Signing Up

Signing up to receive rewards points is not a memorable experience for the majority of respondents, though respondents who redeemed points were more likely to recall signing up.

Recall Signing Up to Receive Reward Points
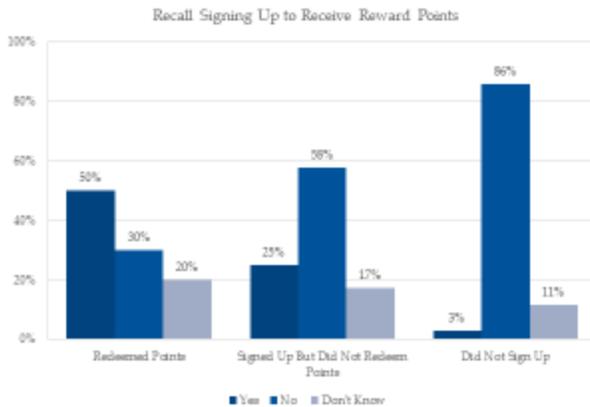
Of the 20 respondents who are flagged as having redeemed points through the program, only 25% could recall doing so.

R1: Redeemed Points n = 20; Signed Up but did not redeem n = 52; Did not sign up n = 70

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Rewards Group>> Ease of Interacting with the Point System and Program Recommendation

Participant experience varies considerably for ease of redeeming and earning points and recommending the program; only one respondent indicated that the reward options motivated them to earn points.

Of the five respondents who remembered redeeming points through the program, only one indicated that the reward options motivated them to earn points.

Ease of Interacting with and Likelihood of Recommending the Program

	9 to 10	6 to 8	0 to 5
Likelihood of Recommending Program	2	3	1
Ease of Redeeming Points	1	3	2
Ease of Earning Points	2	2	2

R5, R6, R7; n=6

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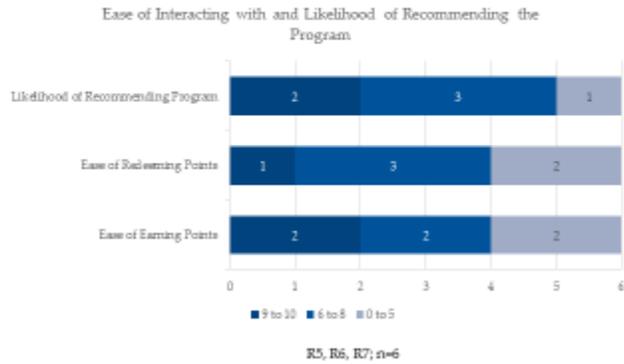
Rewards Group>> Reasons for Not Redeeming Points

Respondents offered a variety of reasons for not redeeming points through the program, the most common reason given was being too busy.

Reason for Not Redeeming Points

Reason	%
I am too busy	21%
I tried to redeem my points but could not figure out how	16%
I forgot	16%
Redeeming the points seemed like it was too hard	11%
I was not interested in any of the reward options	5%
Other	26%
Don't Know	5%
Refused	11%
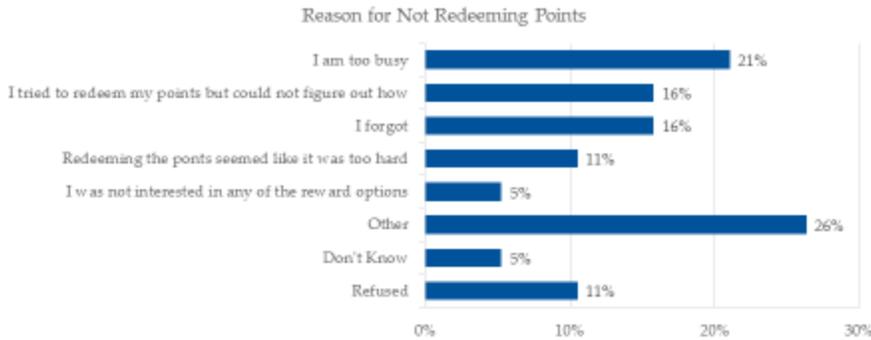
R8; n = 19; multiple responses allowed.
Note: While the "Other" category appears to be a high portion of respondents, due to small sample size it represents only 5 respondents

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A lack of awareness of the program is the main factor in why Rewards participants are not signing up to earn points through the program, followed by a lack of interest in the reward options.
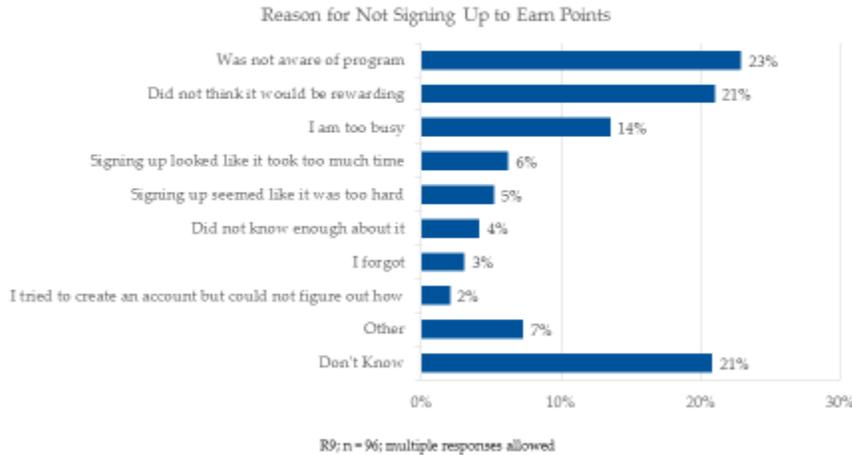
Reason for Not Signing Up to Earn Points

Reason	Percent
Was not aware of program	23%
Did not think it would be rewarding	21%
I am too busy	14%
Signing up looked like it took too much time	6%
Signing up seemed like it was too hard	5%
Did not know enough about it	4%
I forgot	3%
I tried to create an account but could not figure out how	2%
Other	7%
Don't Know	21%

R9; n = 96; multiple responses allowed

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The evaluation revealed several key findings.

