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Idaho Home Energy Reports Program 2015-2016 Evaluation Report

Presented to:
Rocky Mountain Power

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EXECUTIVE SUMMARY

Program Description

Rocky Mountain Power Idaho's Home Energy Reports (HER) program is designed to generate energy savings by providing residential customers with information about their individual energy use as well as related energy conservation suggestions and tips. The information is provided in the form of regularly mailed reports[1] that illustrate the following:

- How customers' recent energy use compares to their energy use in the past
- Tips on how customers can reduce energy consumption, some of which are tailored to each customer's unique circumstances
- Information on how customers' energy use compares to that of neighbors with homes with similar household characteristics

Other studies have shown that customers who receive this type of information are stimulated to reduce their energy use, creating average energy savings in the one to two percent range depending on local energy use patterns.[2]

An important feature of the program is that it is a randomized controlled trial (RCT). Eligible customers are randomly assigned to a treatment group or a control group to estimate changes in energy use due to the program. As an opt-out implementation model, customers do not choose to participate, but they can opt-out if they do not wish to receive the reports—i.e., customers can request removal from the program. Figure 1 illustrates the HER program design.

[1] Participants received monthly reports for the first three months of the program and then moved to every other month until August 2015. Reports were not sent from September to December 2015 and picked up again with a quarterly cadence in January 2016.

[2] See for example:

Allcott, Hunt. 2011. *Social Norms and Energy Conservation.* Journal of Public Economics, Vol 95 (9-10), pp. 1,082–1,095.

Davis, Matt. 2011. *Behavior and Energy Savings: Evidence from a Series of Experimental Interventions*. Environmental Defense Fund.

Rosenberg, Mitchell, G.K. Agnew, and K. Gaffney. *Causality, Sustainability, and Scalability – What We Still Do and Do Not Know about the Impacts of Comparative Feedback Programs*. Paper prepared for 2013 International Energy Program Evaluation Conference, Chicago. 2013.

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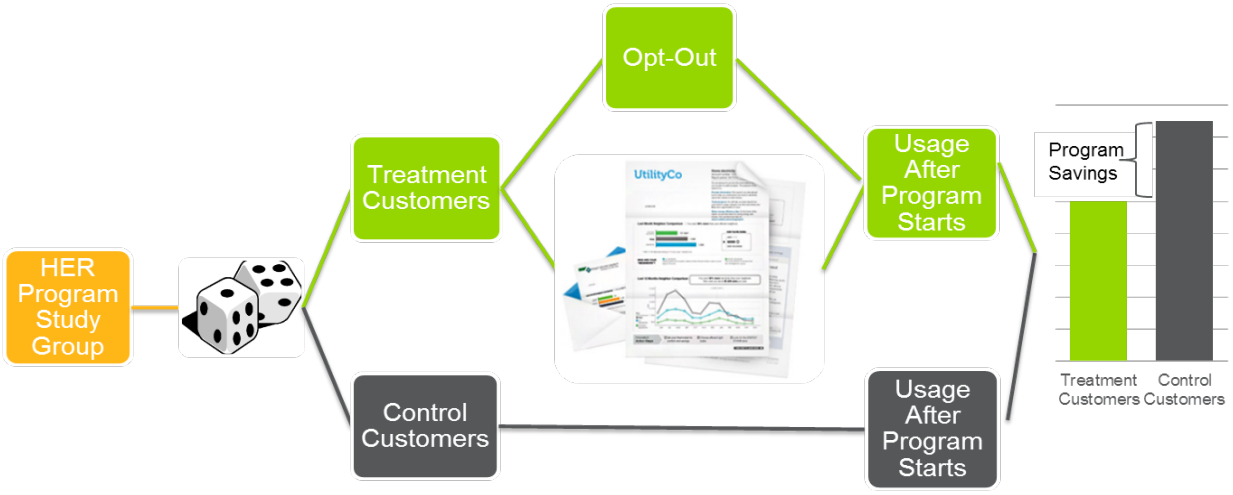
Figure 1. HER Program Design



Source: Navigant

For this evaluation, the program launch is defined as the beginning of the month in which reports were first generated which was December 2014.

Total Savings by Wave and Year

Summaries of total evaluated program savings are shown in Table 1. Navigant considered three evaluation periods for each wave: 2015, 2016, and the two years combined. December 2014 was included in the 2015 analysis making that period 13 months and the 2015-2016 together analysis making that period 25 months. Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis because there is additional information and statistical power in running the two years together rather than just adding together the results of year 2015 and year 2016. Since each period was run as a separate analysis, the savings total for year 2015 and year 2016 does not sum to the savings over the total combined period of 2015-2016 together. The number of treatment customers is the number at the start of each evaluation period.

Table 1 includes summary information from the analysis:

- "Verified Evaluation Savings" which are the savings found in the evaluation before accounting for savings that may be double-counted with other programs.
- "Reported Savings" which came from Rocky Mountain Power's cost-effectiveness inputs for 2015 and 2016. For the 2015-2016 column, 2015 and 2016 were summed together.
- "Realization Rate" which was calculated by comparing reported savings to the verified evaluation savings (prior to adjusting for doubling counting) which is the most accurate comparison as the reported savings do not account for double-counting.
- "Percent Savings" which are the absolute savings converted to a percent.

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- Verified Net Savings which are the savings from the evaluation adjusted for savings that are double-counted with other programs.

As found in Table 1, the need to account for savings that are double-counted with other energy efficiency programs arises because the HER program may change the participation rate in other energy efficiency programs; this change in participation is referred to as uplift. In some cases, uplift estimates are positive, meaning the HER program increased the participation in other programs. With positive uplift, the savings from uplift are subtracted from the HER program (causing HER program savings to go down) to avoid double-counting the savings in both the HER program and another energy efficiency program. Uplift estimates can also be negative, meaning the HER program decreased participation in other programs. With negative uplift, the negative savings from uplift are subtracted from the HER program (causing HER program savings to go up) to avoid making the baseline usage too low and thus underestimating HER program savings. For this program, the overall uplift was positive in both years causing HER program savings to go down after adjusting for uplift. The methodology for calculating uplift is described in more detail in Section 2.3. Detailed results of the uplift analysis are in Section 5.3.

Table 1. Program Electric Savings*, **

Type of Statistic	2015	2016	2015-2016
Number of Treatment Customers	17,805	16,015	17,805
Verified Evaluation Savings (MWh), Prior to Uplift Adjustment	3,216	3,103	6,319
Reported Savings (MWh)	3,461	3,423	6,883
Realization Rate	93%	91%	92%
Percent Savings	1.16%	1.33%	1.24%
Verified Net Savings (MWh), After Uplift Adjustment	**3,173**	**3,098**	**6,271**

*All savings are at the site.

** Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis; the savings totals for year 2015 and year 2016 do not sum to the savings over the total combined period of 2015-2016 together.

Source: Navigant analysis

Program Cost-Effectiveness

The cost-effectiveness of utility-funded programs in Idaho is typically analyzed using tests prescribed by the California Standard Practice Manual.[3] Detailed information on the cost-effectiveness results are

[3] The California Standard Practice Manual is an industry accepted manual; it identifies the cost and benefit components and cost-effectiveness calculation procedures from several major perspectives: participant, ratepayer impact measure (RIM), and total resource cost (TRC). Definitions and methodologies of these cost-effectiveness tests can be found at http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF.

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included in Section 7 of this report. Table 2 includes results from the cost-benefit tests for 2015, 2016, and for the two years combined.[4]

Table 2. Cost-Benefit Results by Evaluation Period

Evaluation Period	PTRC	TRC	UCT	RIM	PCT
2015	1.71	1.55	1.55	0.37	-
2016	1.53	1.39	1.39	0.38	-
2015-2016	1.61	1.46	1.46	0.38	-

Source: Navigant analysis

The program passes all cost-effectiveness tests except for the Ratepayer Impact Measure (RIM) test.[5] The Utility Cost Test is the primary criterion in Idaho and the program remains cost-effective from the perspective over the 25-month evaluation period.

Key Findings and Recommendations

This section summarizes key findings and recommendations.

Impact Evaluation

Finding 1. Table 3 below shows the total evaluated energy savings in megawatt hours (MWh), after adjusting for uplift,[6] and percent savings in each time period. Percent savings grew slightly from the first to the second year indicating ramp-up as the program matured.

Table 3. Savings by Wave and Year*

	2015	2016	2015-2016
Percent Savings	1.16%	1.33%	1.24%
Total Savings (MWh)	3,173	3,098	6,271

* Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis; the savings totals for year 2015 and year 2016 do not sum to the savings over the total combined period of 2015-2016 together.

Source: Navigant analysis

[4] Due to the complexity of running the cost-effectiveness test for a combination of years using one set of avoided costs, Navigant's analysis combined the results of the individual program year analyses to arrive at a combination of the two years. Therefore, the savings presented throughout the report are slightly different than the savings used for the 2015-2016 cost-effectiveness tests. This approach is consistent with previous evaluations for the HER program.

[5] The Ratepayer Impact Measure Test (RIM) measures the impact a conservation program will have on utility rates and takes into account lost revenues, though does not include long term rate impacts. Most EE programs have RIM test values less than 1.0.

[6] Uplift occurs when HER treatment customers participate in Rocky Mountain Power's other energy efficiency programs at a higher or lower rate than they would have in the absence of the HER program. Savings driven by uplift (positive or negative) must be subtracted from the HER savings to avoid double-counting savings in other energy efficiency programs. Uplift is discussed in more detail in Section 2.3.

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Recommendation 1. Future refill waves should target the highest usage customers not already in the program. Prior to adding future refill waves, the program should verify that the allocation of households across the treatment and control groups is consistent with a RCT.

Finding 2. Total double-counted savings were 48 MWh (or 0.8 percent of total savings) for the Appliance Recycling and Home Energy Savings (HES) programs across 2015 and 2016, which means that treatment customers were slightly more likely than control customers to participate in other Rocky Mountain Power energy efficiency programs.[7] The small magnitude indicates double-counting of energy savings is not a concern for this program at this time. Additionally, Navigant found no evidence of double-counting in the upstream energy efficient lighting portion of the HES program.

Cost-Effectiveness Evaluation

Finding 3. The program was cost-effective in 2015, 2016 and the combination of program years. The program passes all cost-effectiveness tests except for the RIM test.

Process Evaluation

Finding 4. As shown in Table 4 below, survey respondents reported high levels of satisfaction with Rocky Mountain Power overall. Satisfaction was the same for treatment and control customers.

Finding 5. Sixty-two percent of treatment respondents indicated that they were satisfied with the reports, as shown in Table 4 below. Although, this level of satisfaction may seem low compared to other programs it is in-line with satisfaction seen for other HER programs. Control respondents do not receive reports from the HER program and were not asked this question.

Finding 6. Treatment respondents reported lower satisfaction with their home energy usage than control respondents (59 percent, 71 percent), as shown in Table 4 below. One possible explanation for lower satisfaction with energy use among treatment customers was that they received frequent tips and granular comparisons to remind them that there is more that they could do to save energy; thus, these customers were less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

Table 4. Summary of Satisfaction Findings*

	Treatment	Control
Satisfaction with Rocky Mountain Power	87%	87%
Satisfaction with the HER program	62%	-
Satisfaction with home's energy usage	59%	71%

* Percentages given above reflect percent satisfied (rating of 6 or higher on a scale from 1 to 10).

Source: Navigant analysis

[7] The double counting results are discussed in more detail in Section 5.3.

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1. INTRODUCTION

1.1 Program Description

Rocky Mountain Power's Idaho Home Energy Reports (HER) program is designed to generate energy savings by providing residential customers with information about their individual energy use and related energy conservation suggestions and tips. The information is provided in the form of regularly mailed reports[8] that illustrate the following:

- How customers' recent energy use compares to their energy use in the past
- Tips on how customers can reduce energy consumption, some of which are tailored to each customer's unique circumstances
- Information on how customers' energy use compares to that of neighbors with homes with similar household characteristics

Other studies have shown that customers who receive this type of information are stimulated to reduce their energy use, creating average energy savings in the one to two percent range depending on local energy use patterns.[9]

An important feature of the program is that it is a randomized controlled trial (RCT). Eligible customers are randomly assigned to a treatment group or a control group to estimate changes in energy use due to the program. As an opt-out implementation model, customers do not choose to participate, but they can opt-out if they do not wish to receive the reports—i.e., customers can request removal from the program. Figure 1-1 illustrates the HER program design.

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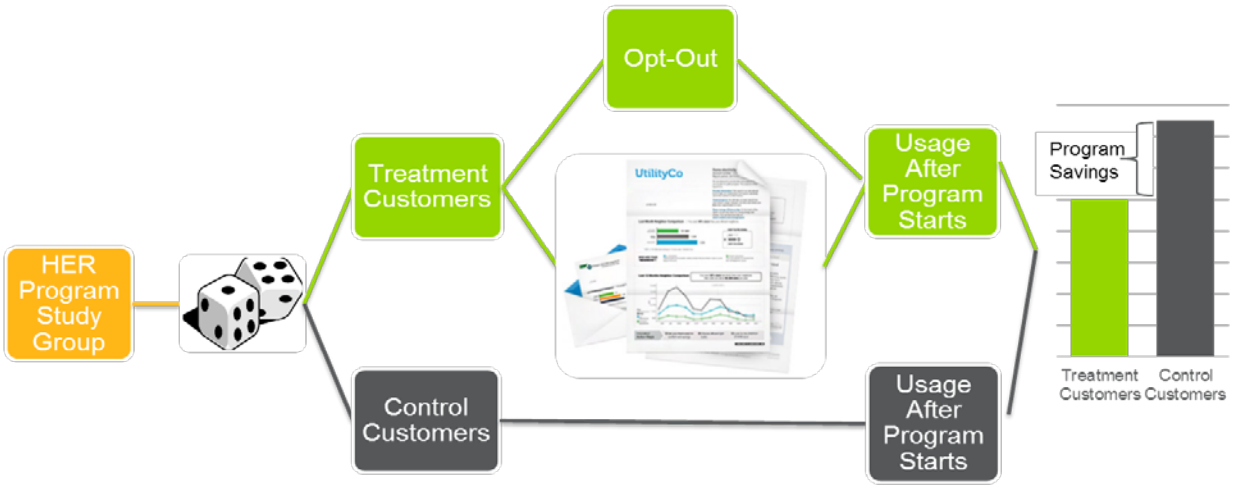
Figure 1-1. HER Program Design

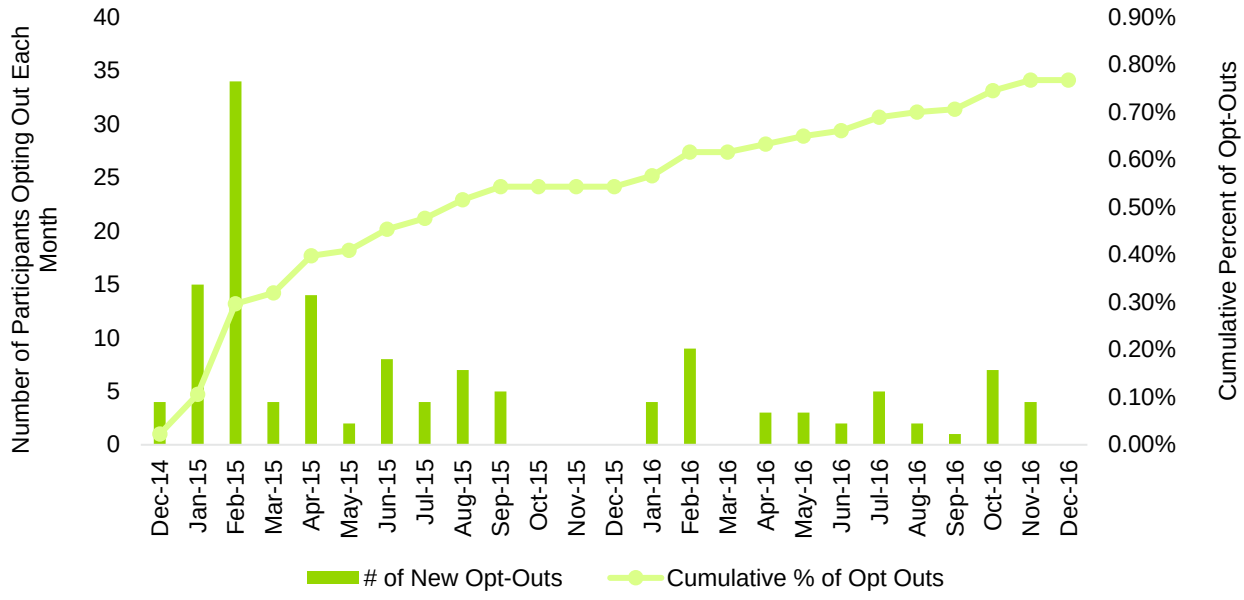


Source: Navigant

For this evaluation, the program launch is defined as the beginning of the month in which reports were first generated which was December 2014.

There are two sources of decay in program participation over time. The first is customers who opt out of the program. Figure 1-2 shows the number of treatment customers opting out of the program each month and the cumulative percentage of opt outs since the start of the program. Since the start of the program 0.77 percent of the treatment customers have opted out.

