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Utah
Home Energy Reporting Program
18 Month Evaluation Report
(8/1/2012 – 1/31/2014)

Presented to
Rocky Mountain Power
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E. Executive Summary

E.1. Program Description

Rocky Mountain Power's Home Energy Reporting (HER) program in Utah is designed to generate energy savings by providing residential customers with sets of information about their specific energy use and related energy conservation suggestions and tips. The information is provided in the form of Home Energy Reports that give customers various types of information, including: a) how their recent energy use compares to their energy use in the past; b) tips on how to reduce energy consumption, some of which are tailored to the customer's circumstances; and c) information on how their energy use compares to that of neighbors with similar homes. In other studies, this type of information has shown that customers are stimulated to reduce their energy use, creating average energy savings in the 1% to 2% range, depending on local energy use patterns.

E.2. Key Impact Findings

The HER program savings for the first year of the program are presented in Table E-1. The number of participants is the number at the start of the evaluation period. Findings include:

- Total verified net program savings during the first 18 months of the program were 45,158 MWh.
- On average, participants reduced their electricity usage by 2.05% during the first 18 months of the program.
- As expected, savings "ramped up" over time, increasing from 1.38% in 2012 to 2.29% in 2013.
- Double counting of savings with Utah's Home Energy Savings and Appliance Recycling programs is relatively small –310 MWh, or 0.7% of total savings.
- Program savings at site, both in terms of MWh and percentage, increase with customer energy usage.

Table E-1. Program Electric Savings†

Type of Statistic	2012	2013	18 Months
Number of Participants		92,797	
Reported Savings (MWh)	7,860	32,299	-
Verified Savings (MWh)	8,988	33,108	45,467
Realization Rate	1.14	1.03	-
Percent Savings	1.38%	2.29%	2.05%
Verified Net Savings (MWh)‡	**8,902**	**32,901**	**45,158**

†All savings are at site.
‡Verified net savings are savings after netting out savings double counted with other EE programs.
Source: Navigant analysis.

E.3. Program Cost Effectiveness

The cost effectiveness of utility-funded programs in Utah is typically analyzed using tests prescribed by the California Standard Practice Manual.[1] Overall the program is cost effective as determined by various industry-accepted tests. The program was found to be cost effective over its first 18 months for four of five standard cost-effectiveness tests: the Participant Cost Test (benefit/cost ratio ($0 participant cost), the Utility Cost Test (benefit/cost ratio of 2.40), the Total Resource Cost Test (benefit/cost ratio of 2.40), and the PacifiCorp Total Resource Cost Test (benefit/cost ratio of 2.64). The exception is the Rate Impact Test (benefit/cost ratio of 0.53), which restricts the cost-effectiveness analysis to the effect of a program on ratepayer bills. These tests generated qualitatively similar results for 2012 and for 2013. Section 6 presents the analysis of program cost effectiveness.

E.4. Recommendations

In light of the observed savings, Navigant recommends the following:

- Expand the program, especially to high usage customers. If the program is expanded, Navigant (or another third party) should receive the billing data for the new participant and control households for the year before these households are added to the program, *before* the home energy reports are initially sent to the new participant households. Navigant (or another third party) can verify that the allocation of households across the two groups is consistent with a randomized controlled trial.

- Consider evaluation of program demand savings. It is possible that customer energy savings are greater than average during peak demand hours. If the interval data necessary to estimate these savings is available, a fairly simple statistical analysis that takes advantage of the experimental design of the program could be used to estimate peak demand savings.

[1] The California Standard Practice Manual is an industry accepted manual; it identifies the cost and benefit components and cost-effectiveness calculation procedures from five 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.