1 Participants in both Groups gave similar satisfaction ratings for the HER program, in line with satisfaction ratings from similar programs.

2 Compared to the Normative Group, Rewards participants expressed higher agreement with statements related to report relevance and usefulness in saving energy in their homes.

3 A majority of Normative Group participants indicated that the neighbor comparisons do not motivate them to save energy.

4 Overall, participants in the Rewards Group are not engaged with the rewards aspect of the program.
 » The majority of participants did not recall signing up to receive points
 » Only 40% of Rewards Group participants thought the opportunity to earn rewards points was valuable.

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Appendix A

Rewards Group>> Ease of Sign Up Process

One fifth of respondents indicated that they had difficulty signing up to receive rewards points, while only 40% indicated that the process was extremely easy.

Ease of Sign Up Process

| 40% | 32% | 20% | 8% |

0%   20%   40%   60%   80%   100%

■ 9 to 10 ■ 6 to 8 ■ 0 to 5 ■ Don't Know

R2: n=25

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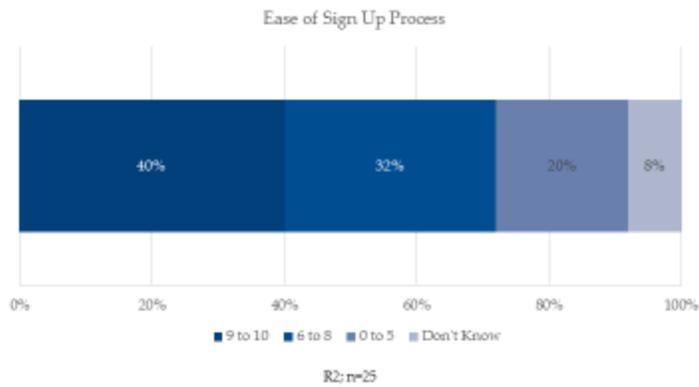
Turning off lights or upgrading to energy efficient bulbs was the most common action taken reported across respondents.

What Action did your Family Take?
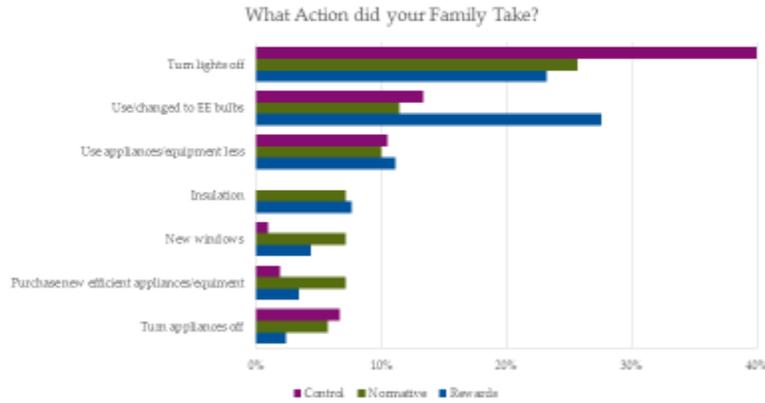
EA7b; Control n = 105; Normative n = 70; Rewards n = 59.7
Confidence precision not calculated for this question

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Appendix C. Non-Participant Survey Instrument—Control Group

Eversource New Hampshire Residential Home Energy Reports (HER) Program
Control Survey
July 9, 2015 FINAL

PURPOSE: This survey will access customer awareness of and attitudes regarding energy efficiency and current energy efficiency actions taken in the home. The evaluation team will use results from this control group survey to compare against participants in the HER program.

Table C-1. HER Control Survey Questions Table of Contents

My name is <NAME> and I'm calling from Dieringer Research Group, a national survey research company, on behalf of Eversource Energy (formerly Public Service of New Hampshire), your electric company. I have a few questions about how you use energy.

Alert interviewee that the call will be recorded.
Note that responses will remain confidential and only be reported in aggregate with other responses.

C.1 Screener

Before we get started, I'd like to ask you a few questions to make sure you qualify for participation in this study.
S1. Am I speaking with someone at [SERVICE ADDRESS]?

> 1   Yes
> 2   No [TERMINATE]
> 98   DK [TERMINATE]
> 99   REF [TERMINATE]

S2. Great, thanks. Are you the person in the household who reads the mail from Eversource Energy? This might include the electric bill, letters about your account, and information about energy efficiency.

> 1   Yes
> 2   No
> 98   DK
> 99   REF [TERMINATE]

{IF S2 = 2 or 3, *GET REFERRAL, SAY: "Can I speak to the person in your household that handles the mail your household receives from Eversource Energy?"*}

Your feedback is important and will help Eversource Energy improve future energy efficiency programs. We are only gathering information and I will not sell you anything. We will keep your name and opinions confidential and the survey will only take 7 [to 10] minutes.

Just one thing before we get started with the survey.

S4. Several of the questions I will ask concern the amount of energy-efficient lighting in your home. We know from past experience that responses to these questions are most accurate when respondents are free to walk around their home looking at the lighting. Are you on a cell phone or a cordless phone? Can we call you back on another number where you are free to move around the house? [IF TOTALLY NECESSARY, SCHEDULE A CALL BACK.]

C.2 Live Audit

L1. I want to start by asking you about the lights in the room that you're currently in. What type of room are you in? [DO NOT READ LIST]

          1 Kitchen
          2 Dining Room
          3 Living Room
          4 Bedroom
          5 Family Room
          6 Bathroom
          7 Basement
          8 Garage
          97 Other [SPECIFY]
          99 REF

L2a. Please look around at the lights in the room. How many of the light bulbs in the room are compact fluorescent lights, which are often called "CFLs"? These are the bulbs with the spiral shape. I can wait if you need a minute to look around the room.

          Number: ____
          98 DK
          99   REF

L2b. Please look around at the lights in the room. How many of the light bulbs in the room are LED (light-emitting diodes) lights, which are often more expensive than other bulbs? These generally look like a regular light bulb. I can wait if you need a minute to look around the room.