Figure 1-2. Customers Opting Out of the HER Program



Source: Navigant analysis

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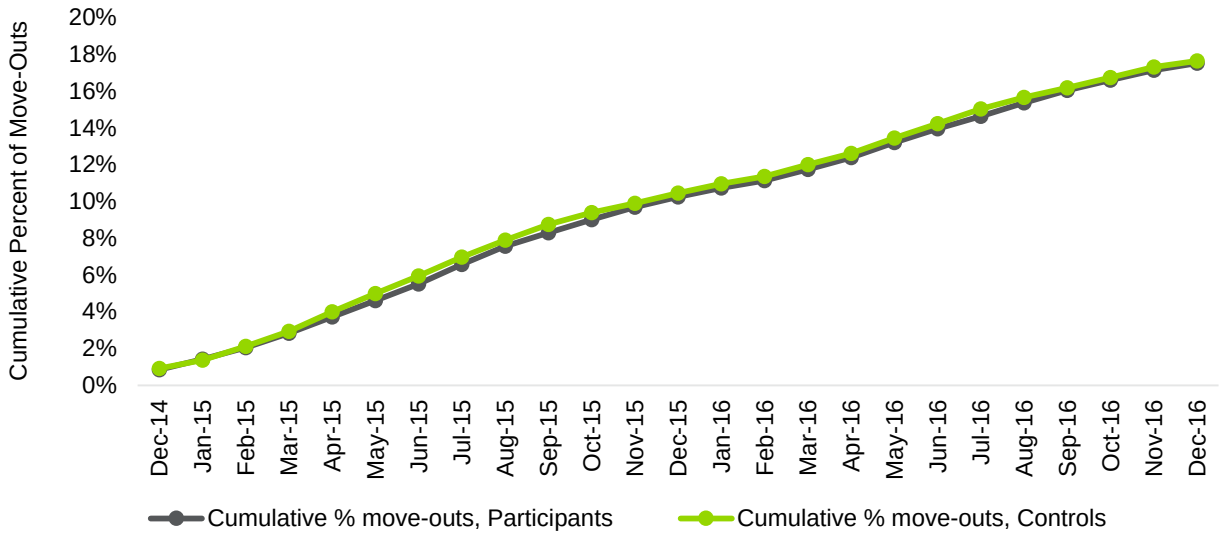
The second source of decay is customers who move from their residence. Figure 1-3 shows the cumulative percentage of move outs over the course of the program for both treatment and control groups. The rate of customer loss per month is virtually the same for treatment and control customers. From the program start to December 2016, approximately 18 percent of both treatment and control customers had been shed from the program due to move outs.

Figure 1-3. Cumulative Percentage of Move Outs by Wave



Source: Navigant analysis

1.2 Evaluation Objectives

The primary objectives of the analysis in this report are to determine the extent to which treatment customers in the HER program reduced their energy consumption due to the program and to determine the cost-effectiveness of the program.

Secondary objectives include:

- Investigating the effect of the HER program on energy awareness, engagement, and satisfaction;
- Reporting on treatment customer satisfaction with the HER program;
- Reporting on behavioral and information effects of the HER program, including effects on customer awareness and purchases of energy efficient appliances and customer awareness of Rocky Mountain Power's energy efficiency programs.

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2. IMPACT EVALUATION APPROACH

The impact evaluation approach Navigant employed in this analysis is consistent with the methodology described in the SEE Action report,[10] relying on statistical analysis appropriate for RCTs. This evaluation has three primary components:

1. Checking that the allocation of customers to treatment and control groups is consistent with an RCT
2. Regression analysis to quantify program savings
3. Quantification of double-counted savings from participation uplift in other energy efficiency programs

Each of these three components was completed for each wave of the program. This section describes these components in more detail.

2.1 Statistical Consistency of the Program with an RCT

Navigant tested the statistical consistency of each wave with an RCT prior to this evaluation. To do so, Navigant compared the monthly energy usage of the treatment and control groups during the twelve-month period prior to the start of the program.[11] If the allocation of households across the treatment and control 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. To check this, Navigant compared the mean energy usage for each of the 12 months before the start of each program wave. As an additional check, Navigant conducted a regression analysis in which average daily usage in the pre-program period was a function of monthly binary variables and a binary participation variable.

Figure 2-1 depicts the average energy usage of treatment and control households for the 12 months prior to the start of the HER program. The green line indicates the average energy usage for control customers and the gray dashed line indicates the average energy usage for treatment customers. The two lines are nearly identical, indicating no difference in average usage patterns for the treatment and control groups.

[10] Todd, A., E. Stuart, S. Schiller, and C. Goldman. *Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations.* Lawrence Berkeley National Laboratory. May 2012. Available at: http://behavioranalytics.lbl.gov/

[11] The 12-month pre-period is December 2013 to November 2014.

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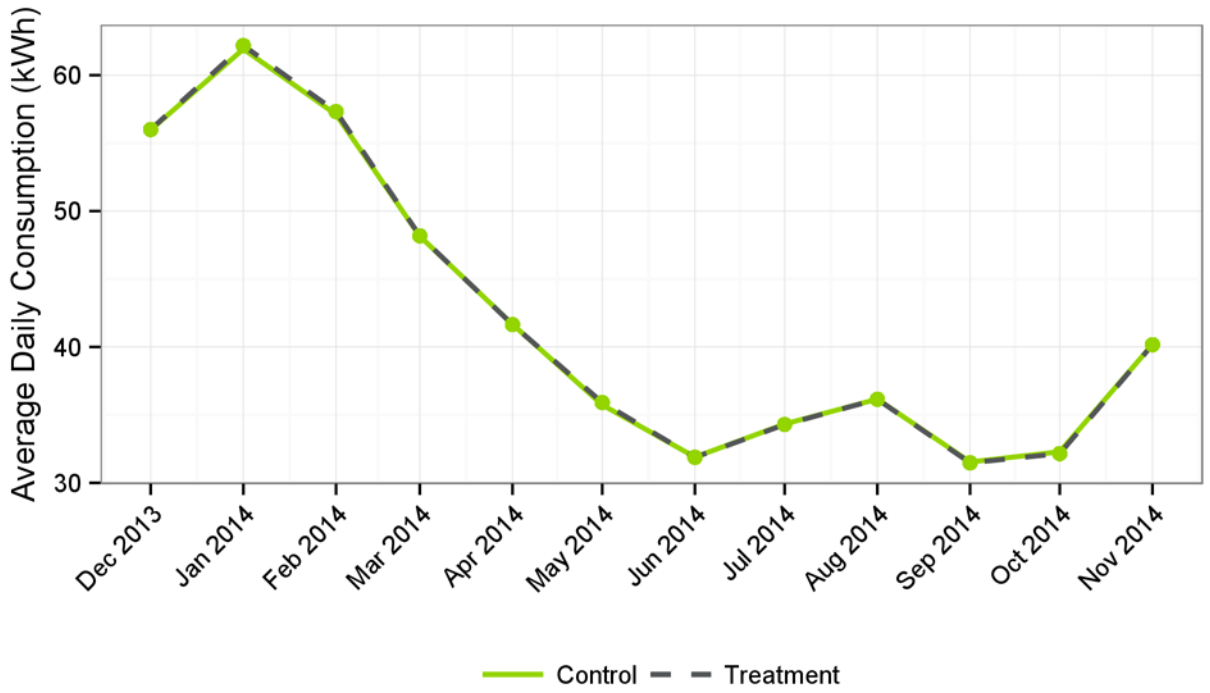
Figure 2-1. Average Daily Consumption during the Pre-Program Year



Source: Navigant analysis

Navigant also conducted a statistical test on the difference in the mean energy usage in each of the 12 pre-program months and found no statistically significant differences at the 90 percent confidence level. As an additional check, Navigant conducted a regression analysis in which average daily usage in the pre-program period was a function of monthly binary variables and a binary treatment customer variable. The parameter on the treatment customer variable was not significant at the 90 percent confidence level, indicating no statistical difference in energy use between the treatment and control groups prior to the start of the program.

In light of these results, Navigant used statistical methods appropriate for use with RCTs to quantify the energy savings for the program as detailed in the following sections.

2.2 Net Impact Evaluation Methodology

A key feature of the RCT design for the HER program is that the analysis estimates net savings, not gross savings. While some customers that receive reports may have taken energy-conserving actions or purchased high-efficiency equipment in the absence of the program, the random selection of program treatment customer (as opposed to voluntary participation) assures that, on average, their behavior would have been no different in the absence of the program than the actual average behavior of the control group. Thus, there is no free ridership, and no net-to-gross adjustment is necessary.

Navigant separately estimated savings for 2015, 2016, and the combined 2015-2016 period. Table 2-1 summarizes the analysis periods for each wave. Since the program started in December 2014, this single

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month of 2014 was grouped in with 2015 making the 2015 analysis period 13 months long and the combined 2015-2016 period 25 months long.

Table 2-1. Analysis Periods

Start Date	Analysis Periods
12-01-2014	2015 (Dec 2014 – 2015)
	2016
	25 months (Dec 2014 – 2016)

Source: Navigant analysis

Navigant estimated program impacts using two approaches: a lagged dependent variable (LDV) analysis[12] with lagged controls and a linear fixed-effects regression (LFER) analysis applied to monthly billing data. Although the two models are structurally different, both generate unbiased estimates of program savings in an RCT. Navigant estimated the LDV and LFER models for 2015, 2016, and the aggregation of the two years. Navigant used the LDV results for reporting total program savings but ran both models as a robustness check.[13]

The LDV model combines cross-sectional and time-series data in a panel dataset and uses the post-program data only with lagged energy use for the same calendar month of the pre-program period to pick up customer-specific effects and as a control for any small systematic differences between the treatment and control customers. In particular, energy use in calendar month *m* of the post-program period is framed 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 treatment and control customers will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Formally, the model is shown in Equation 2-1.

Equation 2-1. LDV Model

$$ADC_{kt}=\beta_1 Treatment_k+\sum_j \beta_{2j} Month_{jt}+\sum_j \beta_{3j} Month_{jt}\cdot ADClag_{kt}+\varepsilon_{kt}$$

Where,

ADC_{kt}	= Average daily consumption in kWh for customer *k* during billing cycle *t*
$Treatment_k$	= Binary variable indicating whether customer *k* was in the treatment group (taking a value of 1) or in the control group (taking a value of 0)
$Month_{jt}$	= Set of binary variables taking a value of 1 if the observation of billing cycle *t* is in month *j* and 0 otherwise

[12] This model is identical to the post-program regression (PPR) model used in previous evaluations. We have changed the nomenclature to better align with academic research and because LDV is more descriptive of the model structure than PPR.

[13] Navigant prefers to report out the LDV model as we do not believe that unobservable characteristics are time invariant which is assumed by the LFER model. As long as the unobservable characteristics are correlated with energy usage they will be controlled for by the lag.

$ADULag_{kt}$ = Customer *k*'s energy use in the same calendar month of the pre-program year as the calendar month of month *t*

ε_{kt} = Cluster-robust error term for customer *k* during billing cycle *t.* Cluster-robust errors account for heteroscedasticity and autocorrelation[14] at the customer level

In this model β_1 is the estimate of average daily energy savings due to the program.

A minor complication to the use of this model in the analysis of savings over longer than a twelve-month period is that the time lapse to the same pre-program calendar month is 12 months for some months of the post period and 24 months for others. In evaluations of similar programs, Navigant has tested whether there was a difference between a twelve-month lag and a 24-month lag by including two lag dummy variables. There was no statistically different effect across the two lag lengths; thus, only one lag is included for this analysis.

The LFER model also combines cross-sectional and time-series data in a panel dataset. The regression essentially compares pre- and post-program billing data for treatment and control customers to identify the effect of the program. The customer-specific constant term (fixed effect) is a key feature of the LFER analysis and captures all customer-specific effects on energy usage that do not change over time, including those that are unobservable. Similar to the pre-period lag in the LDV model, the fixed effect represents an attempt to control for any small systematic differences between the treatment and control groups that might occur due to chance. Specifically, Navigant estimated the regression model in Equation 2-2.

Equation 2-2. LFER Model

$$ADC_{kt}=\alpha_{0k}+\alpha_1 Post \quad +\alpha_2 Treatment_k \cdot Post_t+\varepsilon_{kt}$$

Where,

α_{0k} = Customer-specific fixed effect (constant term) for customer *k*, which controls for all customer-specific effects on energy usage that do not change over time

$Post_t$ = Binary variable indicating whether bill cycle *t* is in the post-program period (taking a value of 1) or in the pre-program period (taking a value of 0)

All other variables are as defined in the LDV model. Average daily savings are indicated by the parameter α_2.

Finally, to investigate how savings vary with usage level, Navigant divided the program treatment and control customers in each wave into three equal-sized segments based on their usage during the pre-program year and estimated Equation 2-1 separately for each segment (high, medium, and low).

[14] Ordinary Least Squares (OLS) regression models assume the data are homoscedastic and not autocorrelated. If either of these assumptions is violated the resulting standard errors of the parameter estimates are likely underestimated. A random variable is heteroscedastic when the variance is not constant. A random variable is autocorrelated when the error term in one period is correlated with the error terms in at least some previous period.

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2.3 Uplift Analysis Methodology

Behavior based programs may increase or decrease participation in other energy efficiency programs. If another energy efficiency programs claims the increased savings, the savings cannot be double-counted in the HER program. Uplift estimates the participation rate stemming from the HER program to other energy efficiency programs in order to avoid double-counting savings in other energy efficiency programs. Applying uplift is standard practice in the Uniform Methods Project ("UMP").[15]

The home energy reports include energy-saving tips, some of which encourage treatment customers to enroll in other energy efficiency programs offered by Rocky Mountain Power. If participation rates in other energy efficiency programs are the same for HER treatment 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 energy efficiency programs. Thus, there would be no need to make any adjustment to the savings.

However, if the HER program affects participation rates in other energy efficiency programs, then portfolio savings differ from the simple summation of savings in the HER program and other energy efficiency programs. For instance, if the HER program increases participation in other energy efficiency programs, the increase in savings may be allocated to either the HER program or the other energy efficiency program but cannot be allocated to both programs simultaneously.

On the other hand, if the HER program generates negative participation in other energy efficiency programs, a negative spillover—as might happen, for instance, if the HER program encourages behaviors or actions that reduce a customer's motivation for participating in other energy efficiency programs —then there is no double-counting of savings. The negative savings associated with this negative spillover should be included as HER program savings because they represent a downward bias in the statistical estimate of HER program savings. In other words, because the statistical analysis does not account for the lower rate of energy efficiency participation by HER treatment customers, estimated savings are lower than actual savings by an amount equal to the negative savings. Net verified savings are equal to the program savings less uplift savings.

Navigant used a difference-in-difference (DID) approach, illustrated in Figure 2-2, to estimate uplift in Rocky Mountain Power's Idaho energy efficiency programs over the longest analysis period for each wave. This method uses differences between the treatment and control groups in the rate of change in energy efficiency program participation to calculate the uplift in energy efficiency program participation due to the HER program. For instance, if the average annualized rate of participation in an energy efficiency program during the HER program was five percent for the treatment group and three percent for the control group and the rate of participation during the year before the start of the HER program was two percent for the treatment group and one percent for the control group, then the annualized rate of uplift due to the HER program was one percent, as found in the calculation (5%-2%)-(3%-1%)=1%. The DID statistic generates an unbiased estimate of uplift when the baseline average rate of participation is the same for the treatment and control groups or when they are different due only to differences between the two groups in time-invariant factors.

[15] National Renewable Energy Laboratory (NREL). 2015. Chapter 17: Residential Behavior Protocol. In *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures.* http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

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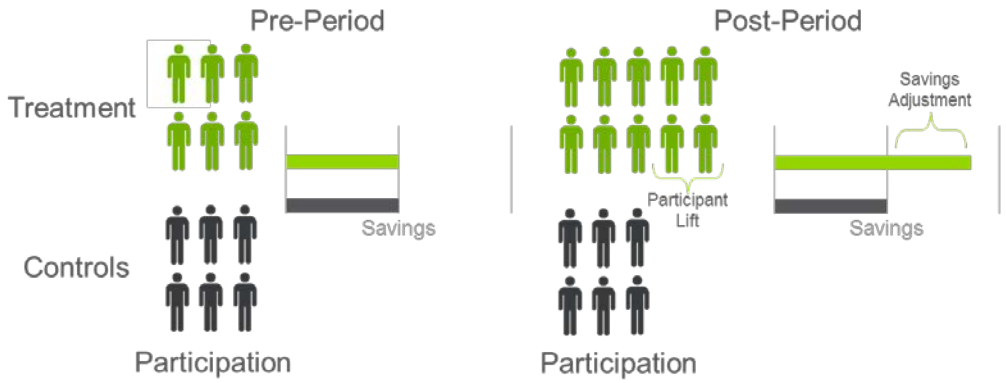
Figure 2-2. Uplift Analysis



Source: Navigant

The DID statistic described above is the incremental change in the rate at which treatment customers join other energy efficiency programs because of the HER program. To get the change in participation or participant lift (measure in number of people) in the other energy efficiency programs, this DID rate is multiplied by the total number of treatment customers. The participant lift is multiplied by the median annual savings for the other energy efficiency program[16] to the double-counted savings in kWh.