1. Introduction

1.1 Program Description

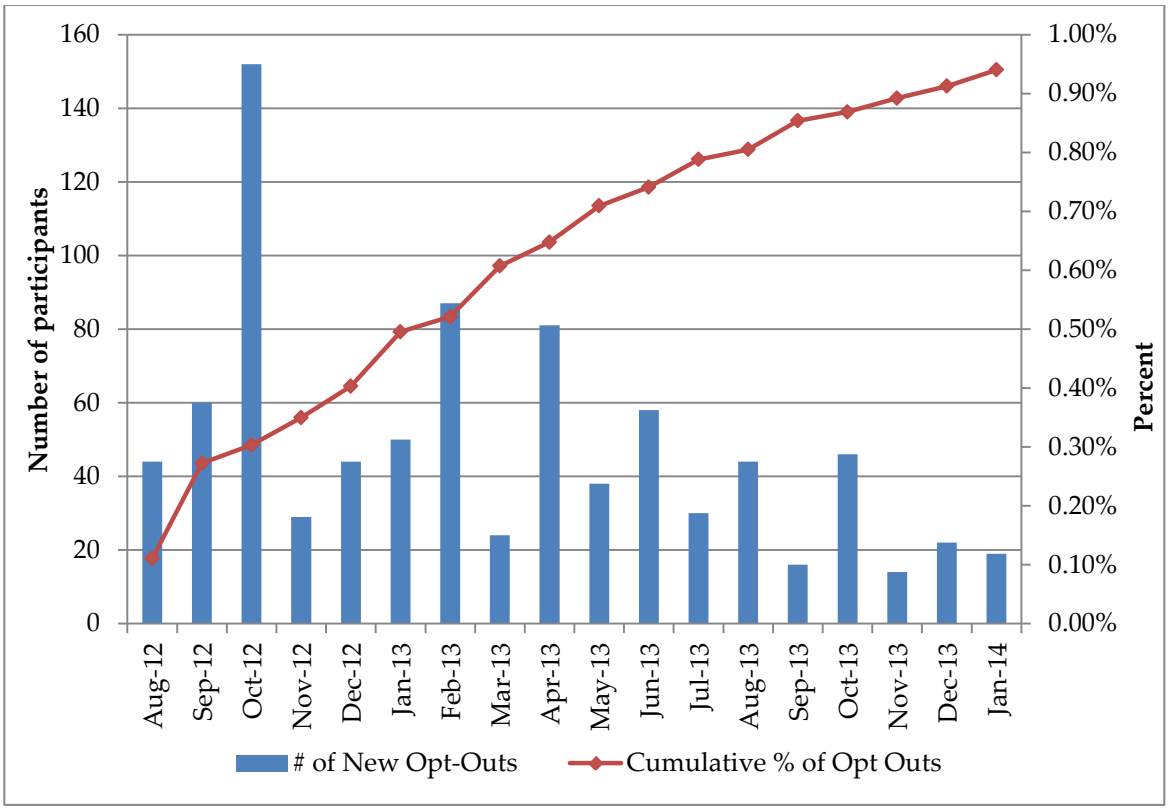
Utah's Home Energy Reporting (HER) program is designed to generate energy savings by providing residential customers with information about their specific energy use and related energy conservation suggestions and tips. The information is provided in the form of home energy reports that illustrate: a) how customers' recent energy use compares to their energy use in the past; b) tips on how the customers can reduce energy consumption, some of which are tailored to each customer's unique circumstances; and c) information on how the customers' energy use compares to that of neighbors with similar homes. In other studies, this type of information has stimulated customers to reduce their energy use, creating average energy savings in the 1% to 2% range, depending on local energy use patterns.

An important feature of the program is that it is a randomized controlled trial (RCT). Eligible customers are randomly assigned to a participant group and a control group for the purpose of estimating changes in energy use due to the program.

The HER program was launched in July 2012, with the first reports generated on July 17, 2012. The initial deployment of the program includes 92,797 residential customers, with an additional 29,475 residential customers designated as controls.[2] There are two sources of decay in program participation over time. The first is customers who opt out of the program. Figure 1-1 shows the monthly number of participants choosing to opt out of the program, and the cumulative percentage of opt-outs, since the start of the program. Over the first 18 months, 0.95% of participants have chosen to opt out of the program. The second is customers who move from the residence. Figure 1-2 shows the cumulative percentage of move-outs over the course of the program for both participants and controls. The rate of program customer loss due to move outs is a little more than 0.5% per month, and is virtually the same for participants and controls. Over the 18-month period of the program covered by this evaluation, 9.3% of participant accounts and 9.2% of controls accounts had been shed from the program due to move outs.