          Number: ____
          98 DK
          100   REF

L3. Now I want to ask about the total number of lights that are currently on in your home, and the number of those that are CFLs and the number that are LEDs. Let's begin with the *total* number of lights that are currently on in your home. Beginning with the room you're currently in, please walk

through your home and count the number of lights *of any type* that are *currently* turned on. Please don't turn off any of the lights that are currently on, because when you're done I'm going to ask you another question about the light bulbs that are currently on. If you need to put down the phone for this, I can wait. [IF RESPONDENT ASKS ABOUT WHETHER TO COUNT LIGHTS THEY TURN ON TO HELP THEM GO THROUGH THE HOME, THE ANSWER IS NO –ONLY COUNT LIGHTS THAT ARE ALREADY ON].

> Number of lights on in home: _____
> 98 DK
> 99 REF

L4a. Next, please count the number of CFLs currently turned on in your home. Please don't include any lights you turned on as part of your walk-through.

> Number of CFLs on: _____
> 98 DK
> 99 REF

L4b. Now, please count the number of LEDs currently turned on in your home. Please don't include any lights you turned on as part of your walk-through.

> Number of CFLs on: _____
> 98 DK
> 100 REF

L5. Now I'd like you to locate your home's thermostat. Please tell me what temperature it's currently set at.

> Set temperature:_____
> 98 DK
> 99 REF

L6. Can you tell me what your thermostat says is the actual temperature of your home?

> Actual temperature:_____
> 98 DK
> 99 REF

C.3 Energy Awareness

For the following questions, I will be referring to your electric energy use and your electric utility bill. Please answer all questions accordingly.

EA1. Please tell me how much you agree or disagree with these statements on a scale from zero to ten, where zero means you "strongly disagree" and ten means you "strongly agree".
> [RANDOMIZE ORDER, RECORD NUMBER 0-10, DK, REF]

EA1a.	I am very concerned about how energy use affects the environment.
EA1b.	I often worry that the cost of energy for my home will increase.
EA1c.	I intend to conserve on electricity consumption in my home this summer.
EA1d.	I am already doing everything I can to save energy in my home.

EA1e.   I understand how actions taken by me and others in my household result in higher or lower energy use.

EA1f.   It would make me proud to have one of the most energy-efficient houses in my neighborhood.

EA2. I'd like to ask a few more questions about your opinions on energy use and ways to save energy. Using the same scale from zero to ten that we used before, where zero means you "strongly disagree" and ten means you "strongly agree", please tell me how much you agree with the following statements.

[RANDOMIZE ORDER, RECORD NUMBER 0-10, DK, REF]

EA2a.   I pay closer attention to my energy costs now than I did two years ago.

EA2b.   I feel guilty if I use too much energy.

ER2c.   I know about other things I could be doing to save energy, beyond what I'm already doing.

EA2d.   Improving my home's energy efficiency is a worthwhile investment

EA2e.   My energy bill is noticeably lower when I make an extra effort to conserve.

EA3. How would you rate your level of satisfaction with your home's electric energy consumption on a scale from zero to ten, where zero means you are "extremely dissatisfied" and ten means you are "extremely satisfied"?

[RECORD NUMBER 0-10, DK, REF]

    EA3a. Why did you give that rating? (Open end)

EA4.   Have you heard of any energy efficiency programs offered by Eversource Energy?

[DO NOT READ; PROBE FOR SPECIFICS BUT DO NOT PROBE FOR ADDITIONAL MENTIONS; ACCEPT 8 MENTIONS]
[INTERVIEWER NOTE: IF YES, ASK "Which ones?"]
[INTERVIEWER NOTE: IF RESPONDENT SAYS "NO"; SELECT CODE 9]

1   Energy Star Appliance Rebate program
2   Energy Star Heating and Cooling Rebate program
3   NH Home Performance with ENERGY STAR – Existing Homes
4   Energy Star Homes Program – New Construction
5   Home Energy Assistance – Income Eligible
6   Home Lighting Rebates
7   I have not heard of any Eversource Energy efficiency programs [Skip to EA7]
97   Other [Specify]
98   Don't Know [Skip to EA7]
99   Refused [Skip to EA7]

EA5.   Where did you learn of these other Eversource Energy efficiency programs? [Do not read, accept 8 mentions]

1   From my bill
2   Online
3   Word of mouth (friend/family)
4   Radio advertisement
5   Flyer/mailer
6   Phone call from Eversource Energy
7   Email from Eversource Energy
97   Other (Specify)
98   DK
99   REF

EA6.   Have you participated in any of these other energy efficiency programs?

1   Yes
2   No
98   DK
99   REF

EA7.   Did you have conversations with other members of your household about reducing energy usage?

1   Yes
2   No
98 DK
99 REF

EA7a.   Do you or your family take any energy-saving actions as a result of these conversations?

1   Yes   [Continue]
2   No   [Go to PS5d]
98   DK   [Go to PS5d]
99   REF   [Go to PS5d]

EA7b.   What actions did you or your family take? (Open ended)

EA8. Did you purchase an energy-efficient appliances in the last year?

1   Yes
2   No
98   DK
99   REF

EA9.   On a scale from zero to ten, where zero is "not at all likely" and ten is "extremely likely", how likely are you to make additional energy efficiency improvements to your home in the future?

[RECORD NUMBER 0-10, DK, REF]

08   DK
99   REF

C.4 Home Characteristics

We're almost finished. I now have a few final questions about your household.

HC1. Do you rent or own your home?
1.   (Rent)
2.   (Own)
97.   (Other, Specify: _____)
98.   (Don't know)
99.   (Refused)

HC2. Which of the following best describes your home?
1.   Single-family detached building
2.   Mobile Home/Manufactured home
3.   Condominium
4.   Duplex/two-family
5.   Multi-family building (3 or more units)
6.   Townhouse
97.   (Other – Please specify: _____)
98.   (Don't know)
99.   (Refused)

HC3.   About how many square feet of living space does your home have? Your best approximation is fine. Don't include the basement unless it is a space that you consider lived in.
    [Record number of square feet]

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

HC4. What type of fuel do you use primarily to heat your home? [IF NEEDED: Read list]
01.   (Natural gas)
02.   (Bottled, tank or LP gas)
03.   (Electric) [ASK HC5; ELSE GO TO HC6]
04.   (Oil, kerosene)
05.   (Coal (coke))
06.   (Wood)
07.   (Solar)
97.   (Other, specify)
96.   (No fuel)
98.   (Don't know)
99.   (Refused)

HC5.   Do you have baseboard or heat pump as the source of electric heat in your home?
1.   Baseboard

2.   Heat pump
98.   (Don't know)
99.   (Refused)

HC6.   What type of fuel do you use to heat your water?