Navigant examined the uplift associated with two energy efficiency programs: Appliance Recycling and Home Energy Savings (HES). The Appliance Recycling program was formally ended at the end of 2015 and in 2016 there was only limited participation at the beginning of the year. It is not possible to state definitively the double-counted savings between the HER program and the portion of the HES program involving upstream energy efficient lighting (EEL) because it is not feasible to develop appropriate tracking data. A survey conducted as part of the program evaluation included two questions designed to provide an upper bound on the double-counting of these savings. The first asked about the number of installed CFLs and LEDs in the room in which the respondent is located while answering the survey. The second asked the respondent to walk through the residence, counting first the number of all lights turned on and then counting the number of lights turned on that are CFLs or LEDs (importantly, all surveys were conducted in the evening). If there is a statistical difference in the average deployment and/or use of EEL between treatment and control customers, the evaluation team assumes that this difference is due entirely to the HES program. These observed differences are then extrapolated to average annual differences in energy use which are entirely attributed to the EEL program; the evaluation team then obtains an upper bound on the estimate of double-counted savings.

2.4 Verified Net Program Savings

Verified net savings are calculated via Equation 2-3.

Equation 2-3. Calculation of Verified Net Savings

$$\text{Verified Net Savings} = \frac{-\beta_1 * \text{Number of Program Days}}{1{,}000} - \text{Double-Counted Savings}$$

[16] The median annual savings are calculated based on savings in the other energy efficiency program for HER treatment customers during the HER post-program period, i.e. the time after the HER program began running.

Where,

β_1 = Parameter from Equation 2-1 that indicates average daily impacts from the LDV model in kWh (thus division by 1,000 to convert the value to MWh)

The number of program days is the sum across all treatment customers of the number of days during the specified period that a treatment customer's account was active.[17]

2.5 Data Used in the Impact Analysis

In preparation for the impact analysis, Navigant cleaned the data provided by the HER program implementer, Oracle.[18] The evaluation team verified the number of treatment customers for each analysis from the initial dataset by removing customers who moved out of their residences before the start of the analysis period. Using this definition, the 2015 analysis and the combined 2015-2016 analysis had the same number of treatment customers, but the 2016 analysis had fewer due to customers who moved out before the start of 2015. These customers had zero observations in the post period and thus had zero savings. The verified treatment customers for each wave are summarized in Table 2-2.

Table 2-2. Verified Treatment Customers

Customers in Initial Dataset	Analysis Periods	Verified Customers in Each Analysis
17,844 Treatment 11,920 Control	2015 (Dec 2014 – 2015)	17,805 Treatment 11,892 Control
	2016	16,015 Treatment 10,674 Control
	25 months (Dec 2014-2016)	17,805 Treatment 11,892 Control

Source: Navigant analysis

As part of the data cleaning, Navigant removed the following observations to create the sample size used in the regression analyses:

- Observations with fewer than 20 days or more than 40 days in the billing cycle; these observations were removed because long and short bills can be an indication of an issue in the recording of energy use
- Observations outside of the evaluation period, including the twelve-month pre-program period and the post-program period
- Outliers, which are defined as observations with average daily usage at least 10 times larger or 10 times smaller than the median usage; these observations were removed because very high or very low observations of energy use can have an outsize impact on the regression results biasing the estimate of savings.[19]

[17] Only treatment customers with an active account accrue savings—when a treatment customer moves out, they stop accruing savings toward the program. Treatment Customers who opt out of the program remain in the analysis to preserve the statistical equivalence of the treatment and control groups and because they might continue to generate savings after they opt-out.

[18] Oracle acquired Opower, the program implementer, in 2016.

[19] As an example, the median usage for the 25-month analysis was 34.1 kWh per day, and so observations with usage greater than 341 kWh or less than 3.41 kWh per day were excluded from the analysis.

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3. PROCESS EVALUATION APPROACH

As part of Rocky Mountain Power's Idaho HER program analysis, Navigant conducted a telephone survey to look at the energy habits of the program's control and treatment customers in the program. The primary objective of the survey was to investigate the effect of the HER program on energy awareness, engagement, and satisfaction. Secondary objectives included exploring the effect of the HER program on customer awareness and purchase of energy efficient appliances and customer awareness of Rocky Mountain Power's energy efficiency programs and branding.

Navigant wrote the survey and contracted with a research firm, The Dieringer Research Group (DRG), to program and field the survey in November 2016. Prior to survey launch, Navigant worked with DRG to perform continuous quality control checks on programming logic and data output. In addition to these technical reviews, Navigant conducted a training with the DRG call center staff to review survey objectives, rehearse, and provide client-specific context where appropriate. The evaluation team reviewed survey recordings from a limited number of soft-launch respondents before launching a full rollout of the survey.

To increase accuracy of Navigant's Live Audit survey battery (see Section 6.1), DRG conducted the phone interviews strictly between the hours of 5 p.m. and 9 p.m. local time.

Appendix A presents a copy of the final survey instrument.

3.1 Survey Sample Size

Navigant designed the sample to meet a desired confidence/precision of 90/10 on binary questions. The focus on the difference in responses between cohorts reflects the understanding that it is this difference that represents the effect of the HER program on respondent behaviors and attitudes.

Navigant targeted 200 completed surveys divided evenly between the treatment and control groups. This target was designed to allow for statistical testing at the 90 percent confidence interval using the Chi-squared test. The confidence level achieved for each individual question is noted throughout the results in Section 6.

3.2 Survey Response Rates and Analysis

To achieve the surveys in each of the two cohorts, Navigant provided DRG with a list of 4,301 randomly selected customers for each targeted cohort. These customers were chosen from a list of almost 30,000 customers. Table 3-1 below provides a summary of the completion outcome.

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Table 3-1. Survey Targets and Achieved Completes

Cohort	Target	Achieved	Amount of Sample Provided	Total in Population
Control	100	100	1,800	11,920
Treatment	100	100	2,501	17,844
Total	**200**	**200**	**4,301**	**29,764**

Source: Navigant

4. COST-EFFECTIVENESS EVALUATION APPROACH

Program cost-effectiveness was evaluated for 2015, 2016, and the overall 25-month evaluation period. The cost-effectiveness of utility-funded programs in the state is typically analyzed using tests prescribed by the California Standard Practice Manual.[20] The UCT is the primary criterion in Idaho for evaluating a program's cost-effectiveness.

For the purposes of this evaluation, Rocky Mountain Power specifically required the following cost-effectiveness tests:

- Participant Cost Test (PCT)
- Utility Cost Test (UCT)
- Ratepayer Impact Measure (RIM)
- Total Resource Cost Test (TRC)
- PacifiCorp's Total Resource Cost Test (PTRC)

Navigant initialized and validated the cost-effectiveness model used for this evaluation. This model was calibrated using prior inputs and outputs from the previous evaluation cycle to ensure that similar inputs yielded similar outputs. Navigant worked through a range of input assumptions pertaining to avoided cost data formats, financial assumptions regarding discount and escalation rates, participant costs and benefits, and other input parameters.

Cost-effectiveness inputs of program cost, program savings by measure, and measure life were provided by Rocky Mountain Power staff, including data obtained from the 2015 Class 2 DSM Decrement Study.

Table 4-1 below presents details of these tests. Table 4-2 below provides an overview of cost-effectiveness input values used by Navigant in the cost-effectiveness analysis.

[20] The California Standard Practice Manual is an industry-accepted manual; it identifies the cost and benefit components and cost-effectiveness calculation procedures from several major perspectives: Participant, Ratepayer Impact Measure (RIM), and Total Resource Cost (TRC). Definitions and methodologies of these cost-effectiveness tests can be found at http://www.energy.ca.gov/greenbuilding/documents/background/07-J_CPUC_STANDARD_PRACTICE_MANUAL.PDF.

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Table 4-1. Details of Cost-Effectiveness Tests[21]

Test	Acronym	Key Question Answered	Summary Approach
Participant Cost Test	PCT	Will the participants benefit over the measure life?	Comparison of costs and benefits of the customer installing the measure
Utility Cost Test	UCT	Will utility revenue requirements increase?	Comparison of program administrator costs to supply-side resource costs
Ratepayer Impact Measure Test	RIM	Will utility rates increase?	Comparison of program administrator costs and utility bill reductions to supply-side resource costs
Total Resource Cost Test	TRC	Will the total costs of energy in the utility service territory decrease?	Comparison of program administrator and customer costs to utility resource savings
PacifiCorp Total Resource Cost Test	PTRC	Will the total costs of energy in the utility service territory decrease when a proxy for benefits of conservation resources is included?	Comparison of program administrator and customer costs to utility resource savings with a 10% benefits adder

Source: Navigant analysis

Table 4-2. HER Program Cost-Effectiveness Evaluation Input Values

Parameters	2015	2016	2015-2016
Discount Rate for all B/C Tests	6.66%	6.66%	6.66%
Inflation Rate for all B/C Tests	1.90%	1.90%	1.90%
Line Loss Factor - Energy (%)	11.47%	11.47%	11.47%
Residential Energy Rate ($/kWh)	$0.1048	$0.1041	-
Gross Customer Costs	$0	$0	$0
Program Delivery	$93,752	$117,690	$211,442
Evaluation, Marketing, Development	$651	$802	$1,453
Utility Administration	$10,253	$7,648	$17,901
Incentive Costs	$0	$0	$0

Source: Navigant analysis

[21] "Understanding Cost Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy – Makers" NAPEE, November 2008. http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf.

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5. IMPACT EVALUATION RESULTS

This section includes results from the impact evaluation. Overall, verified net program savings from December 2014 to December 2016, after adjusting for uplift, was 6,217 MWh. The LDV and LFER models generated similar results for program savings in all three time periods. Navigant uses the LDV model's results for reporting total program savings.

Table 5-1 shows total HER program savings in each of the three evaluation time periods: 2015 (including December 2014), 2016, and the two years combined. Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis because there is additional information and statistical power in running the two years together rather than just adding together the results of year 2015 and year 2016. Since each period was run as a separate analysis, the savings total for year 2015 and year 2016 does not sum to the savings over the total combined period of 2015-2016 together. December 2014 was included in the ear 2015 analysis making that period 13 months and the 2015-2016 together analysis making that period 25 months. The number of treatment customers is the number at the start of each evaluation period.

Table 5-1. Total Program Savings in Each Time Period*, **

Type of Statistic	2015	2016	2015-2016
Number of Treatment Customers	17,805	16,015	17,805
Verified Evaluation Savings (MWh)	3,216	3,103	6,319
Percent Savings	1.16%	1.33%	1.24%
Verified Net Savings (MWh)* **	**3,173**	**3,098**	**6,271**

*All savings are at the site.
** Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis; the savings totals for year 2015 and year 2016 do not sum to the savings over the total combined period of 2015-2016 together.
***Verified net savings are savings after netting out savings double-counted with other energy efficiency programs.
Source: Navigant analysis

Detailed findings are included in the sections below.

5.1 Verified Net Program Impact Results

Table 5-2 presents verified net savings results from the HER program. Total verified net program savings from December 2014 to December 2016 were 6,271 MWh. Average percentage savings were 1.24 percent, meaning that on average the treatment group consumed 1.24 percent less energy than the control group in the analysis period.

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Table 5-2. Net Program Savings and Uplift of Savings in Other Energy Efficiency Programs*

Type of Statistic	2015 (and Dec 2014)	2016	2015-2016 (25 months)
Number of Treatment Customers†	17,805	16,015	17,805
Number of Control Customers†	11,892	10,674	11,892
Percent Savings	1.16%	1.33%	1.24%
Standard Error	*0.21%*	*0.27%*	*0.21%*
90% Confidence Bound	*[0.83%,1.50%]*	*[0.89%,1.78%]*	*[0.89%,1.59%]*
Average Daily Savings per Customer (kWh)	0.48	0.55	0.51
Standard Error	*0.085*	*0.111*	*0.088*
90% Confidence Bound	*[0.34,0.62]*	*[0.37,0.73]*	*[0.37,0.66]*
Verified Net Savings Prior to Uplift Adjustment (MWh)	3,216	3,103	6,319
Standard Error	*569*	*625*	*1087*
90% Confidence Bound	*[2280,4152]*	*[2075,4131]*	*[4530,8107]*
Savings Uplift in Other Energy Efficiency Programs (MWh)	43	5	48
Verified Net Savings (MWh)	**3,173**	**3,098**	**6,271**

* Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis; the savings totals for year 2015 and year 2016 do not sum to the savings over the total combined period of 2015-2016 together.

† See Section 2.5 for the derivation of the customer counts presented here (and used in the analysis) from the raw customer counts.

Source: Navigant analysis

Figure 5-1 shows the evolution of savings over time for each wave. Savings increased from 1.16 percent in 2015 to 1.33 percent in 2016. This increase in savings follows the classic ramp-up pattern seen across HER programs.

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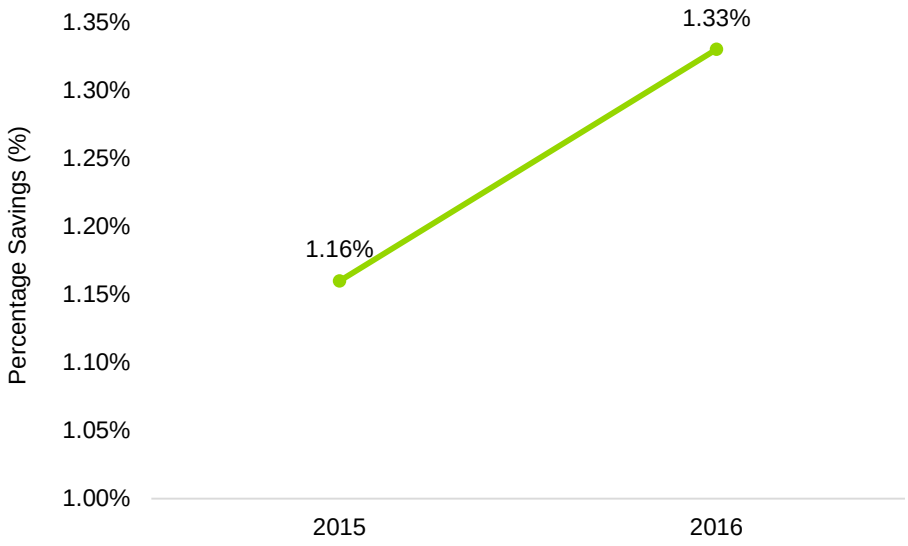
Figure 5-1. Savings through Time



Source: Navigant analysis

5.2 Impact Parameter Estimates

Parameter estimates for the estimated models are presented in Appendix B. In all cases, the estimate of savings from the LDV model and the LFER model were similar.

5.3 Uplift of Savings in Other Energy Efficiency Programs

LDV program savings include savings resulting from the uplift in participation in other energy efficiency 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 energy efficiency programs but not both. The uplift of savings in other energy efficiency programs during the 2015-2016 evaluation period was a small proportion of the total savings: 47,971 kWh (48 MWh or 0.8 percent of program savings).

Navigant considered uplift for Rocky Mountain Power's Appliance Recycling and HES programs. Table 5-3 shows the incremental change in treatment customers in other energy efficiency programs because of the HER program, and the double-counted savings in the HER program because of this change in participation over the two years of the program. Detailed tables of the uplift results are included in Appendix C.

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Table 5-3. Uplift Summary

	Program		Total
	Appliance Recycling	HES	
Change in Participation (People)	-13	55	**42**
Double-Counted Savings (kWh)	-9,830	57,801	**47,971**

Source: Navigant analysis

The double-counted savings, positive or negative, are subtracted from the net savings estimates from the regression analysis to get total verified savings.

The estimate of double-counted savings is most likely an overestimate because it presumes participation in the other energy efficiency programs occurred at the start of the program year. Although participation in other programs likely occurred throughout the program year, it is standard to subtract the annual savings from the HER program as a conservative estimate of double-counting.[22] The outcome is that double-counting of savings with other energy efficiency programs for which tracking data are available is not a significant issue for the HER program at this time.

5.3.1 Double-Counting of Savings with the HES Upstream EEL Program

Due to a lack of tracking data, it is not possible to state definitively the double-counted savings of the HER program and the HES upstream EEL delivery channel. Navigant's approach to this issue is to use a set of survey questions to examine whether the HER program is in fact serving to increase the use of EEL and, if so, to derive an upper bound on the double-counting of savings, as described in Section 2.3. The survey questions, referred to as a Live Audit battery, gather information on respondent's real-time lighting use by asking them to walk through their house and answer questions about the bulb types and number of lights. 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.