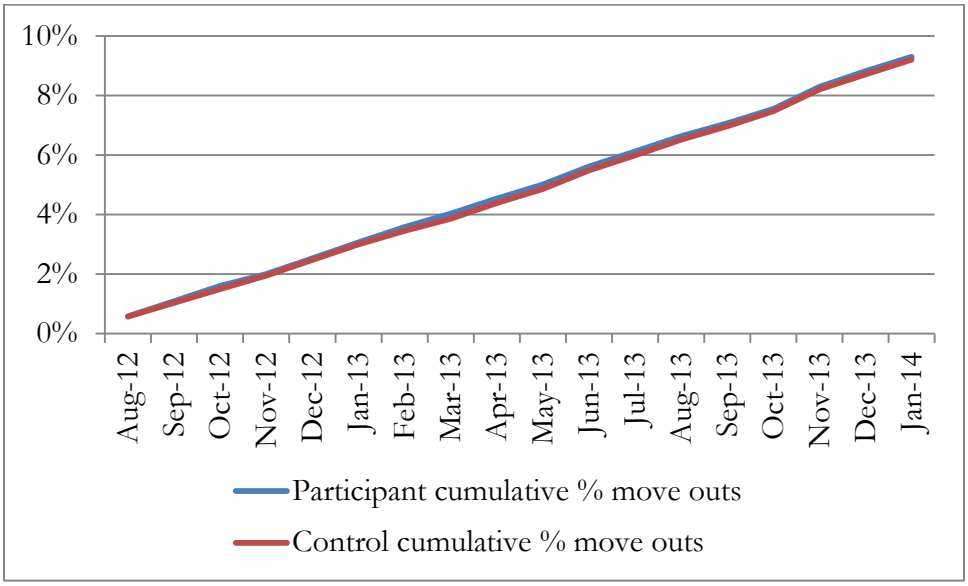
[2] The initial dataset indicated records for 94,042 participants and 29,830 controls. The reduction to the actual number of participants and controls reported here is explained in section 2.4.

Figure 1-1. Customers Opting Out of the HER Program, First 18 Months



Source: Navigant Analysis

Figure 1-2. Cumulative Move Outs, First 18 Months



Source: Navigant Analysis

1.2 Evaluation Objectives

The primary objective of the analysis in this report is to determine the extent to which participants in the HER program reduced their energy consumption due to the program.

Secondary objectives are to report on customer satisfaction with the HER program, and on behavioral and information effects of the HER program, including effects on customer awareness and purchase of energy efficient appliances and customer awareness of Pacific Power's energy efficiency programs.

2. Impact Evaluation Approach

The impact evaluation approach Navigant employed in this analysis is consistent with the methodology described in the SEE Action report,[3] relying on statistical analysis appropriate for RCTs. This evaluation has three primary components: 1) checking the allocation of customers to the participant and control groups for consistency with an RCT, 2) regression analysis to quantify program savings, and 3) quantification of double-counted savings from participation uplift in other energy efficiency programs. This section describes these components in more detail.

2.1 Statistical Consistency of the Program with an RCT

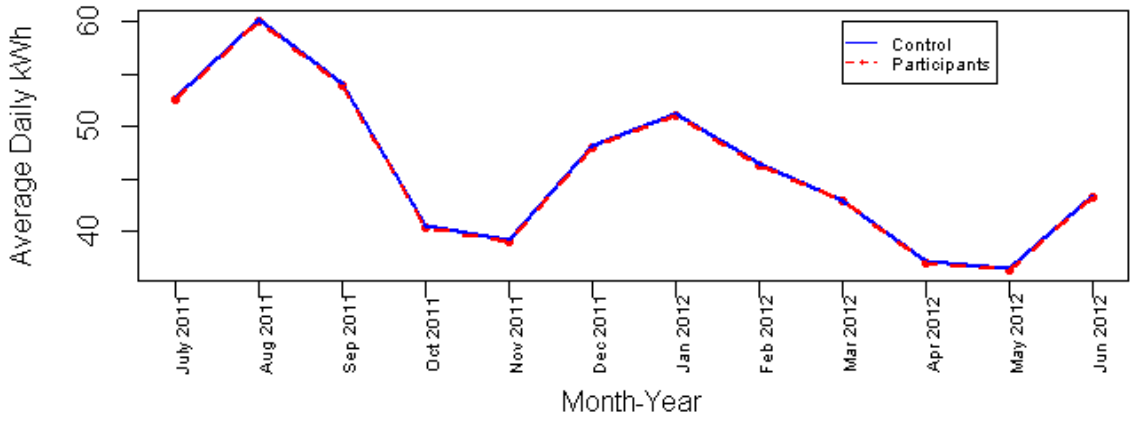
Navigant compared the monthly energy usage of the participant and control groups during the 12 month period prior to the start of the program (July 2011 through June 2012). If the allocation of the households across the participant and control groups is truly random, the two groups should have the same distribution of energy usage for each of the 12 months before the start of the program. For this analysis, Navigant compared the mean usage for each of the 12 months before the start of the program.