01.   (Natural gas)
02.   (Bottled, tank or LP gas)
03.   (Electric)
06.   (Wood)
07.   (Solar)
97.   (Other, specify)
96.   (No fuel)
98.   (Don't know)
99.   (Refused)

C.5 Demographics

D1.   Approximately, how many people live in your household full time (at least nine months out of the year)? [NUMERIC 0-20, 98=DK, 99=Refused]

D2.   In what year were you born?
00. [NUMERIC OPEN END FROM 1890 TO 1994]
9999. (REFUSED)

D3.   What is the last grade of school you completed?
1.   (Grade school or less (1-8))
2.   (Some high school (9-11))
3.   (Graduated high school (12))
4.   (Vocational/technical school)
5.   (Some college (1-3 years))
6.   (Graduated college (4 years))
7.   (Post-graduate education)
98   (Don't know)
99   (Refused)

D5.   Which of the following categories best represents your annual household income from all sources in 2014, before taxes? Please stop me when I get to your range. (READ)
1.   Less than $15,000
2. $15,000-$29,999
3. $30,000-$49,999
4. $50,000-$74,999
5. $75,000-$99,999
6. $100,000 and over

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

D6. [RECORD RESPONDENT GENDER – DO NOT READ]
1.   Male
2.   Female

That's all of the questions I have for you today. Thank you for your time. Eversource Energy appreciates your participation.

Appendix D. Participant Survey Instrument—Normative and Reward Group

Eversource New Hampshire Residential Home Energy Reports (HER) Program
Normative and Reward Participant Survey
July 9, 2015 FINAL

PURPOSE: This survey is designed to measure overall participant satisfaction with the HER program. Additionally, the survey will determine if satisfaction differs between the normative and rewards treatment group.

Table D-1. HER Survey Questions Table of Contents

My name is <NAME> and I'm calling from Dieringer Research Group, a national survey research company, on behalf of Eversource Energy (formerly Public Service of New Hampshire), your electric company. I have a few questions about one of Eversource Energy's energy efficiency programs.

Alert interviewee that the call will be recorded.
Note that responses will remain confidential and only be reported in aggregate with other responses.

D.1 Screener

Before we get started, I'd like to ask you a few questions to make sure you qualify for participation in this study.

S1. Am I speaking with someone at [SERVICE ADDRESS]?
      1   Yes
      2   No [TERMINATE]
      98   DK [TERMINATE]
      99   REF [TERMINATE]

S2. Great, thanks. Are you the person in the household who reads the mail from Eversource Energy? This might include the electric bill, letters about your account, and information about energy efficiency.
      1   Yes
      2   No

        98   DK
        99   REF [TERMINATE]

{IF S2 = 2 or 3, *GET REFERRAL, SAY: "Can I speak to the person in your household that handles the mail your household receives from Eversource Energy?"*}

S3. Do you recall receiving reports from Eversource Energy that describe your home's electric energy use?

(READ IF NECESSARY: The reports are different from your electric utility bill. They arrive in a different envelope, are printed on one piece of paper, and include color charts and graphs about your electric energy use.)

        1   Yes   [CONTINUE]
        2   No   [TERMINATE]
        98 DK   [TERMINATE]
        99 REF   [TERMINATE]

Your feedback is important and will help Eversource Energy improve future energy efficiency programs. We are only gathering information and I will not sell you anything. We will keep your name and opinions confidential and the survey will only take ten [to fifteen] minutes.

Just one thing before we get started with the survey.

S4. Several of the questions I will ask concern the amount of energy-efficient lighting in your home. We know from past experience that responses to these questions are most accurate when respondents are free to walk around their home looking at the lighting. Are you on a cell phone or a cordless phone? Can we call you back on another number where you are free to move around the house? [IF TOTALLY NECESSARY, SCHEDULE A CALL BACK.]

D.2 Live Audit

L1. I want to start by asking you about the lights in the room that you're currently in. What type of room are you in? [DO NOT READ LIST]
        1 Kitchen
        2 Dining Room
        3 Living Room
        4 Bedroom
        5 Family Room
        6 Bathroom
        7 Basement
        8 Garage
        97 Other [SPECIFY]
        99 REF

L2a. Please look around at the lights in the room. How many of the light bulbs in the room are compact fluorescent lights, which are often called "CFLs"? These are the bulbs with the spiral shape. I can wait if you need a minute to look around the room.

       Number: _____
       98 DK
       101 REF

L2b. Please look around at the lights in the room. How many of the light bulbs in the room are LED (light-emitting diodes) lights, which are often more expensive than other bulbs? These generally look like a regular light bulb. I can wait if you need a minute to look around the room.

       Number: _____
       98 DK
       102 REF

L3. Now I want to ask about the total number of lights that are currently on in your home, and the number of those that are CFLs and the number that are LEDs. Let's begin with the *total* number of lights that are currently on in your home. Beginning with the room you're currently in, please walk through your home and count the number of lights *of any type* that are *currently* turned on. Please don't turn off any of the lights that are currently on, because when you're done I'm going to ask you another question about the light bulbs that are currently on. If you need to put down the phone for this, I can wait. [IF RESPONDENT ASKS ABOUT WHETHER TO COUNT LIGHTS THEY TURN ON TO HELP THEM GO THROUGH THE HOME, THE ANSWER IS NO –ONLY COUNT LIGHTS THAT ARE ALREADY ON].