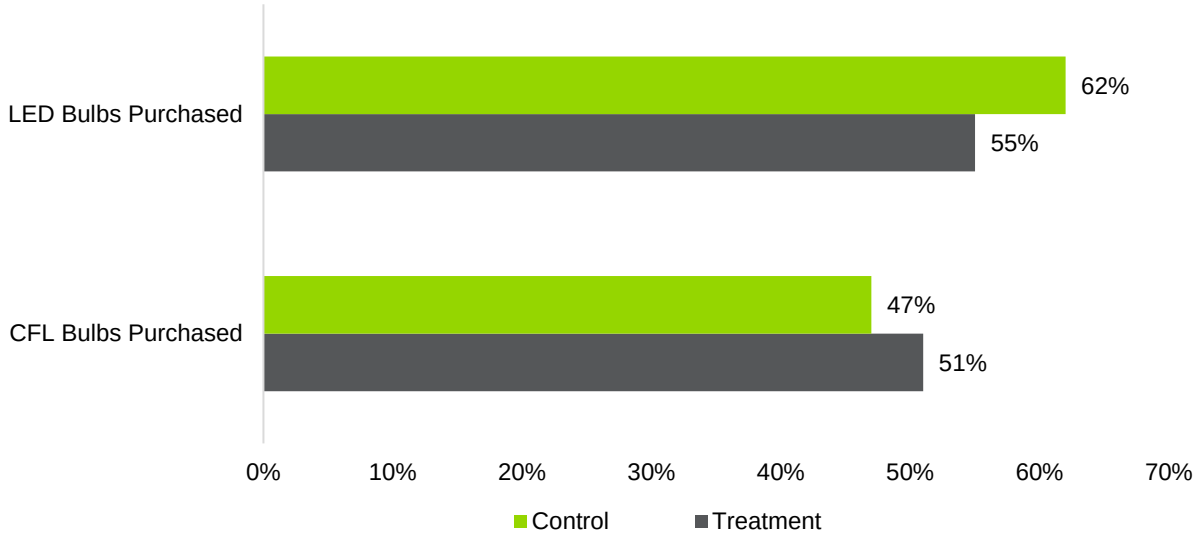
The first question of this battery asked respondents to count the number of CFL and LED bulbs installed in the room that the respondent occupied at the time of the survey. The analysis revealed that treatment respondents had 0.37 fewer CFL bulbs but 0.02 more LED bulbs installed than control respondents. Neither of these differences were statistically significant at the 90 percent confidence interval. The next three questions in this battery asked customer how many lights respondents had turned on in their home at the time of the survey. There were no statistically significant differences in the number or type of bulbs turned on.

The survey also asked customers whether (a) they had seen materials encouraging them to purchase CFLs or LEDs; (b) they had purchased at least one CFL in in the last 12 months; and (c) they had purchased at least one LED in in the last 12 months. Treatment customers were significantly more likely

[22] Under the assumption that participation in other programs occurred uniformly throughout the year, the double-counted savings would be approximately 24 MWh, half the estimate value of 48 MWh. The double-counted savings are small enough compared to the total HER savings that using 24, as opposed to 48, would not make a considerable difference in the total program savings.

than control customers to recall receiving information from Rocky Mountain Power encouraging them to replace incandescent light bulbs with CFL and LED bulbs (88 percent, 65 percent).[23] Figure 5-2 shows the percentage of respondents in each group who purchased EEL over the previous 12 months. About half of the treatment respondents purchased EEL in the past year, with 55 percent purchasing CFL bulbs and 51 percent purchasing LED bulbs. In the control group, CFL bulb purchases were more common than LED purchases. Sixty-two percent of control customers purchased CFL bulbs compared to 47 percent who purchased LED bulbs. None of these differences were statistically significant at the 90 percent confidence level. Treatment respondents purchased, on average, 9.1 CLFs while controls purchased 8.5 CFLs. The treatment respondents purchased 11.2 LEDs while the controls purchased 11.7 LED bulbs. These differences were not statistically significant.

Figure 5-2. Purchased CFLs or LEDs in Past 12 Months



Control n=89; Treatment n=88

Source: Navigant analysis of customer survey; LP2, LP3

In summary, there appears to be little difference between treatment and control customers in their installation and use of energy efficient light bulbs. The treatment groups showed higher awareness of marketing materials encouraging them to purchase CFL and LED bulbs. However, the higher awareness did not seem to convert to more purchases or installations of efficient bulbs. Navigant concludes from these survey results that the HER program does not have a statistically significant effect on customer participation in the upstream lighting program and thus no double-counted savings are estimated.

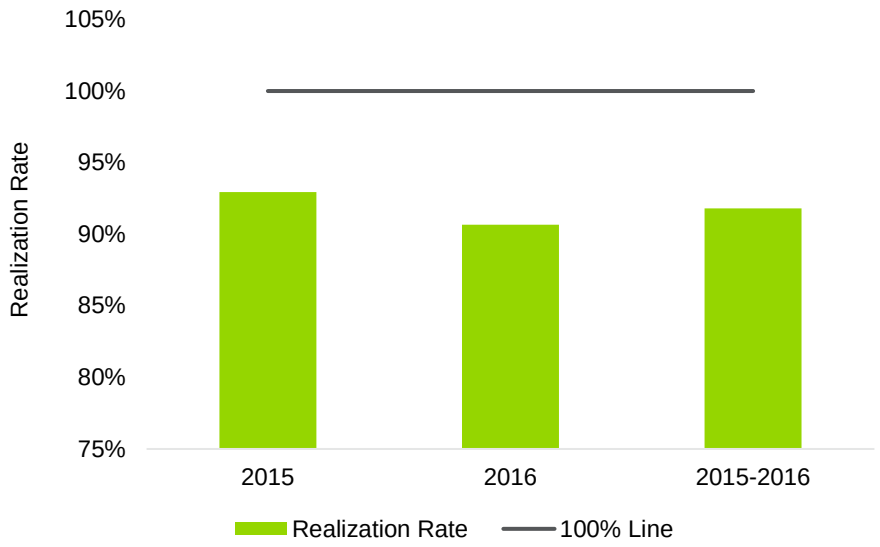
5.4 Realization Rates

Navigant calculated realization rates by comparing reported savings to the verified net savings prior to uplift as reported in Table 5-2. Reported savings came from cost-effectiveness inputs supporting Rocky

[23] Statistically significant at .001 using Fisher's Exact Test.

Mountain Power's reports. Figure 5-3 shows the realization rate in each year. The realization rate was between 90 and 95 percent in each period.

Figure 5-3. Realization Rates



Source: Navigant analysis

Table 5-4 shows the inputs for the realization rate calculations including the evaluation savings and the reported savings for each year.

Table 5-4. Realization Rates

Year	Evaluation Savings (MWh)	Reported Savings (MWh)	Realization Rate
2015	3,216	3,461	93%
2016	3,103	3,423	91%

Source: Navigant analysis

These percent realization rates are slightly lower than seen in some other HER programs; however, Navigant and Oracle's savings estimates are not statistically different from one another.[24] The difference between Navigant's savings estimate and Oracle's appears to be the result of normal variation in statistical modelling,[25] rather than an error in the implementer's or evaluator's savings estimation. Figure 5-4 shows Navigant and Oracle's point estimates of average daily usage per participant with 90% confidence bounds from each model. The estimates are similar in absolute terms (between 0.05 and 0.1 kWh different), but this difference is five to ten percent since the point estimates are so small.

[24] Using a Wald Test at a 90% confidence level.

[25] Navigant and Oracle run different variations of the LDV model to estimate savings. Navigant's model (as shown in Equation 2-1) includes a usage lag from each month of the pre-program period, whereas Oracle includes three lags averaging usage from the entire pre-program period, the pre-program winter season, and the pre-program summer season. Two different statistical models will always produce slightly different savings estimates.

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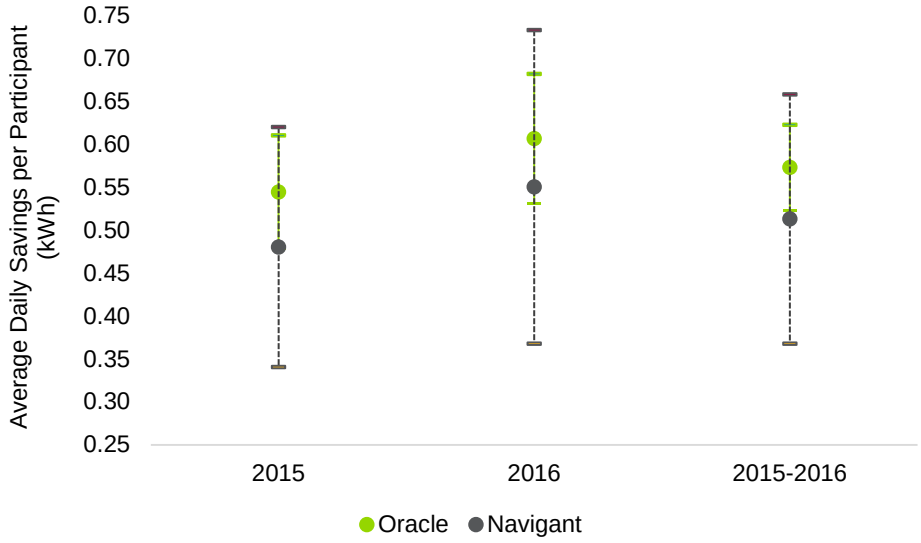
Figure 5-4. Navigant and Oracle's Savings Estimates



Source: Navigant analysis

5.5 Analysis of Savings by Usage Level

Navigant analyzed how program savings varied with usage level by segmenting program treatment and control customers within each wave into three equally sized groups based on their pre-program usage level. This analysis was run on the aggregated 2015-2016 analysis period for each wave. Table 5-5 provides descriptive statistics and savings values for each of the three segments.

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Table 5-5. Savings by Usage Level

Type of Statistic	Legacy Wave		
	Low Usage	Medium Usage	High Usage
Number of Treatment Customers	5,892	5,869	5,841
Number of Controls	3,892	3,914	3,942
Pre-Program Daily Usage Range (kWh)	10.4 to 31.4	31.4 to 46.7	46.7 to 217.8
Pre-Program Daily Usage Mean (kWh)	25.6	36.7	59.7
Percent Savings	0.69%	1.59%	1.19%
Standard Error	*0.39%*	*0.36%*	*0.33%*
90% Confidence Bound	*[0.05% - 1.32%]*	*[0.99% - 2.19%]*	*[0.64% - 1.74%]*
Average Daily Savings per Customer (kWh)	0.18	0.59	0.72
Standard Error	*0.10*	*0.37*	*0.39*
90% Confidence Bound	*[0.01 – 0.34]*	*[0.38 – 0.81]*	*[0.39 – 1.05]*

Source: Navigant analysis

The percentage savings for each usage group are shown in Figure 5-5. The results are arranged with the lowest average usage group on the left and the highest average usage group on the right. Medium usage customers have the highest savings, although they are not statistically different from high usage customers. Although the usual trend of higher percentage savings for higher usage customers does not hold, the highest usage customers do save the most in absolute terms.

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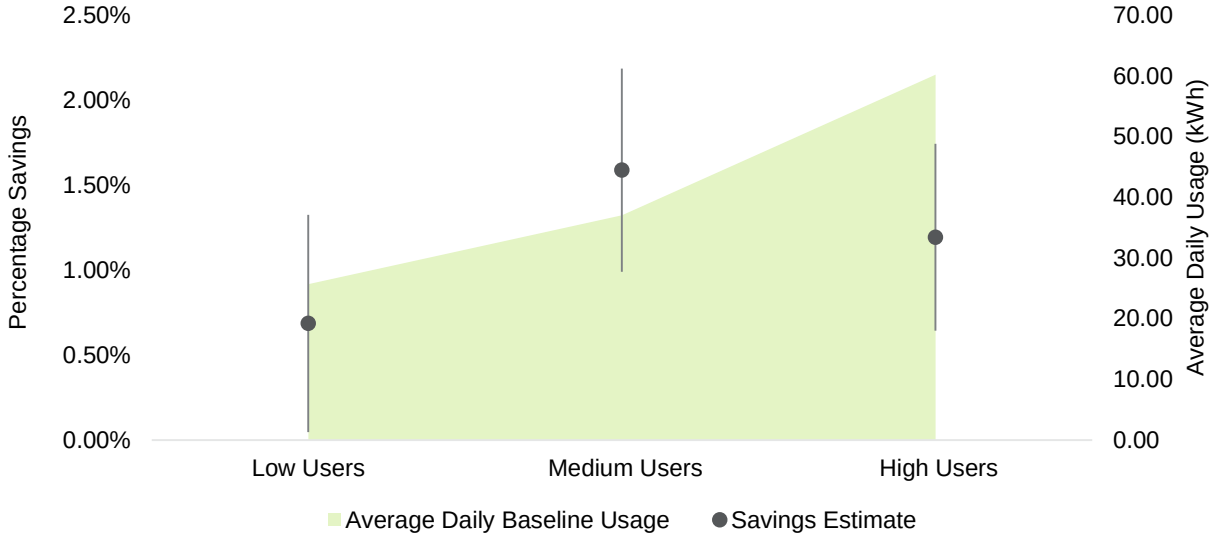
Figure 5-5. Absolute and Percent Savings by Usage Level, 90% Confidence Interval



Source: Navigant analysis

6. PROCESS EVALUATION RESULTS

Navigant designed a customer survey of the treatment and control groups to explore the following objectives:

- The effect of the HER program on energy awareness, engagement, and satisfaction
- Customer satisfaction with the HER program
- Behavioral and informational effects of the HER program, including effects on customer awareness and purchase of energy efficient appliances and customer awareness of Rocky Mountain Power's energy efficiency programs

The following sections present findings related to these objectives. Appendix D includes information on the demographic characteristics of the survey respondents.

6.1 Real-Time Energy Thermostat Behavior

As part of the Live Audit battery discussed in Section 5.3.1, the evaluation team asked respondents a series of questions designed to determine real-time thermostat behavior practices. The survey asked respondents to locate their thermostats during the survey and answer questions about the type of thermostat installed in their home[26], as well as the settings they currently have in place. The evaluation team conducted a regression analysis on the results, controlling for time of day in case temperature settings varied across the four-hour survey period.[27]

About half of respondents reported that they have a digital thermostat installed in their home, as shown in Figure 6-1. Manual thermostats, defined as a thermostat with no digital display and no programming capabilities, were less common and found in 37 percent of control respondents' homes and 49 percent of treatment respondents' homes. The most sophisticated thermostats were smart Wi-Fi/programmable thermostats (smart thermostats), which featured more advanced programming options and allowed for remote thermostat control. Respondents in the treatment group were statistically less likely to have a smart thermostat installed than the control group (two percent - treatment; 12 percent - control).[28]

[26] Three types of thermostats were asked about in the survey: (1) a manual thermostat defined as a thermostat with a dial or lever that allows the user to adjust the temperature but which does not have a digital display; (2) a digital thermostat defined as a thermostat with a digital display that allows the user to adjust the temperature by pressing buttons; and (3) a smart/Wi-Fi programmable thermostat defined as a thermostat with a digital display that allows for remote control of your thermostat, examples include the Google Nest and the Honeywell Lyric.

[27] The evaluation team conducted surveys between 5 p.m. and 9 p.m. local time.

[28] These comparisons were statistically significant at 0.03 using the Pearson statistic.

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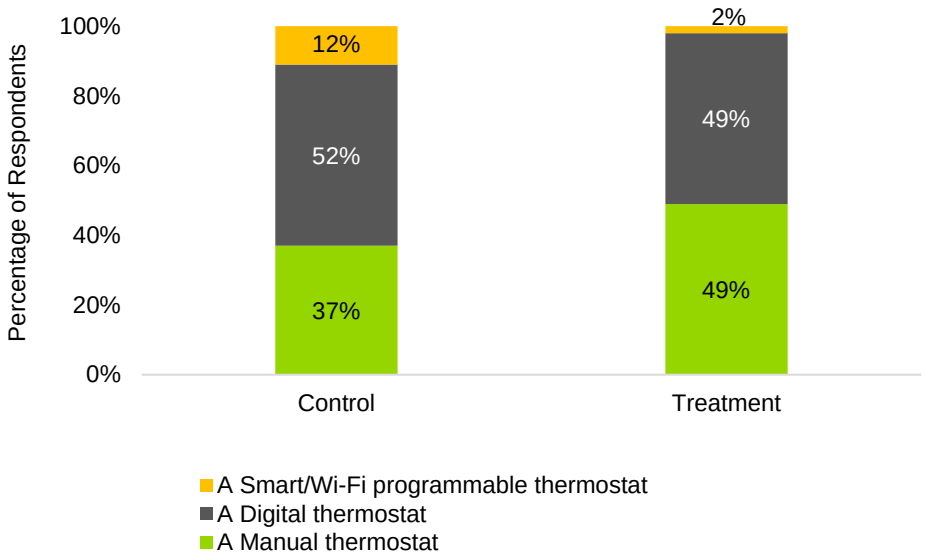
Figure 6-1. Home Thermostat Type



Control n=94; Treatment n=92
Source: Navigant analysis of customer survey; L5

For those respondents who reported having a thermostat with programming capabilities, 64 percent of both groups indicated that, at the time of the survey, they were using programmed settings.

In concluding the Live Audit battery, the survey gathered information on current temperature settings for each cohort. Almost all respondents had their thermostats turned on, with the temperature setpoint programmed to an average of 68 degrees Fahrenheit. The actual temperature of respondents' homes was 70 degrees Fahrenheit. There were no statistically significant differences in the thermostat settings or home temperature across the treatment and control customers.

6.2 Energy Awareness and Attitudes

The survey asked all respondents a series of questions designed to explore awareness of their energy usage and to assess their perception of energy-saving behaviors. Additionally, Navigant survey questions were designed to identify differences in behavior and awareness between control and treatment group respondents.

Figure 6-2 shows respondents' awareness of and attitudes toward energy efficiency. Respondents showed no statistically significant differences between the control and treatment groups in their awareness of energy-saving behaviors and whether they associated lower energy bills with conservation efforts.