The results of the analysis indicate that the allocation of program households across the participant and control groups is consistent with an RCT design. Figure 2-1 depicts the average energy usage for participant and control households for the 12 months prior to the start of the HER program. The blue line indicates the average energy usage for controls and the red dashed line indicates the average energy usage for participants. The two lines in each graph are nearly identical, indicating no difference in average usage patterns for the participant and control groups.

Navigant conducted a statistical test on the difference in the mean energy usage in each of the twelve months. Navigant found no month in which the difference is statistically significant at the 90% confidence level. As an additional check, Navigant conducted a regression analysis in which average daily usage in the pre-program was a function of monthly binary variables and a binary participant variable. The parameter on the participant variable was not significant at the 90% confidence level, indicating no statistical difference in energy use between the participant and control groups prior to the start of the program. In light of these results, and as detailed in the next section, Navigant used a statistical method appropriate for use with RCTs to quantify the energy savings for the program.

[3] 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/

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



Source: Navigant analysis

2.2 Net Impact Evaluation Methodology

Navigant estimated program impacts using two approaches: linear fixed effects regression (LFER) analysis applied to monthly billing data, and a simple post-program regression (PPR) analysis with lagged controls. We run both models as a robustness check. Although the two models are structurally very different, both generate unbiased estimates of program savings in an RCT.

A key feature of the RCT design of the HER program is that the analysis estimates net savings, not gross savings. The random selection of program participants (as opposed to voluntary participation) assures that on average their behavior with regard to energy conservation actions and the purchase of energy efficient equipment 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.

The LFER model combines both cross-sectional and time series data in a panel dataset. The regression essentially compares pre- and post-program billing data for participants and controls 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. The fixed effect represents an attempt to control for any small systematic differences between the participant and control customers that might occur due to chance. Specifically, Navigant estimated the following regression model:

Equation 2-1. LFER Model

$$ADC_{kt} = \alpha_{0k} + \alpha_1 Post_t + \alpha_2 Participant_k \cdot Post_t + \varepsilon_{kt} \,,$$

where,

ADC_{kt} = The average daily usage in kWh for customer *k* during billing cycle *t*. This is the dependent variable in the model.

$Post_t$ = A 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).

$Participant_k$	= A binary variable indicating whether customer *k* is in the participant group (taking a value of 1) or in the control group (taking a value of 0).
α_{0k}	= The customer-specific fixed effect (constant term) for customer *k*. The fixed effect controls for all customer-specific effects on energy usage that do not change over time.
α_1, α_2	= Regression parameters corresponding to the independent variables.
ε_{kt}	= The cluster-robust error term for customer *k* during billing cycle *t*. Cluster-robust errors account for heteroscedasticity and autocorrelation[4] at the customer level.

Average daily savings are indicated by the parameter α_2. Program savings are the product of the average daily savings estimate, the number of days in the post-period[5], and the number of participants.

As with the LFER model, the PPR model combines both cross-sectional and time series data in a panel dataset, but it uses the post-program data only, with lagged energy use for the same calendar month of the pre-program period replacing the customer-specific fixed effect as a control for any small systematic differences between participants and controls. In particular, energy use in calendar month *m* of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between participants and controls will be reflected in differences in their past energy use, which is highly correlated with their current energy use. Formally, the model is,

Equation 2-2. PPR Model

$$ADC_{kt} = \beta_0 + \beta_1 ADClag_{kt} + \beta_2 Participant_k + \sum_j \beta_{3j} Month_j + \varepsilon_{kt},$$

where ADC_{kt} and $Participant_k$ are defined as in the LFER model, $ADClag_{kt}$ is customer *k*'s energy use in the same calendar month of the pre-program year as the calendar month of month *t*, and $Month_j$ is a binary variable taking a value of 1 if the observation is in Month *j* and 0 otherwise. In this model β_2 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 18-month savings is that the time lapse to the same pre-program calendar month is 12 months for the first 12 months of the program (August 2012-July2013), and 24 months for the last six months of the program (August 2013-January 2014). Concerned that the effect on post-program consumption of the pre-program variable can be different for a 12-month lag than for a 24-month lag, we used $ADClag1_{kt}$ for the case where the time lapse to the same pre-program calendar month was 12 months, and $ADClag2_{kt}$ for the case where it was 24 months. The effects of the lag length are statistically different at the 90% confidence level,

[4] 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 periods.