       Number of lights on in home: _____
       98 DK
       100 REF

L4a. Next, please count the number of CFLs currently turned on in your home. Please don't include any lights you turned on as part of your walk-through.

       Number of CFLs on: _____
       98 DK
       101 REF

L4b. Now, please count the number of LEDs currently turned on in your home. Please don't include any lights you turned on as part of your walk-through.

       Number of CFLs on: _____
       98 DK
       102 REF

L5. Now I'd like you to locate your home's thermostat. Please tell me what temperature it's currently set at.

       Set temperature:_____
       100 DK
       101 REF

L6. Can you tell me what your thermostat says is the actual temperature of your home?

Actual temperature:_____

98 DK

99 REF

D.3 Energy Awareness

For the following questions, I will be referring to your electric energy use and your electric utility bill. Please answer all questions accordingly.

EA1. Please tell me how much you agree or disagree with these statements on a scale from zero to ten, where zero means you "strongly disagree" and ten means you "strongly agree".

[RANDOMIZE ORDER, RECORD NUMBER 0-10, DK, REF]

EA1a.   I am very concerned about how energy use affects the environment.
EA1b.   I often worry that the cost of energy for my home will increase.
EA1c.   I intend to conserve on electricity consumption in my home this summer.
EA1d.   I am already doing everything I can to save energy in my home.
EA1e.   I understand how actions taken by me and others in my household result in higher or lower energy use.
EA1f.   It would make me proud to have one of the most energy-efficient houses in my neighborhood.

EA2. I'd like to ask a few more questions about your opinions on energy use and ways to save energy. Using the same scale from zero to ten that we used before, where zero means you "strongly disagree" and ten means you "strongly agree", please tell me how much you agree with the following statements.

[RANDOMIZE ORDER, RECORD NUMBER 0-10, DK, REF]

EA2a.   I pay closer attention to my energy costs now than I did two years ago.
EA2b.   I feel guilty if I use too much energy.
ER2c.   I know about other things I could be doing to save energy, beyond what I'm already doing.
EA2d.   Improving my home's energy efficiency is a worthwhile investment.
EA2e.   My energy bill is noticeably lower when I make an extra effort to conserve.

EA3. How would you rate your level of satisfaction with your home's electric energy consumption on a scale from zero to ten, where zero means you are "extremely dissatisfied" and ten means you are "extremely satisfied"?

[RECORD NUMBER 0-10, DK, REF]

EA3a. Why did you give that rating? (Open end)

EA4.   Have you heard of any energy efficiency programs offered by Eversource Energy?

[DO NOT READ; PROBE FOR SPECIFICS BUT DO NOT PROBE FOR ADDITIONAL MENTIONS; ACCEPT 8 MENTIONS]

[INTERVIEWER NOTE: IF YES, ASK "Which ones?"]
[INTERVIEWER NOTE: IF RESPONDENT SAYS "NO"; SELECT CODE 9]

8   Energy Star Appliance Rebate program
9   Energy Star Heating and Cooling Rebate program
10   NH Home Performance with ENERGY STAR – Existing Homes
11   Energy Star Homes Program – New Construction
12   Home Energy Assistance – Income Eligible
13   Home Lighting Rebates
14   I have not heard of any Eversource Energy efficiency programs [Skip to EA7]
97   Other [Specify]
98   Don't Know [Skip to EA7]
99   Refused [Skip to EA7]

EA5.   Where did you learn of these other Eversource Energy efficiency programs? [Do not read, accept 8 mentions]

8   From my bill
9   Online
10   Word of mouth (friend/family)
11   Radio advertisement
12   Flyer/mailer
13   Phone call from Eversource Energy
14   Email from Eversource Energy
97   Other (Specify)
98   DK
99   REF

EA6.   Have you participated in any of these other energy efficiency programs?

1   Yes
2   No
98   DK
99   REF

EA7.   Did you have conversations with other members of your household about reducing energy usage?

3   Yes
4   No
98   DK
99   REF

EA7a.   Did you or your family take any energy-saving actions as a result of receiving the HER reports?

3   Yes   [Continue]
4   No [Go to EA8]

        98   DK   [Go to EA8]
        99   REF   [Go to EA8]

EA7b.   What actions did you or your family take? (Open ended)

EA8. Did the tips in the home energy reports motivate you to purchase an energy-efficient appliance in the last year?

        3   Yes
        4   No
        98   DK
        99   REF

EA9.   On a scale from zero to ten, where zero is "not at all likely" and ten is "extremely likely", how likely are you to make additional energy efficiency improvements to your home in the future?

        [RECORD NUMBER 0-10, DK, REF]

        98   DK
        99   REF

EA10.   Do you plan to continue the energy-saving steps you took during your participation in the Eversource Energy HER Pilot Program?

        1   Yes
        2   No
        98   DK
        99   REF

D.4 HER Program Satisfaction

PS1.   How often do you read the home energy reports? Would you say…[READ LIST]?

        1   Always
        2   Sometimes
        3   Never   [SKIP TO (R1-Reward Group; HC1: Normative Group)]
        98 DK (DO NOT READ)   [SKIP TO (R1-Reward Group; HC1: Normative Group)]
        99 REF (DO NOT READ) [SKIP TO R1-Reward Group; HC1: Normative Group]

PS2.   On a scale of zero to ten, with zero being "extremely dissatisfied" and ten being "extremely satisfied," how satisfied are you with the home energy reports? You may use any number from zero to ten.
        [RECORD NUMBER 0-10, DK, REF]
        98   DK
        99   REF

PS3.   Please tell me why you gave that rating.
                (ASK AS OPEN END; PROBE FOR SPECIFICS)

[OPEN END]

    98   DK
    99   REF

PS4.   On a scale of zero to ten, where zero means "strongly disagree" and ten means "strongly agree," please rate the following statements...
    (READ STATEMENTS – REPEAT SCALE AS NECESSARY)
    [RECORD NUMBER 0-10, DK, REF] [RANDOMIZE – DYNAMIC DISPLAY]

    ASK OF ALL
    PS4a. The home energy reports helped me better understand my energy usage.
    PS4b.   The tips in the home energy reports are relevant to me.
    ASK OF NORMATIVE GROUP ONLY
    PS4c.   Being compared to my neighbors motivates me to use less energy.
    PS4d.   Being compared to my neighbors motivates me to use more energy.
    ASK OF ALL
    PS4e. The home energy reports helped me better understand ways to save energy.
    PS4f. The home energy reports help me save money on my bills.