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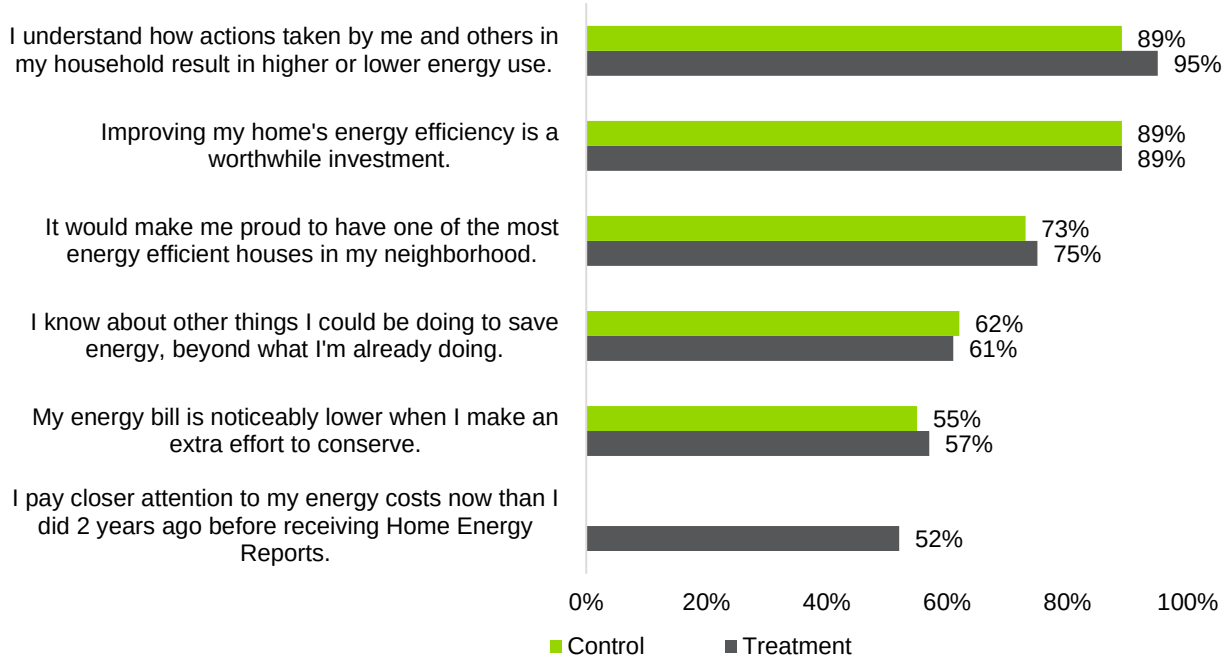
Figure 6-2. Energy Efficiency Attitudes and Awareness



†Asked only of treatment group respondents.

Control n=99; Treatment n=99

Source: Navigant analysis of customer survey; EA2e, EA2f, EA3a, EA3c, EA3d, EA3e

The survey asked respondents to rate their level of satisfaction with their home's energy use. Responses fell in the middle of the range for both groups, with mean ratings of 6.4 for the treatment group and 6.8 for the control group (which was not a statistically significant difference). One possible explanation for the directionally lower satisfaction with energy use among treatment customers is that these customers receive frequent tips and granular comparisons that remind them that there is more that they could do to save energy; thus, these customers are less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

When asked to elaborate on their home's energy use satisfaction rating, respondents in both groups most frequently said that they chose the satisfaction rating they did because they have been or are trying to be more energy efficient or purchase energy efficient products, with 26 percent of treatment group respondents and 25 percent of control group respondents mentioning this reason. Additional reasons frequently mentioned by respondents included that they could make improvements, they are satisfied with their usage, their home and equipment are old and inefficient, that they try to conserve and that they had high bills. Figure 6-3 shows treatment and control group respondents' reasons for their satisfaction ratings. The question associated with this figure was open-ended and respondents could mention multiple reasons.

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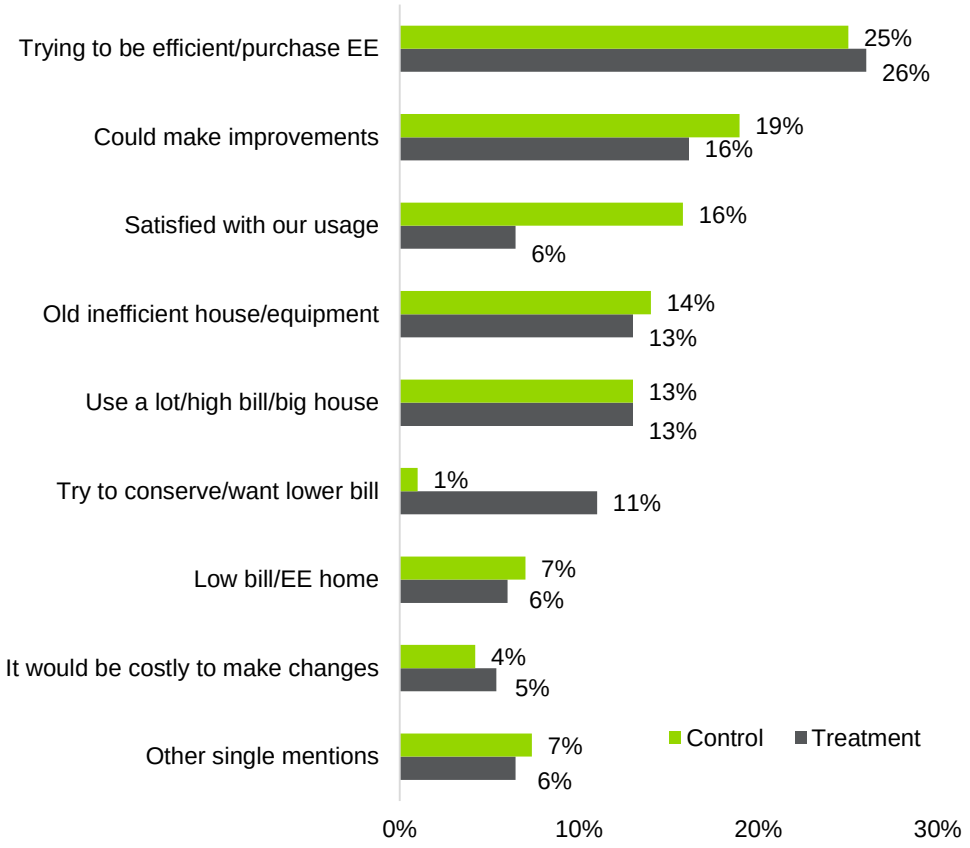
Figure 6-3. Reasons for Satisfaction Rating of Energy Use



Multiple responses accepted; figure includes reasons mentioned by at least 5% of respondents.
Treatment n=98; Control n=97
Source: Navigant analysis of customer survey; EA4a

Over half of all survey respondents made energy efficient purchases or upgrades over the previous 12 months. Respondents in the control group made changes more frequently than those in the treatment group. Fifty-eight percent of respondents in the control group made an energy efficient purchase or upgrade in the previous 12 months compared to 53 percent of the treatment group. These differences were not statistically significant.

Treatment group respondents purchased LED light bulbs more frequently than any other energy efficient appliance or equipment and almost twice as often as control group respondents as shown in Figure 6-8. Forty-one percent of the treatment group respondents reported purchasing LEDs in the last 12 months compared to 21 percent of the control group respondents.

Treatment respondents differed from control group respondents for several other purchases, including CFLs (17 percent control and 24 percent treatment), clothes washers (13 percent control and 22 percent treatment), water heaters (6 percent control and 16 percent treatment), and freezers (2 percent control and 10 percent treatment).

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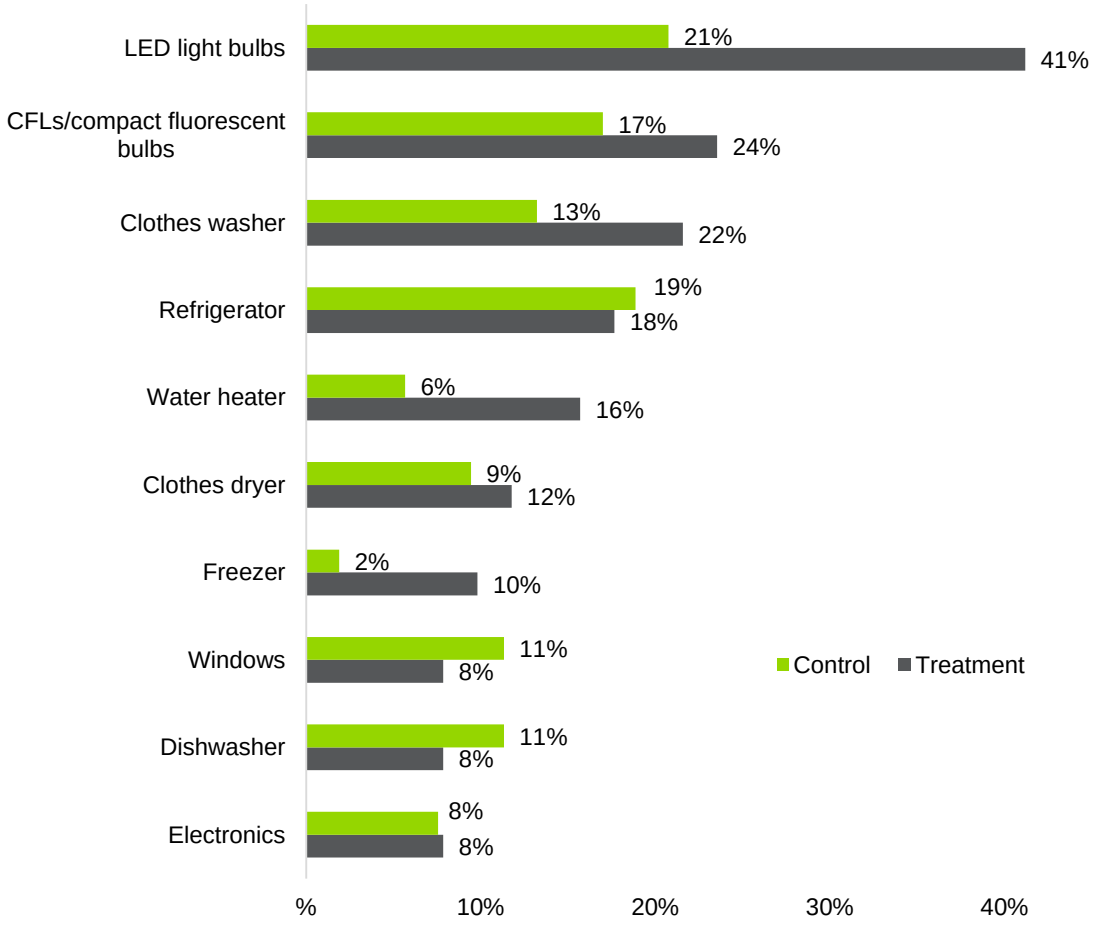
Figure 6-4. Purchases Made in Past 12 Months



Multiple responses accepted; figure includes purchases mentioned by more than 5% of respondents.
Control n=91; Treatment n=96
Source: Navigant analysis of customer survey; EA5b

The survey found that a slight majority of survey respondents took actions to reduce or minimize their electricity, gas, or water consumption over the previous year. This finding was true across both groups: in the treatment group, 53 percent of respondents took at least one action compared to 51 percent of the control group.

Respondents most frequently said, “Turn off lights when not in use” when asked which actions or behavior changes they had made over the past year. Approximately 35 percent of both groups mentioned this behavior. Figure 6-5 shows the most frequently mentioned actions or behaviors taken over the previous 12 months.

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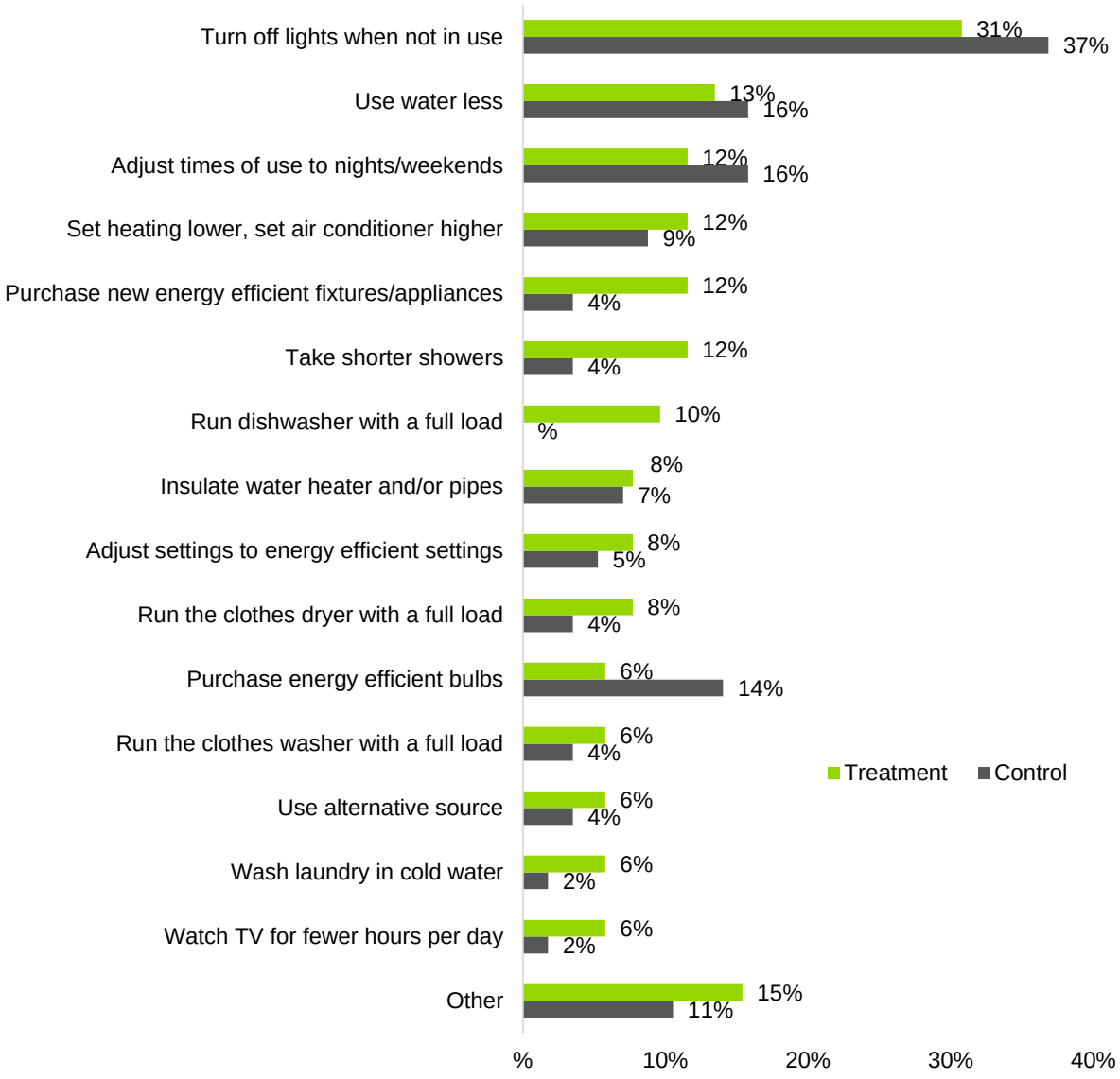
Figure 6-5. Actions or Behavior Changes in Past 12 Months



Multiple responses accepted; figure includes actions mentioned by more than 5% of respondents.
Control n=99; Treatment n=99
Source: Navigant analysis of customer survey; EA6b

6.3 Satisfaction with Utility

Overall, Rocky Mountain Power customers were highly satisfied with their utility. The research team asked respondents to rate their satisfaction with the utility on a scale from 1 to 10. For purposes of the evaluation, Navigant considered a rating of 6 or higher to indicate satisfaction.

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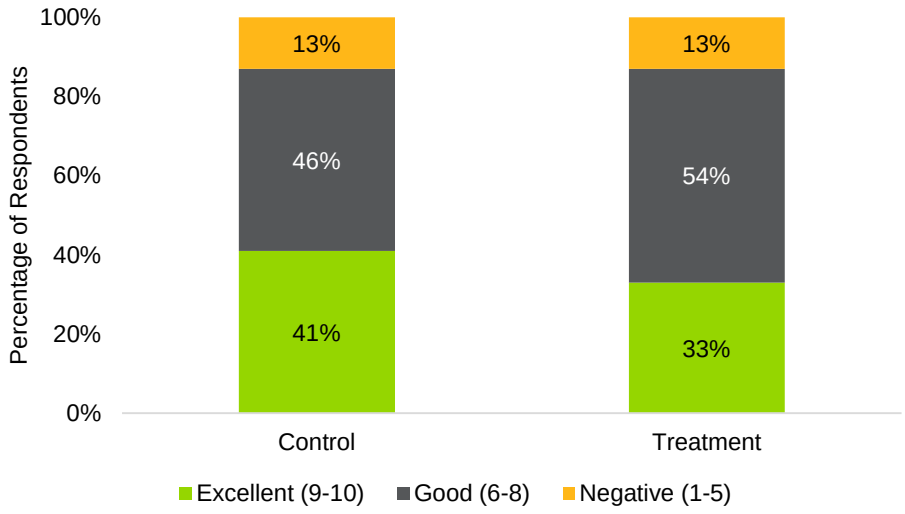
Figure 6-6 provides a breakdown of all satisfaction ratings, broken out into three categories to reflect "Excellent" ratings (9-10 on the rating scale), "Good" ratings (6-8), and "Negative" ratings (1-5). Control customers were slightly more likely to provide an excellent rating with Rocky Mountain Power than treatment customers. Forty-one percent of control respondents and 33 percent of treatment respondents rated the utility "Excellent," and 46 percent of control respondents and 54 percent of treatment respondents rate the utility "Good." These differences were not statistically different.

Figure 6-6. Overall Satisfaction with Utility



Control n=100; Treatment n=100
Source: Navigant analysis of customer survey; SAT1

Figure 6-7 shows respondents' reasons for their satisfaction rating with their utility. When asked to elaborate on their satisfaction rating with Rocky Mountain Power, approximately 40 percent of both groups said that they did not have any problems with the utility. Other positive responses mentioned were that:

- The utility has good or prompt customer service
- Power is reliable and the prices are fair
- The utility services are satisfactory

The most frequently mentioned negative issues were that the prices are too high, customers experience too many outages and customer service is poor.

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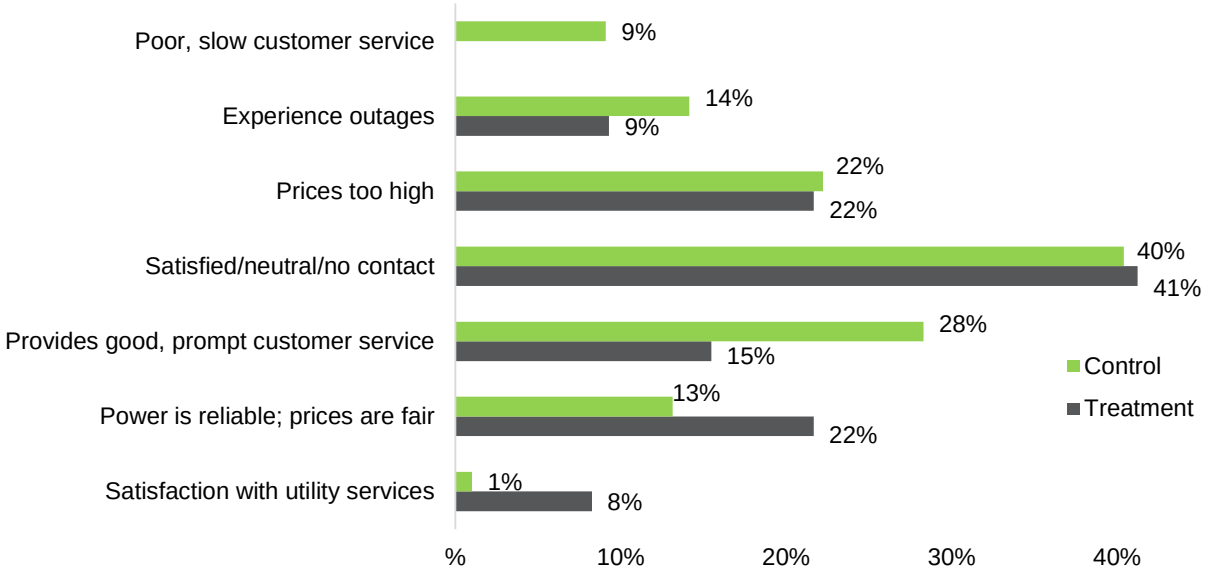
Figure 6-7. Reasons for Utility Satisfaction Rating



Multiple responses accepted; figure includes reasons mentioned by at least 5% of respondents.
Control n=99; Treatment n=97
Source: Navigant analysis of customer survey; SAT1a

6.4 Experience with the HER Program

To better explore customer experience with the program, the survey asked treatment customers a series of questions specifically targeting the home energy reports and respondents' impressions of them.

About three-fourths of respondents receiving the home energy reports spent less than five minutes reading them, with about half in the two to five minute range and 24 percent in the less than two minutes range. Almost 20 percent spent six to ten minutes reading the reports. Another five percent of the treatment respondents reported that they discard the reports before reading them.

Concerning the accuracy of the home energy reports in terms of household energy usage, almost three-fourths of respondents considered the reports to be either extremely or moderately accurate. About 15 percent of respondents considered the reports "Extremely Accurate," while 57 percent considered them "Moderately Accurate." Few customers said the reports were "Moderately Inaccurate" (eight percent) or "Extremely Inaccurate" (six percent). These results are shown in Figure 6-8.

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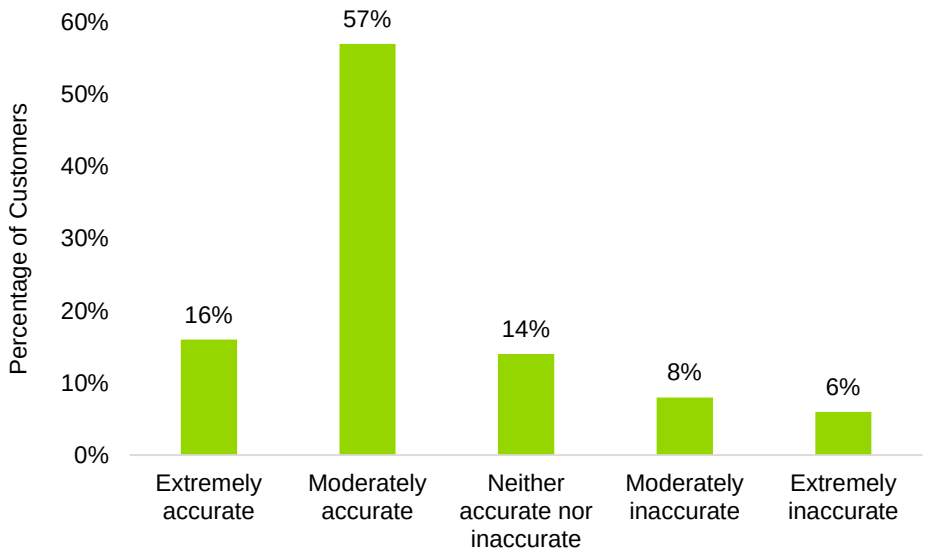
Figure 6-8. Perceived Accuracy of Home's Energy Usage in Reports: Treatment Only



Treatment=44

Source: Navigant analysis of customer survey; H3

To determine which components of the reports were most useful to program treatment customers, the evaluation team asked respondents to identify both the most and least valuable components of the home energy reports. As shown in Figure 6-9, the most valuable component of the home energy report was the comparison of the customers' home energy use to previous years; 38 percent rated this component of the report the most valuable compared to only two percent who rated it least valuable. Respondents were most likely to consider the comparison to other homes the least valuable component of the report (49 percent of respondents) compared to 26 percent who considered the comparison to other homes the most valuable. Few treatment respondents rejected the entire report as not valuable (two percent).

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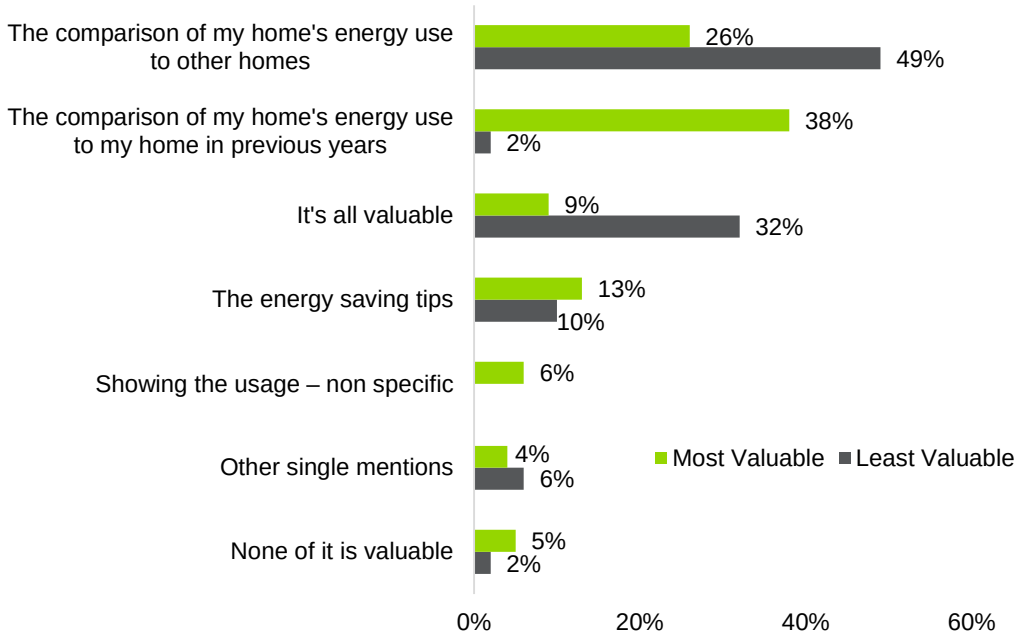
Figure 6-9. Most and Least Valuable Component of the Home Energy Reports: Treatment Only



Multiple responses accepted; figure includes reasons mentioned by at least 4% of respondents.

Treatment n=61

Source: Navigant analysis of customer survey; H4, H5

6.5 Other Program Awareness

The evaluation team asked respondents about their familiarity with Rocky Mountain Power's wattSmart brand, a branded umbrella title that encompasses all the utility's residential and business energy efficiency programs. Overall, respondents reported high levels of familiarity with the wattSmart brand, with about 70 percent of all respondents indicating that they were familiar.

Approximately 40 percent of all respondents indicated that they have participated in at least one wattSmart program, as shown in Figure 6-10. Over one-fourth of the respondents (treatment =26 percent; control =26 percent) are familiar with the brand but have not participated in a program. Less than one-third of respondents are unfamiliar with the wattSmart brand. Navigant found no statistical differences between the treatment and control respondents.

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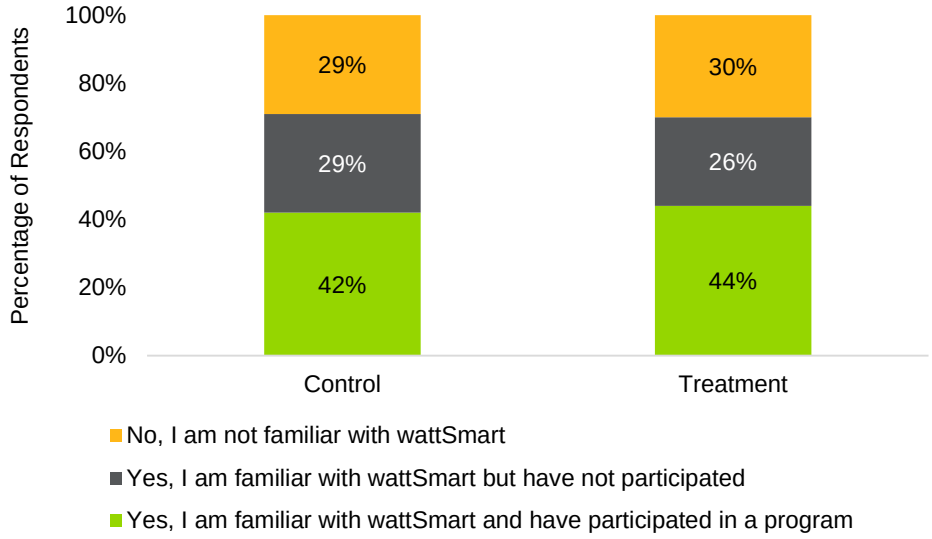
Figure 6-10. Respondent Familiarity with the wattSmart Brand



Control n=100; Treatment n=100

Source: Navigant analysis of customer survey; PA1, PA2

7. PROGRAM COST-EFFECTIVENESS

Navigant calibrated and updated the cost-effectiveness models based on evaluated net savings prior to uplift adjustment, as reported in Table 5-2. Navigant does not use savings after uplift adjustment because the adjustment reflects an issue of double-counting with other programs, rather than an issue of overstating program savings. That is, removing the savings associated with uplift would inaccurately penalize the HER program by removing savings which are, at least partially, caused by the HER program which would make the HER program appear less effective than it is. As Table 7-1 to Table 7-3 indicate, for all three evaluation periods the program is cost-effective for four of the five standard cost tests, with the exception being the RIM test.

Table 7-1. HER Program 2015 Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized $/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + 10% Conservation Adder	$0.0352	$104,657	$178,659	$74,003	1.71
Total Resource Cost Test (TRC) No Adder	$0.0352	$104,657	$162,418	$57,761	1.55
Utility Cost Test (UCT)	$0.0352	$104,657	$162,418	$57,761	1.55
Ratepayer Impact Measure Test (RIM)	-	$443,505	$162,418	-$281,088	0.37
Participant Cost Test (PCT)	-	$0	$369,558	$369,558	-
Lifecycle Revenue Impacts ($/kWh)					$0.0000821492
Discounted Participant Payback (years)					-

Source: Navigant analysis

Table 7-2. HER Program 2016 Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized $/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + 10% Conservation Adder	$0.0434	$126,140	$192,417	$66,277	1.53
Total Resource Cost Test (TRC) No Adder	$0.0434	$126,140	$174,924	$48,784	1.39
Utility Cost Test (UCT)	$0.0434	$126,140	$174,924	$48,784	1.39
Ratepayer Impact Measure Test (RIM)	-	$454,769	$174,924	-$279,845	0.38
Participant Cost Test (PCT)	-	$0	$363,093	$363,093	-
Lifecycle Revenue Impacts ($/kWh)					$0.0000812039
Discounted Participant Payback (years)					-

Source: Navigant analysis

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Table 7-3. HER Program 2015-2016 25-Month Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized $/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + 10% Conservation Adder	$0.0393	$230,797	$371,076	$140,280	1.61
Total Resource Cost Test (TRC) No Adder	$0.0393	$230,797	$337,342	$106,545	1.46
Utility Cost Test (UCT)	$0.0393	$230,797	$337,342	$106,545	1.46
Ratepayer Impact Measure Test (RIM)	-	$898,275	$337,342	-$560,932	0.38
Participant Cost Test (PCT)	-	$0	$732,651	$732,651	-
Lifecycle Revenue Impacts ($/kWh)				$0.0001627684	
Discounted Participant Payback (years)					-

Source: Navigant analysis

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8. KEY FINDINGS AND RECOMMENDATIONS

This section summarizes key findings and recommendations.

8.1 Impact Evaluation

Finding 1. Table 8-1 below shows the total evaluated energy savings in megawatt hours (MWh), after adjusting for uplift,[29] and percent savings in each time period. Percent savings grew slightly from the first to the second year indicating ramp-up as the program matured.

Table 8-1. Savings by Wave and Year*

	2015	2016	2015-2016
Percent Savings	1.16%	1.33%	1.24%
Total Savings	3,173	3,098	6,271

* Navigant estimated each period (i.e. year 2015, year 2016, and 2015-2016 together) as a separate analysis; the savings totals for year 2015 and year 2016 do not sum to the savings over the total combined period of 2015-2016 together.
Source: Navigant analysis

Recommendation 1. Future refill waves should target the highest usage customers not already in the program. Prior to adding future refill waves, the program should verify that the allocation of households across the treatment and control groups is consistent with a RCT.

Finding 2. Total double-counted savings were 48 MWh (or 0.8 percent of total savings) for the Appliance Recycling and HES programs across 2015 and 2016, which means that treatment customers were slightly more likely than control customers to participate in other Rocky Mountain Power energy efficiency programs.[30] The small magnitude indicates double-counting of energy savings is not a concern for this program at this time. Additionally, Navigant found no evidence of double-counting in the upstream EEL portion of the HES program.

8.2 Cost-Effectiveness Evaluation

Finding 3. The program was cost-effective in 2015, 2016 and the combination of program years. The program passes all cost-effectiveness tests except for the RIM test.

8.3 Process Evaluation

Finding 4. As shown in Table 8-2 below, survey respondents reported high levels of satisfaction with Rocky Mountain Power overall. Satisfaction was the same for treatment and control customers.

[29] Uplift occurs when HER treatment customers participate in Rocky Mountain Power's other energy efficiency programs at a higher or lower rate than they would have in the absence of the HER program. Savings driven by uplift (positive or negative) must be subtracted from the HER savings to avoid double-counting savings in other energy efficiency programs. Uplift is discussed in more detail in Section 2.3.

[30] The double counting results are discussed in more detail in Section 5.3.

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Finding 5. Sixty-two percent of treatment respondents indicated that they were satisfied with the reports, as shown in Table 8-2 below. Although, this level of satisfaction may seem low compared to other programs it is in-line with satisfaction seen for other HER programs. Control respondents do not receive reports from the HER program and were not asked this question.

Finding 6. Treatment respondents reported lower satisfaction with their home energy usage than control respondents (59 percent, 71 percent), as shown in Table 8-2 below. One possible explanation for lower satisfaction with energy use among treatment customers was that they received frequent tips and granular comparisons to remind them that there is more that they could do to save energy; thus, these customers were less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

Table 8-2. Summary of Satisfaction Findings†

	Treatment	Control
Satisfaction with Rocky Mountain Power	87%	87%
Satisfaction with the HER program	62%	-
Satisfaction with home's energy usage	59%	71%

† Percentages given above reflect percent satisfied (rating of 6 or higher on a scale from 1 to 10).

Source: Navigant analysis

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APPENDIX A. SURVEY INSTRUMENT

PacifiCorp HER Participant and Non-Participant Telephone Survey Guide – Idaho and Wyoming
Final
November 2, 2016

Introduction I

May I speak with [CONTACT NAME]? (**IF NOT AVAILABLE, SAY:** May I speak with the person in your household who is most knowledgeable about your energy bill?) **[IF NO ONE AVAILABLE FROM HOUSEHOLD, SCHEDULE A CALL BACK.]**

Hello, I'm [YOUR NAME] of Dieringer Research, calling on behalf of Rocky Mountain Power about energy efficiency programs that your utility offers its customers to save energy. I want to emphasize that this is not a sales call; Rocky Mountain Power would like to ask their customers some questions for research purposes only.