PS5.   I'm going to read a list of the pieces of information provided in the home energy reports. Please indicate whether or not you consider each piece of information valuable. *[ASK AS YES/NO, RECORD YES/NO, DK, REF]* [RANDOMIZE – DYNAMIC DISPLAY]

    b.   The comparison of my home's energy use to similar homes [ASK ONLY OF NORMATIVE GROUP]
    c.   The comparison of my home's energy use to my home in the previous year [ASK ONLY OF REWARD GROUPS]
    d.   The personalized savings goal
    e.   The energy-saving tips
    f.   The opportunity to earn rewards points [ASK ONLY OF REWARD GROUPS]

PS6.   If Eversource Energy were to continue sending home energy reports similar to those we've been discussing, what additional information would be useful for you?

    [ASK OPEN END, PROBE FOR SPECIFCS]

D.5 Rewards Questions

ASK OF PARTICIPANTS IN REWARD GROUPS
    1.   SIGNED UP FOR REWARDS AND REDEEMED THEM
    2.   SIGNED UP FOR REWARDS AND DID NOT REDEEM THEM
    3.   DID NOT SIGN UP FOR REWARDS

R1. Did you sign up to receive reward points from the Eversource Energy Pilot Program? (GROUPS 1,2,3)

    1   Yes [CONTINUE]
    2   No [SKIP TO R9]
   98 DK
   99 REF

ASK ONLY IF THEY SIGNED UP FOR THE REWARDS. (GROUPS 1, 2)

R2. On a scale of zero to ten, where zero is "very difficult" and ten is "very easy", how would you rate the sign-up process?

[RECORD NUMBER 0-10, DK, REF]

R3. Did you redeem the points that you earned by saving energy in your home? (GROUPS 1,2)

    1   Yes [CONTINUE] [N=70]
    2   No [SKIP TO R10] [N=70]
   98 DK [SKIP TO R5]
   99 REF [SKIP TO R5]

ASK ONLY IF THEY REDEEMED THE POINTS AND REMEMBERED THAT THEY EARNED POINTS (GROUP 1 ONLY)

R4. Did the reward options motivate you (or your family) to earn points?

    1   Yes
    2   No
   98 DK
   99 REF

R5. On a scale of zero to ten, where zero is "extremely difficult" and ten is "extremely easy", how would you rate the process of earning points? (GROUPS 1, 2)

[RECORD NUMBER 0-10, DK, REF]

R6. Using the zero to ten scale, how would you rate the process of redeeming rewards where zero is "extremely difficult to redeem rewards" and ten is "extremely easy to redeem rewards"? (GROUPS 1,2)

[RECORD NUMBER 0-10, DK, REF]

R7.   Based on your experiences, how likely would you be to recommend Eversource's rewards program to a friend or colleague? Please answer on a scale from zero to ten, where zero is "not at all likely" and ten is "extremely likely".

[RECORD NUMBER 0-10, DK, REF]

GROUP 1 SKIPS TO HC1

ASK ONLY IF THEY DID NOT REDEEM THEIR POINTS – GROUP 2 THEN GO TO HC1

R8. You earned 150 reward points for signing up for the program and may have earned additional points for reducing your energy usage. Why didn't you redeem your points before the program ended? [Do not read, accept 7 mentions] [SKIP TO HC1]

1. I forgot
2. I was not interested in any of the reward options
3. I am too busy
4. Redeeming the points seemed like it was too hard
5. Redeeming the points looked like it took too much time
6. I tried to redeem my points but could not figure out how
7. Other [Specify]
98 DK
99 REF

ASK ONLY IF THEY DID NOT SIGN UP FOR REWARDS – GROUP 3

R9. Why didn't you create an account to earn reward points? [Do not read, accept 7 mentions]

1. I forgot
2. I was not interested in any of the reward options
3. I am too busy
4. Signing up seemed like it was too hard
5. Signing up looked like it took too much time
6. I tried to create an account but could not figure out how
7. Other [Specify]
98 DK
99 REF

D.6 Home Characteristics

We're almost finished. I now have a few final questions about your household.
HC1. Do you rent or own your home?
1. (Rent)
2. (Own)
00. (Other, Specify: _____)
98. (Don't know)
99. (Refused)

HC2. Which of the following best describes your home?
1. Single-family detached building
2. Mobile Home/Manufactured home
3. Condominium
4. Duplex/two-family
5. Multi-family building (3 or more units)
6. Townhouse

00.   (Other – Please specify: _____)
98.   (Don't know)
99.   (Refused)

HC3.   About how many square feet of living space does your home have? Your best approximation is fine. Don't include the basement unless it is a space that you consider lived in.
        [Record number of square feet]

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

HC4. What type of fuel do you use primarily to heat your home? [IF NEEDED: Read list]
01.   (Natural gas)
02.   (Bottled, tank or LP gas)
03.   (Electric) [ASK HC5; ELSE GO TO HC6]
04.   (Oil, kerosene)
05.   (Coal (coke))
06.   (Wood)
07.   (Solar)
00.   (Other, specify)
96.   (No fuel)
98.   (Don't know)
99.   (Refused)

HC5.   Do you have baseboard or heat pump as the source of electric heat in your home?

        1. Baseboard
        2. Heat pump
        98. (Don't know)
        99. (Refused)

HC6.   What type of fuel do you use to heat your water?