[IF AVAILABLE INDIVIDUAL IS NOT FROM THE HOUSEHOLD LISTED IN THE CONTACT LIST, THANK AND TERMINATE]

Rocky Mountain Power is interested in how to better design energy efficiency programs to save their customers money on their utility bills. They have found that one of the best sources of information is to survey customers like you. 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 10 [to 15] minutes.
Your responses to our questions are strictly confidential. They will be averaged with those of other customers to evaluate the usefulness of Rocky Mountain Power's energy efficiency programs. This call may be monitored for quality assurance purposes**.**

SA. Am I reaching you on a cell phone?

1 Yes
2 No

IF SA=1 PROCEED ELSE SKIP TO S1]

SB. Is this a safe time to talk or are you driving?

1 Yes – Safe to talk
2 No – Driving (schedule callback)

SCREENER

S1. We have your address listed as [INSERT ADDRESS HERE]. Could you please verify that this information is correct?

1 Yes [CONTINUE]
2 No [TERMINATE]
98 Don't know [TERMINATE]
99 Refused [TERMINATE]

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

1 Yes [CONTINUE]
2 No
98 Don't know
99 Refused [TERMINATE]

[IF S2 = 2 or 98, CONTINUE, ELSE SKIP TO S3.]
S2A. *Can I speak to the person in your household that handles the mail your household receives from Rocky Mountain Power?"*

1 Yes [RETURN TO INTRODUCTION]
99 No/Refused [TERMINATE]

[ASK OF PARTICIPANTS ONLY]
S3. Do you recall receiving reports from Rocky Mountain Power that describe your home's electric energy use comparing your usage to your neighbors? [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 Don't know [TERMINATE]
99 Refused [TERMINATE]

IF SA=2 PROCEED ELSE SKIP TO L1]

Just one more 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 cordless phone? [NOTE TO SURVEYOR: IF THERE IS A QUESTION ABOUT THE LEGITIMACY OF THE SURVEY, THE PARTICIPANT MAY CALL Nikki Karpavich of Rocky Mountain Power at 801-220-4439.]

1 Yes [CONTINUE]
2 No [TERMINATE]

[IF S4 = 2, CONTINUE, ELSE SKIP TO L1.]
S5. Can we call you back on another number where you are free to move around the house?

1 Yes [SCHEDULE CALLBACK]
2 No [TERMINATE]

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LIVE AUDIT

Thank you for confirming.

L1. I want to start by asking you about the lights in the room that you're currently in. What type of room is it? (DO NOT READ LIST.)

1	Kitchen
2	Dining Room
3	Living Room
4	Bedroom
5	Family Room
6	Bathroom
7	Basement
8	Garage
9	Other: _____
98	Don't know
99	Refused

L2a. Please look around at the lights in the room you are currently in. 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: ____

998	Don't know
999	Refused

L2b. In the same room that you are in, how many of the light bulbs are LED lights, which stands for light emitting diodes. These are often more expensive than other bulbs and generally look like a regular light bulb.

Number: ____

998	Don't know
999	Refused

L3. Now I want to ask about the total number of lights that are currently turned on in your home and the number of those that are CFLs and the number that are LEDs.

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Let's begin with the ***total*** number of lights that are currently on. 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. IF THE RESPONDENT ASKS ABOUT MULTIPLE BULBS CONNECTED TO THE SAME LIGHT SWITCH (I.E., ONE SWITCH TURNS ON THREE BULBS), COUNT EACH BULB SEPARATELY. HOLIDAY LIGHTS, WHICH ARE OFTEN LEDS, SHOULD NOT BE COUNTED]**

Number: ____
998 Don't know
999 Refused

L4. Next, please count the number of **CFLs and LEDs** currently turned on in your home. Please don't include any lights you turned on as part of your walkthrough and keep a separate count for each bulb type.

L4a. Number of CFLs on: _____
998 Don't know
999 Refused

L4b. Number of LEDs on: _____
998 Don't know
999 Refused

Now, I'd like to ask you about a few other household appliances.
L5. Please go to your home's thermostat. If you have more than one, go to the one that controls the temperature for the space in your home that is most frequently occupied. Is this thermostat: (READ LIST.) (READ DESCRIPTIONS AS NECESSARY)
A manual thermostat (with a dial or lever that allows you to adjust the temperature; but does not have a digital display)?
A digital thermostat (with a digital display that allows you to adjust the temperature by pressing buttons)?
A smart/Wi-Fi programmable thermostat (with a digital display that allows for remote control of your thermostat)? Examples include the Google Nest and the Honeywell Lyric.

1 A manual thermostat
2 A digital thermostat
3 A smart/Wi-Fi programmable thermostat
98 Don't know (DO NOT READ)
99 Refused (DO NOT READ)

[ASK IF L5=2 or 3]
L5a. Have the programming options been set to automatically adjust throughout the day or week?
1 Yes
2 No
3 [L5=2 ONLY] My thermostat does not have programming options
98 Don't know
99 Refused

L6. Please look at your thermostat. To what temperature is it currently set?

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[READ AS NECESSARY FOR DIGITAL THERMOSTATS] The temperature setting should have the words “set to” or “temperature set” above the number
[READ AS NECESSARY FOR MANUAL THERMOSTATS] The temperature setting should be shown alongside the lever that you use to adjust the temperature.

Set temperature: _____
997 Thermostat is turned off
998 Don’t know
999 Refused

L7. What is the thermostat reading for the actual temperature of your home right now? This may be the same as the temperature your thermostat is set to, but may be different if your home has not yet reached the set temperature or your thermostat is turned off.
[READ AS NECESSARY FOR DIGITAL THERMOSTATS] The actual temperature may have the words “indoor” or “inside” above the number, and the numbers may be larger in size than the “set to” temperature.
[READ AS NECESSARY FOR MANUAL THERMOSTATS] The actual temperature should be shown with an indicator alongside a scale of numbers; this indicator cannot be moved by using the lever.

Actual temperature: _____
998 Don’t know
999 Refused

EFFICIENT LIGHTING AWARENESS AND PURCHASES
LP1. In the past 12 months, do you recall seeing information from Rocky Mountain Power that encourages you to replace traditional incandescent light bulbs with CFLs and LEDs to save energy?

1 Yes
2 No
98 Don’t know
99 Refused

LP2. To the best of your recollection, has your household purchased CFL bulbs in the past 12 months?

1 Yes
2 No
98 Don’t know
99 Refused

[IF LP2=1, CONTINUE. ELSE SKIP TO LP3.]
LP2a. About how many CFLs has your household purchased in the last 12 months?

Number of CFLs purchased in past year: _____
998 Don’t know
999 Refused

LP3. Has your household purchased LEDs in the past 12 months?

1 Yes
2 No
98 Don’t know
99 Refused

[IF LP3=1, CONTINUE. ELSE SKIP TO EA1.]
LP3a. About how many LEDs has your household purchased in the past 12 months?

Number of LEDs purchased in past year: _____
998 Don’t know
999 Refused

ENERGY AWARENESS

EA1. Are you familiar with the ENERGY STAR label for appliances, such as televisions, dishwashers, and clothes washers and dryers that meet national energy efficiency standards?

1 Yes
2 No
98 Don't know
99 Refused

EA2. Please tell me how much you agree or disagree with these statements on a scale from 1 to 10, where 1 means you strongly disagree and 10 means you strongly agree.

[RANDOMIZE ORDER, SHOW SCALE WITH END LABELS, 98 Refused, 99 Don't know]

EA2a. I am very concerned about how energy use affects the environment.
EA2b. I often worry that the cost of energy for my home will increase.
EA2c. I intend to conserve electricity in my home this year.
EA2d. I am already doing everything I can to save energy in my home.
EA2e. I understand how actions taken by me and others in my household result in higher or lower energy use.
EA2f. It would make me proud to have one of the most energy efficient houses in my neighborhood.

EA3. 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 1 to 10 that we used before, where 1 means you strongly disagree and 10 means you strongly agree, please tell me how much you agree with the following statements.

[RANDOMIZE ORDER, SHOW SCALE WITH END LABELS, 98 Refused, 99 Don't know]

EA3a. I pay closer attention to my energy costs now than I did 2 years ago before receiving Home Energy Reports. [ASK ONLY OF PARTICIPANTS]
EA3b. I feel guilty if I use too much energy.
ER3c. I know about other things I could be doing to save energy, beyond what I'm already doing.
EA3d. Improving my home's energy efficiency is a worthwhile investment.
EA3e. My energy bill is noticeably lower when I make an extra effort to conserve.

EA4. How would you rate your level of satisfaction with your home's electric energy consumption on a scale from 1 to 10, where 1 means you are extremely dissatisfied and 10 means you are extremely satisfied?

[SHOW SCALE WITH END LABELS, 98 Refused, 99 Don't know]

EA4a. Why did you give that rating? (OPEN-ENDED)

EA5a. Have you made any energy efficient purchases or upgrades to your home in the past 12 months? (DO NOT READ LIST.)

1 Yes
2 No
98 Don't know
99 Refused

[IF EA5A=1, CONTINUE. ELSE SKIP TO EA6.]

EA5b. What purchases or upgrades have you made? (DO NOT READ LIST. ENTER ALL THAT APPLY.)

1 Air conditioner (i.e., window unit, central air, room air conditioner, ductless air conditioner)
2 Clothes dryer
3 Clothes washer

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4 Dehumidifier
5 Dishwasher
6 Electronics (i.e., television, laptop, desktop computer, home office equipment)
7 Furnace fan
8 Other fans (i.e., whole-house fan, attic fan, solar attic fan, box fans, ceiling fans)
9 Heat pump (for heating or cooling home; i.e., a "regular" heat pump, geothermal heat pump, or ductless heat pump)
10 Insulation
11 CFLs/compact fluorescent bulbs
12 LED light bulbs
13 Other lights (outdoor solar lights, dimming lights, motion sensors, occupancy sensors)
14 Pool equipment (i.e., heater, pool pump, variable speed pool pump)
15 Refrigerator
16 Freezer
17 Programmable thermostat
18 Water heater (i.e., "regular" water heater, solar water heater, geothermal water heater, drain water heat recovery system, heat pump water heater, tankless water heater)
19 Windows (i.e., double pane, storm windows, strategically placed new windows)
20 Other [SPECIFY]
98 Don't know
99 Refused

EA6a. In the past 12 months, have you taken any action to reduce or minimize your electric, gas, or water consumption? (DO NOT READ LIST.)

21 Yes
22 No
98 Don't know
99 Refused

[IF EA6A=1, CONTINUE. ELSE SKIP TO EA7.]
EA6B. What actions or behavior changes have you made? (DO NOT READ LIST. ENTER ALL THAT APPLY.)

23 Line-dry clothes
24 Run the clothes dryer with a full load
25 Run the clothes washer with a full load
26 Wash laundry in cold water

27 Air dry dishes
28 Run dishwasher with a full load

29 Adjust settings to energy efficient settings
30 Use power save modes on computers
31 Shut down computer at night
32 Plug electronics into smart strip
33 Unplug chargers when not in use
34 Unplug electronics when not in use
35 Play video games for fewer hours per day
36 Use computer for fewer hours per day
37 Use electronics [unspecified type] for fewer hours per day

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38 Watch TV for fewer hours per day

39 Change AC filter
40 Change furnace filter
41 Clean refrigerator coils
42 Clear areas around heating and cooling vents
43 Keep ac unit clear of debris
44 Maintain equipment to run efficiently
45 Insulate water heater and/or pipes (i.e., install a water heater blanket, insulate water pipes)
46 Seal leaks and drafts (i.e., leaky doors, windows, refrigerator seals, fireplaces, air ducts, air conditioner units, outlets and light switches)
47 Set heating to lower temperature, set air conditioner to higher temperature
48 Take shorter showers
49 Turn off lights when not in use
50 Use less air conditioning
51 Use window shades (i.e., to let heat from sun in on cold days, and/or keep heat from sun out on warm days)

52 Decrease water heater thermostat
53 Program thermostat (i.e., program to reduce heating and/or cooling when away from home or asleep)

54 Other [SPECIFY]
98 Don't know
99 Refused

SATISFACTION

SAT1. On a scale from 1-10, where 1 is extremely dissatisfied and 10 is extremely satisfied, how would you rate your overall satisfaction with Rocky Mountain Power?

[SHOW SCALE WITH END LABELS, 98 Refused, 99 Don't know]

SAT1a. Why did you give that rating? [OPEN-ENDED]

HOME ENERGY REPORTS [PARTICIPANTS ONLY]

H1. On average, how long do you or members of your household spend reading the Home Energy Report? Would you say…

1 Less than 2 minutes
2 2-5 minutes
3 6-10 minutes
4 11-15 minutes
5 More than 15 minutes
6 I don't read the reports
7 Other [SPECIFY]
98 Don't know
99 Refused

H2. On a scale of 1 to 10, with 1 being extremely dissatisfied and 10 being extremely satisfied, how would you rate your satisfaction with the home energy reports? You may use any number from 1 to 10.

[SHOW SCALE WITH END LABELS, 98 Refused, 99 Don't know]

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H2a. Why did you give that rating? [OPEN-ENDED]

H3. How accurate do you think the home energy reports are in terms of your home's energy usage? Would you say they are… (READ LIST.)

1 Extremely accurate
2 Moderately accurate
3 Neither accurate nor inaccurate
4 Moderately inaccurate
5 Extremely inaccurate
98 Don't know
99 Refused

H4. What do you consider to be the MOST valuable piece of information in the home energy reports?

1 The comparison of my home's energy use to other homes
2 The comparison of my home's energy use to my home in previous years
3 The energy-saving tips
4 It's all valuable
5 None of it is valuable
6 Other [SPECIFY] (DO NOT READ)
98 Don't know (DO NOT READ)
99 Refused (DO NOT READ)

H5. What do you consider to be the LEAST valuable piece of information in the home energy reports?

[PROGRAM TO REMOVE THE OPTION SELECTED IN H4]

1 The comparison of my home's energy use to other homes
2 The comparison of my home's energy use to my home in previous years
3 The energy-saving tips
4 It's all valuable
5 None of it is valuable
6 Other [SPECIFY] (DO NOT READ)
98 Don't know (DO NOT READ)
99 Refused (DO NOT READ)

OTHER PROGRAM AWARENESS

PA1. Are you familiar with the wattSmart brand? (READ IF NECESSARY) This is a campaign and outreach effort by Rocky Mountain Power to promote energy efficiency and conservation and to educate customers on saving money on their utility bills.

1 Yes
2 No
98 Don't know
99 Refused

[IF ROCKY MOUNTAIN POWER CUSTOMERS, CONTINUE. ELSE SKIP TO PA4.]

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PA2. Have you ever heard of or participated in any of the following energy efficient programs offered by Rocky Mountain Power? **[PROGRAM AS SEPARATE SCREENS FOR EACH PROGRAM, 1-Yes, Heard of; 2-Yes, Participated in; 3-No; 98-Don't know; 99-Refused]**

a. **Home Energy Savings Program:** Rocky Mountain Power offers cash incentives to customers who install or upgrade the insulation in their home, buy energy efficient electrical appliances and lighting for their home, and more (heating, cooling, water heaters, etc.).

b. **Low Income Weatherization Program:** Rocky Mountain Power works with local agencies to provide free weatherization services to income-qualifying customers.

c. **wattSmart Business Program:** Rocky Mountain Power offers a programs targeted at saving money for your business, including lighting and appliance rebates, custom analysis, energy management services, agricultural equipment rebates, and others.

DEMOGRAPHICS

Just a few more questions and we will be done.

D1. What is the total square footage of your home's living space, finished and unfinished? Your best estimate will be fine.

_____ Square feet
99998 Don't know
99999 Refused

D2. In what year were you born?

[RECORD NUMBER 1900–1996]
Refused

1 {SET IF D3=1995–1996} 18–19
2 {SET IF D3=1990–1994} 20–24
3 {SET IF D3=1980–1989} 25–34
4 {SET IF D3=1970–1979} 35–44
5 {SET IF D3=1960–1969} 45–54
6 {SET IF D3=1950–1959} 55–64
7 {SET IF D3=1900–1949} 65+
8 {SET IF D3=Don't know, Refused} Don't know/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

D4. Approximately how many people live in your household full time (at least 9 months of the year)?

Number: ____
98 Don't know
99 Refused

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D5. What was your approximate annual household income in 2015 before taxes? Please stop me when I say the answer that best reflects your approximate household income.

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-$149,999
7 $150,000 and over
98 Don't know
99 Refused

D6. [RECORD RESPONDENT GENDER – DO NOT READ]

1 Man
2 Woman
3 Other, DK, Refused

Those are all of the questions I have for you today. Thank you very much for your time.