01.   (Natural gas)
02.   (Bottled, tank or LP gas)
03.   (Electric)
04.   (Wood)
05.   (Solar)
06.   (Other, specify)
07.   (No fuel)
98.   (Don't know)
99.   (Refused)

D.7 Demographics

D1.   Approximately, how many people live in your household full time (at least nine months out of the year)? [NUMERIC 0-20, 98=Don't know, 99=Refused]

D2.   In what year were you born?
00. [NUMERIC OPEN END FROM 1890 TO 1994]
9999. (REFUSED)

D3.   What is the last grade of school you completed?
1.   (Grade school or less (1-8))
2.   (Some high school (9-11))
3.   (Graduated high school (12))
4.   (Vocational/technical school)
5.   (Some college (1-3 years))
6.   (Graduated college (4 years))
7.   (Post-graduate education)
98   (Don't know)
99   (Refused)

D5.   Which of the following categories best represents your annual household income from all sources in 2014, before taxes? Please stop me when I get to your range. (READ)
1.   Less than $15,000
2. $15,000-$29,999
3. $30,000-$49,999
4. $50,000-$74,999
5. $75,000-$99,999
6. $100,000 and over
98.   (Don't know)
99.   (Refused)

D6. [RECORD RESPONDENT GENDER – DO NOT READ]
1.   Male
2.   Female

That's all of the questions I have for you today. Thank you for your time. Eversource Energy appreciates your participation.

Appendix E. RCT Memo

The following is a copy of the memo Navigant provided to Eversource New Hampshire in January 2014 with the results of the RCT consistency check.

To: **Cynthia Trottier; PSNH**
              Sarah Burns; Opower

From: **Bethany Glinsmann, Bill Provencher; Navigant**

Date: **January 16, 2014**

Re: **Validation of Control Group for CEP Program (Round 2)**

This memorandum addresses Navigant's validation of the round 2 random allocation of households to the treatment and control groups for the Public Service of New Hampshire (PSNH) Residential Customer Engagement Pilot (CEP) program. The randomization was originally conducted in August 2013; however, problems with the household selection were identified, so the randomization was redone in January 2014.

Methodology
The CEP program consists of 26,250 participants and 26,250 control households selected by the program implementer, Opower. The participants are evenly split between two treatment types: Normative and Rewards. Navigant received data for 111,712 eligible customers that were not selected for the participant or control groups. Navigant compared the monthly energy usage of the treatment groups, control group, and other eligible customers during the 24 month period prior to the start of the program (January 2012 to December 2013). If the selection of participants and controls from the pool of eligible customers is random, the three groups should have the same distribution of energy usage for each of the 24 months before the start of the program. For this analysis, Navigant conducted four comparisons:

1. Normative Treatment vs. Rewards Treatment

2. Normative Treatment vs. Control

3. Rewards Treatment vs. Control

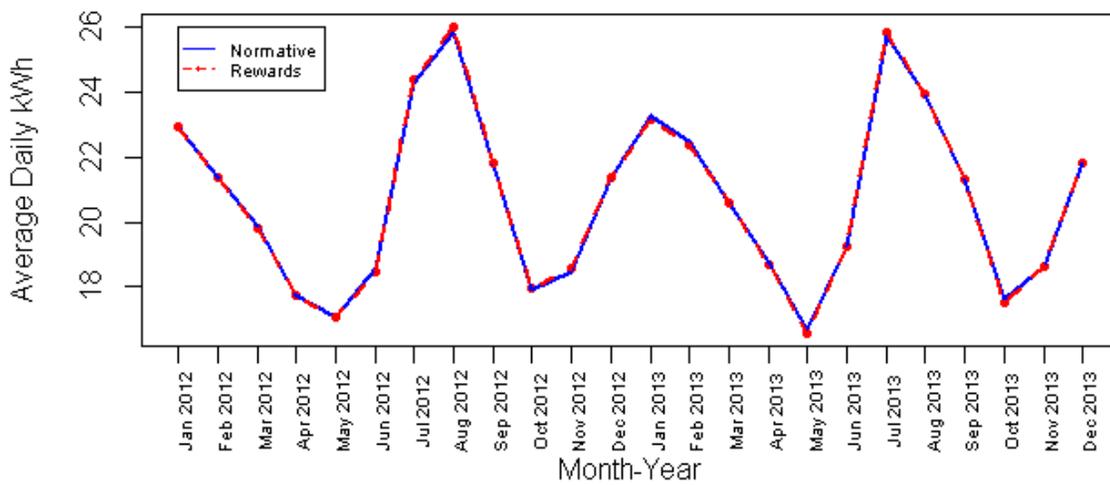4. Program (Normative Treatment, Rewards Treatment, Control) vs. Non-Program

For each of the four comparisons, Navigant conducted a simple comparison of means in each of the 24 months. Additionally, Navigant regressed the average daily usage on a binary group variable and a set of 24 monthly fixed effects and the standard error was clustered at the household level. This model tests whether there is a statistically significant difference in usage for the two groups after conditioning on monthly factors affecting all households and after accounting for correlation across months in the unobservable factors affecting energy use at the household level. The parameter on the binary group variable indicates whether there is a statistically significant difference in usage between the two groups.

Results

The results indicate that the allocation of CEP program households between treatment and control groups, and between program and non-program customers, is consistent with a randomized controlled trial. The comparison of means revealed no statistically significant differences in average usage among groups, with the exception of two months (March 2012, April 2012) for the Program vs. Non-Program customers. Note that using a 90% confidence interval we expect on average one out of every ten months to have a statistically significant difference in average consumption due to random chance.

The figures below depict the average usage for each of the four comparisons. The solid blue line and red dashed line indicate the average energy usage for the two groups being compared. The black Xs in Figure E-4 indicate that the difference in usage is statistically significant at the 90% confidence level. Across all figures the two lines are essentially identical, indicating no difference in average usage patterns for the two groups.