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APPENDIX B. REGRESSION COEFFICIENT ESTIMATES

Table B-1. LDV Parameter Estimates

Variable	2015 (and Dec 2014)		2016		2015-2016 (25 months)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
treatment	-0.480	-5.650	-0.552	-4.960	-0.513	-5.810
yrmo201412	10.612	47.720	-	-	10.632	47.750
yrmo201501	7.471	32.320	-	-	7.490	32.350
yrmo201502	8.667	41.600	-	-	8.683	41.600
yrmo201503	6.554	30.390	-	-	6.574	30.450
yrmo201504	7.258	34.330	-	-	7.278	34.400
yrmo201505	6.733	30.760	-	-	6.753	30.770
yrmo201506	6.907	29.360	-	-	6.927	29.370
yrmo201507	5.819	24.660	-	-	5.839	24.660
yrmo201508	5.469	22.960	-	-	5.486	22.960
yrmo201509	4.169	16.860	-	-	4.189	16.890
yrmo201510	5.548	18.550	-	-	5.568	18.600
yrmo201511	6.096	25.230	-	-	6.116	25.280
yrmo201512	7.741	30.350			7.760	30.370
yrmo201601	-	-	6.864	24.400	6.840	24.580
yrmo201602	-	-	6.822	26.040	6.798	26.280
yrmo201603	-	-	6.722	25.650	6.699	25.920
yrmo201604	-	-	7.050	29.280	7.026	29.660
yrmo201605	-	-	7.911	34.890	7.888	35.460
yrmo201606	-	-	7.030	27.710	7.006	28.030
yrmo201607	-	-	5.592	22.700	5.569	22.940
yrmo201608	-	-	5.675	20.920	5.652	21.130
yrmo201609	-	-	5.220	18.950	5.197	19.130
yrmo201610	-	-	6.875	21.140	6.852	21.250
yrmo201611	-	-	9.772	38.930	9.749	39.300
yrmo201612			7.692	28.050	7.668	28.270
yrmo201412:pre.kwh	0.729	165.090	-	-	0.729	165.090
yrmo201501:pre.kwh	0.816	194.930	-	-	0.816	194.930
yrmo201502:pre.kwh	0.713	177.490	-	-	0.713	177.510
yrmo201503:pre.kwh	0.797	162.660	-	-	0.797	162.670
yrmo201504:pre.kwh	0.738	135.100	-	-	0.738	135.090
yrmo201505:pre.kwh	0.745	115.590	-	-	0.745	115.590
yrmo201506:pre.kwh	0.755	97.210	-	-	0.755	97.210
yrmo201507:pre.kwh	0.881	121.290	-	-	0.881	121.300
yrmo201508:pre.kwh	0.774	111.420	-	-	0.774	111.430
yrmo201509:pre.kwh	0.911	109.910	-	-	0.911	109.910
yrmo201510:pre.kwh	0.778	79.280	-	-	0.778	79.270

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Variable	2015 (and Dec 2014)		2016		2015-2016 (25 months)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
yrmo201511:pre.kwh	0.808	123.390			0.808	123.390
yrmo201512:pre.kwh	0.826	161.470			0.826	161.470
yrmo201601:pre.kwh	-	-	0.863	171.270	0.863	171.270
yrmo201602:pre.kwh	-	-	0.842	166.800	0.842	166.800
yrmo201603:pre.kwh	-	-	0.822	139.160	0.822	139.160
yrmo201604:pre.kwh	-	-	0.771	126.510	0.771	126.520
yrmo201605:pre.kwh	-	-	0.699	107.980	0.699	107.970
yrmo201606:pre.kwh	-	-	0.778	95.630	0.778	95.630
yrmo201607:pre.kwh	-	-	0.845	114.730	0.845	114.730
yrmo201608:pre.kwh	-	-	0.862	110.680	0.862	110.680
yrmo201609:pre.kwh	-	-	0.872	95.990	0.872	95.980
yrmo201610:pre.kwh	-	-	0.782	74.560	0.782	74.560
yrmo201611:pre.kwh			0.652	98.460	0.652	98.460
yrmo201612:pre.kwh			0.766	140.310	0.766	140.320

Note: t-statistics greater than 1.645 in absolute value indicate results are statistically significant at the 90% confidence level.
Source: Navigant analysis

Table B-2. LFER Parameter Estimates

Variable	2015 (and Dec 2014)		2016		2015-2016 (25 months)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Post	-1.045	-15.240	-1.313	-17.170	-1.152	-18.800
Post * Treatment	-0.517	-5.840	-0.558	-5.650	-0.537	-6.790

Note: t-statistics greater than 1.645 in absolute value indicate results are statistically significant at the 90% confidence level.
Source: Navigant analysis

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APPENDIX C. DETAILED UPLIFT TABLES

Table C-1. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs: 2015 (including December 2014)

	Program	
	HES	Appliance Recycling
Median Program Savings (Annual kWh per Treatment Customer)	735	1,052
No. of HER Treatment Households	17,844	17,844
Annualized Rate of Participation (%)	5.08%	1.49%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-13.69%	-
No. of HER Control Households	11,920	11,920
Annualized Rate of Participation	4.96%	1.19%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-13.60%	-
DID Statistic	0.12%	0.30%
Change in Program Participation due to HER Program	-19	53
Statistically Significant at the 90% Confidence Level?	No	Yes
Double-Counted Savings (kWh)	-13,617	56,219
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	3%	25%

Note: Median program savings are equal to the median kWh impact for HER treatment customers during the post-program period.

Source: Navigant analysis

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Table C-2. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs: 2016

	Program	
	HES	Appliance Recycling
Median Program Savings (Annual kWh per Treatment Customer)	762	1,022
No. of HER Treatment Households	17,844	17,844
Annualized Rate of Participation (%)	1.17%	0.02%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-17.60%	-
No. of HER Control Households	11,920	11,920
Annualized Rate of Participation	0.93%	0.01%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-17.63%	-
DID Statistic	0.24%	0.01%
Change in Program Participation due to HER Program	5	2
Statistically Significant at the 90% Confidence Level?	No	No
Double-Counted Savings (kWh)	3,926	1,536
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	26%	100%

Note: Median program savings are equal to the median kWh impact for HER treatment customers during the post-program period.

Source: Navigant analysis

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Table C-3. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs: 2015 (including December 2014)-2016

	Program	
	HES	Appliance Recycling
Median Program Savings (Annual kWh per Treatment Customer)	735	1,052
No. of HER Treatment Households	17,844	17,844
Annualized Rate of Participation (%)	6.25%	1.51%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-12.51%	-
No. of HER Control Households	11,920	11,920
Annualized Rate of Participation	5.89%	1.20%
Change in Annualized Rate of Participation from Pre-Program Year (%)	-12.67%	-
DID Statistic	0.36%	0.31%
Change in Program Participation due to HER Program	-13	55
Statistically Significant at the 90% Confidence Level?	No	Yes
Double-Counted Savings (kWh)	-9,830	57,801
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	6%	26%

Note: Median program savings are equal to the median kWh impact for HER treatment customers during the post-program period.

Source: Navigant analysis

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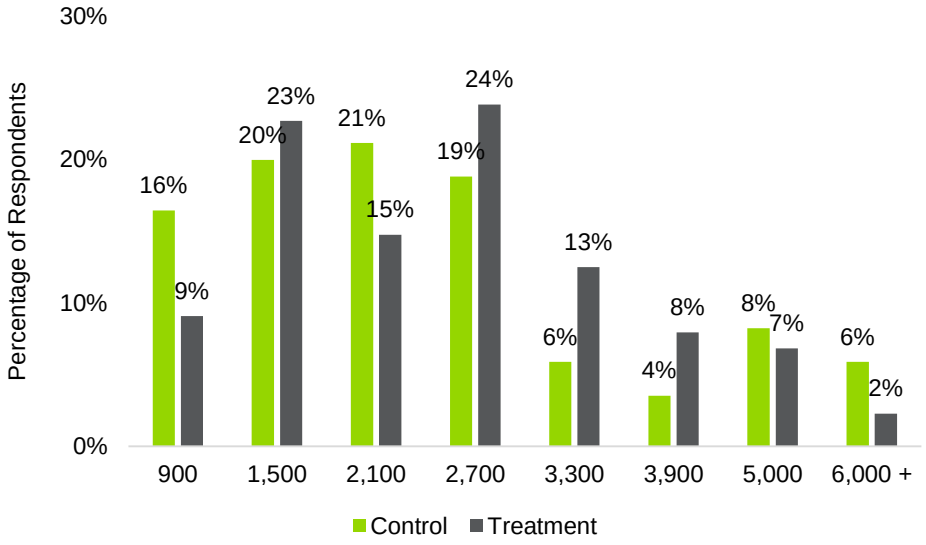
APPENDIX D. DEMOGRAPHICS

The following graphics represent self-reported demographic characteristics of survey respondents.

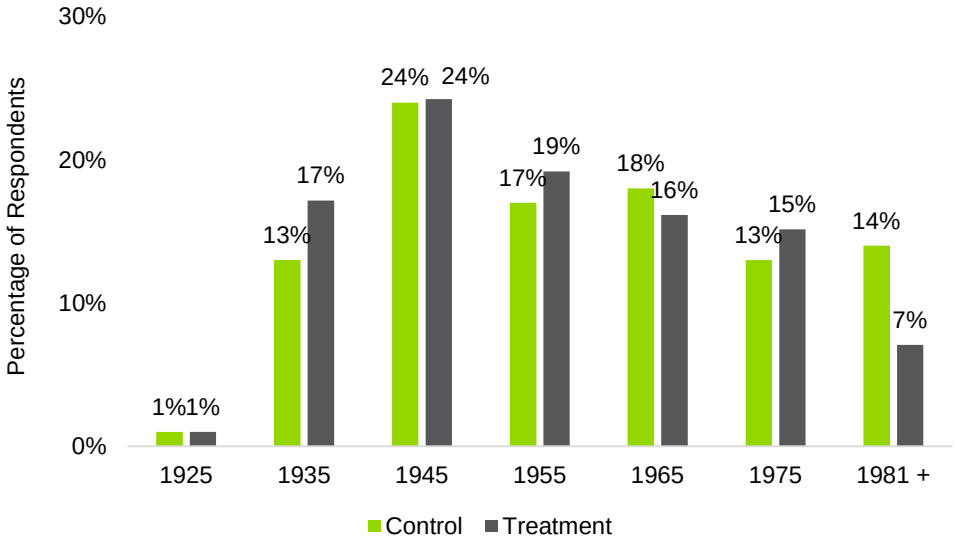
Figure D-1. Household Square Footage



Control n=85; Treatment n=88

Source: Navigant analysis of customer survey; D1

Figure D-2. Birth Year



Control n=100; Treatment n=99

Source: Navigant analysis of customer survey; D2

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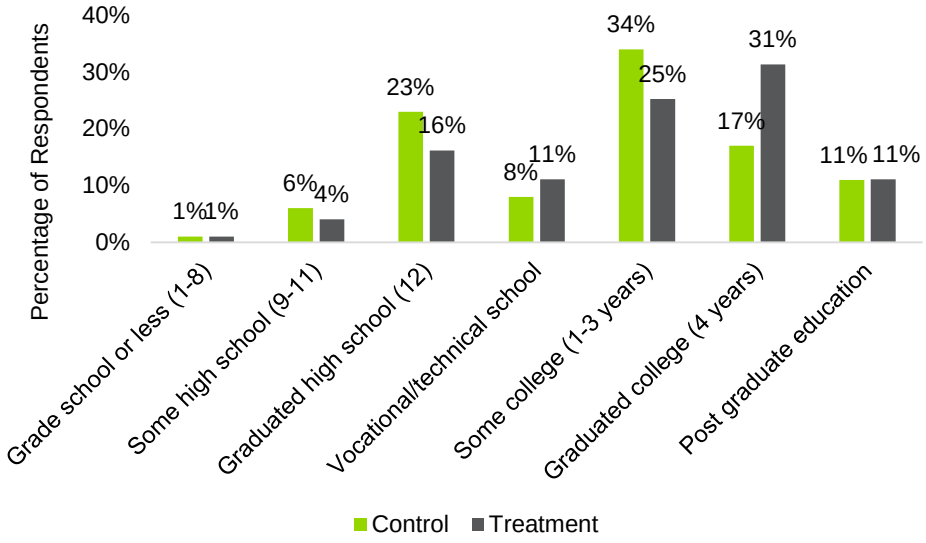
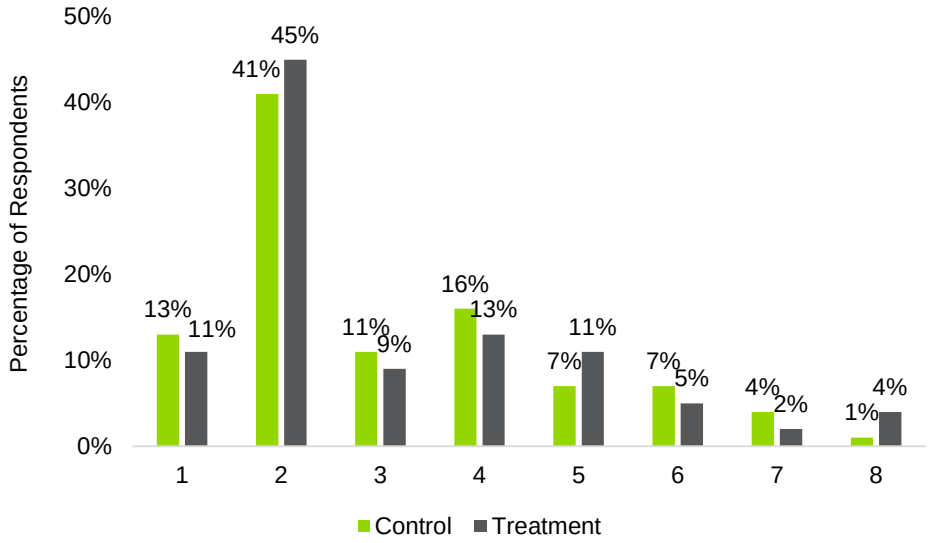
Figure D-3. Educational Background



Control n=100; Treatment n=99

Source: Navigant analysis of customer survey; D3

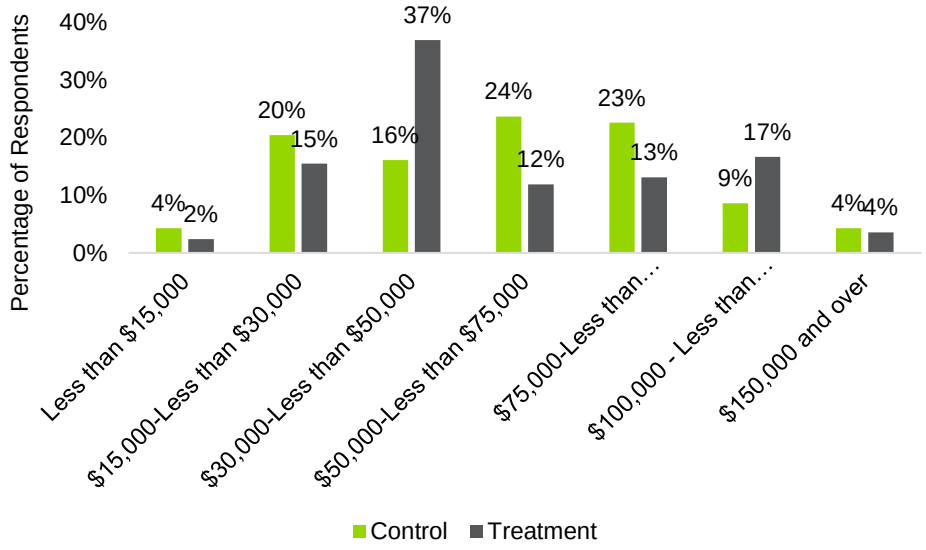
Figure D-4. Number of People in Household



Control n=100; Treatment n=100

Source: Navigant analysis of customer survey; D4

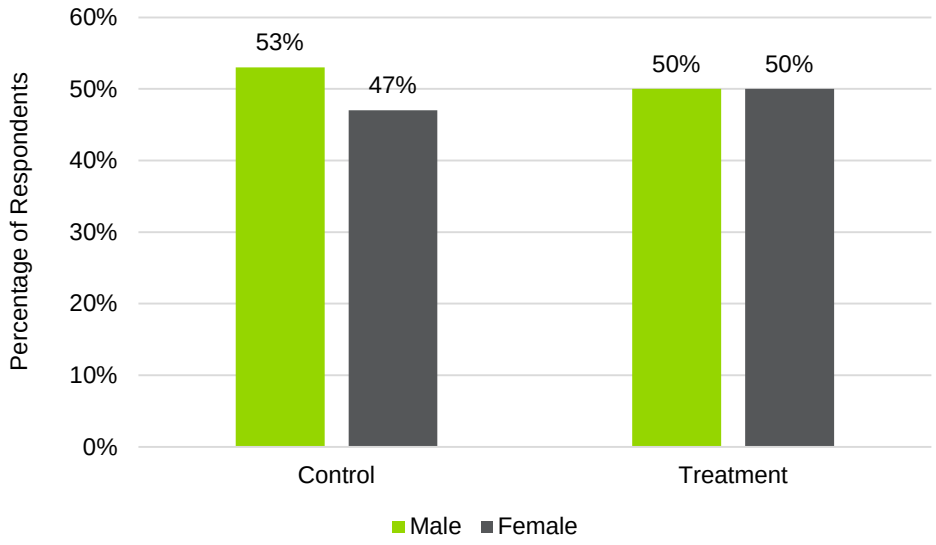
Figure D-5. Household Income



Control n=93; Legacy Treatment n=84

Source: Navigant analysis of customer survey; D5

Figure D-6. Gender



Control n=100; Treatment n=100

Source: Navigant analysis of customer survey; D6