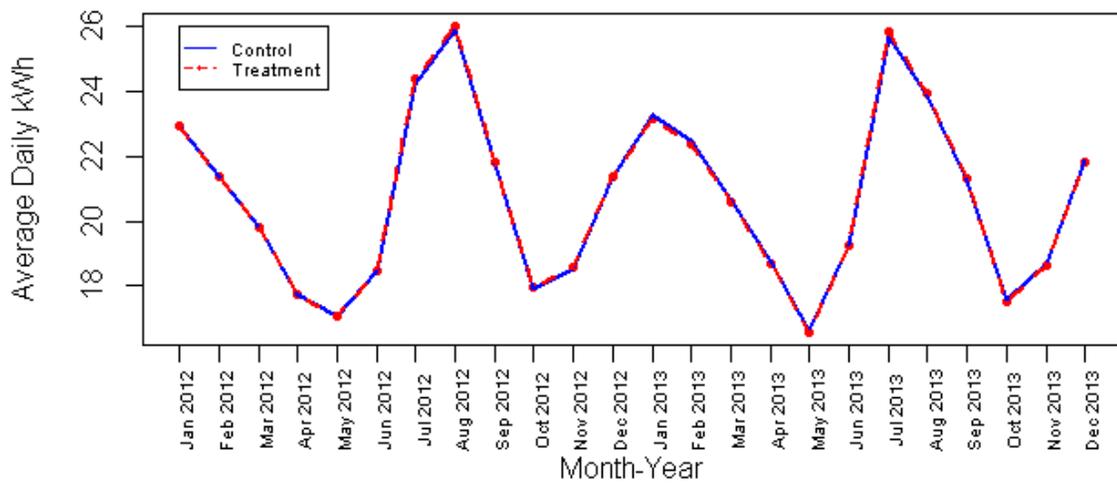**Figure E-1. Mean Energy Usage for Treatment and Control Households, Normative Treatment vs. Rewards Treatment**

Source: Navigant analysis

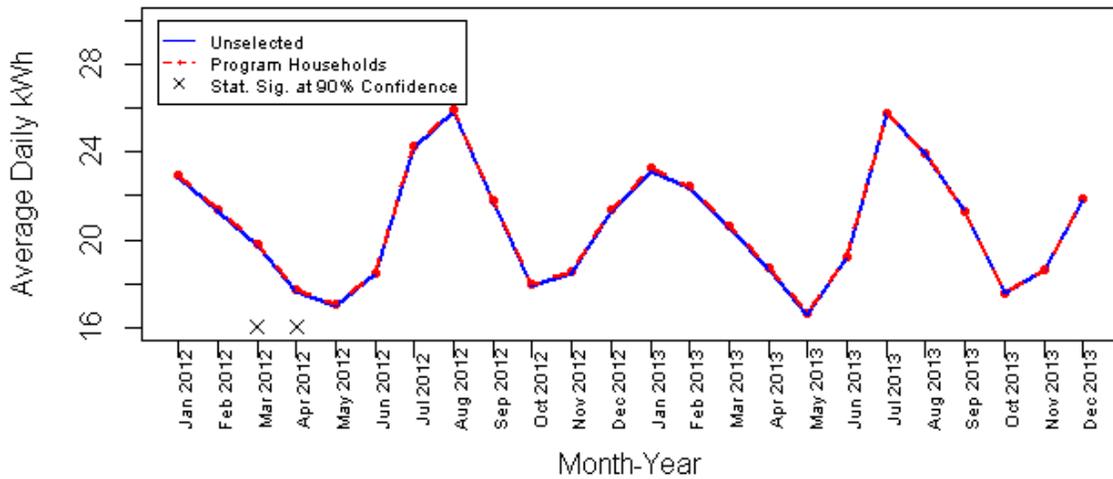**Figure E-2. Mean Energy Usage for Treatment and Control Households, Normative Treatment vs. Control**
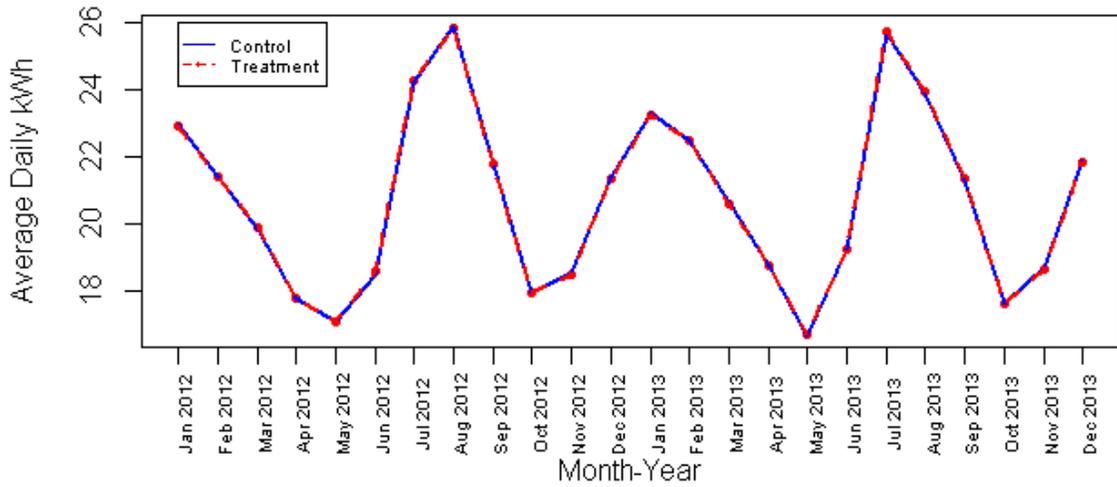
Source: Navigant analysis

Figure E-3. Mean Energy Usage for Treatment and Control Households, Rewards Treatment vs. Control

Source: Navigant analysis

Figure E-4. Mean Energy Usage for Treatment and Control Households, Program vs. Non-Program

Source: Navigant analysis

Having found that monthly differences in usage were generally not statistically significant, Navigant estimated a regression model to investigate whether monthly differences were jointly significant. For each of the four comparisons the parameter on the binary group variable was not statistically significant at the 90% level. This supports the conclusion that households were randomly allocated to the two treatment groups and control group.

Finally, Navigant confirmed that all program households had at least 13 months of billing history in the period of December 2011 to January 2014.

Conclusion

Given that the differences in average energy usage for the two treatment groups, control group, and non-program households were not statistically significant, Navigant concludes that the allocation of CEP program households between treatment and control groups, and between program and non-program customers, is consistent with a randomized controlled trial.