[5] Savings accrue for participants with active accounts.

though as a practical matter their effects are very close, with $ADClag1_{kt}$ =0.859 and $ADClag2_{kt}$=0.818, a difference of 5%.

Finally, to investigate how savings vary with usage level, Navigant divided the program participants and control customers 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).

2.3 Uplift Analysis Methodology

The HERs include energy saving tips, some of which encourage participants to enroll in other energy efficiency (EE) programs offered by Rocky Mountain Power. If participation rates in other energy efficiency programs are the same for HER participants and controls, the savings estimates from the regression analysis are already "net" of savings from the other programs, as this indicates the HER program had no effect on participation in the other EE programs. However, if the HER program affects participation rates in other energy efficiency programs, then portfolio savings differ from the simple summation of savings in the HER and EE programs. For instance, if the HER program increases participation in other EE programs, the increase in savings may be allocated to either the HER program or the energy efficiency program, but cannot be allocated to both programs simultaneously. On the other hand, if the HER program generates *negative* participation in other EE programs –a negative spillover—as might happen, for instance, if the HER program encourages behaviors or actions that reduce the value to customers of participating in other EE program—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 EE participation by HER participants, 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 to estimate uplift in Rocky Mountain Power's Utah's EE programs over the first 18 months of the HER program. This method uses differences between the participant and control groups in the rate of change in EE program participation to calculate the uplift in EE program participation due to the HER program. For instance, if the average annualized rate of participation in an EE program during the HER program is 5% for participants and 3% for controls, and the rate of participation during the year before the start of the HER program is 2% for participants and 1% for the controls, then the annualized rate of uplift due to the HER program is 1%, as found in the calculation (5%-2%)-(3%-1%)=1%. Converting this annual rate of uplift to 18 months generates a value of 1.5%. The DID statistic generates an unbiased estimate of uplift when the baseline average rate of participation is the same for the participant and control groups, or when they are different due only to differences between the two groups in time-invariant factors.

Navigant examined the uplift associated with two energy efficiency programs: Appliance Recycling and Home Energy Savings (HES). It is not possible to state definitively the double-counted savings of 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 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 (importantly, all surveys were done in the evening). If there is a statistical difference between participant and control customers in the average deployment and/or use of energy efficient lighting, and we assume that this difference is due *entirely* to the EEL program, and these observed differences are then extrapolated to average annual differences in energy use in a way that is reasonable and yet generous in the energy savings attributable to the EEL program, then we obtain an upper bound on the estimate of double counted savings. The specifics of these questions and the comparisons of responses for participants and controls are presented in section 4.2.1.

2.4 Data Used in the Impact Analysis

In preparation for the impact analysis, Navigant cleaned the data provided by the HER program implementer, Opower. The initial dataset indicated records for 94,042 participants and 29,830 controls. Navigant reached the count of verified customers used in the analysis –92,797 participants and 29,475 controls –as follows:

- Removed non-random "test" participants (37 participants);
- Removed duplicate records (14 participants, 3 controls);
- Removed customers for whom no observations remained after removing observations where bills were longer than the maximum allowed (40 days) or shorter than the minimum allowed (20 days) (1 participant, 0 controls);
- Removed participants with no "first generation date" indicating a report was sent, and remove controls with a similar indication (1,193 participants, 352 controls).

In addition, Navigant removed the following observations:

- Observations with less 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, defined as observations with average daily usage at least ten times larger or ten times smaller than the median usage.[6]

For the 18-month analysis, the removal of these additional observations reduced the total number of available observations from 3,558,356 to 3,527,377 total bills, a reduction of 0.9%. The percentage reductions for the 2012 and 2013 analyses were each 1.0%.

[6] As an example, the median usage for the 18-month analysis is 40.72 kWh per day, and so observations with usage greater than 407.2 kWh or less than 4.072 kWh per day were excluded from the analysis.

3. Approach to Understanding Behavioral and Information Effects

Navigant conducted a survey as part of the analysis of Utah's Home Energy Reporting program. The primary objective of the survey was to investigate the effect of the HER program on participation in the upstream energy efficient lighting program, in order to provide a basis for estimating double-counted savings with the lighting program. Secondary objectives included determining customer satisfaction with the HER program, and determining the effect of the HER program on customer awareness and purchase of energy efficient appliances and customer awareness of Pacific Power's energy efficiency programs. The survey was written by Navigant and programmed and fielded by The Dieringer Research Group (DRG) in March and April 2014. The survey instrument is presented in Appendix A.

3.1 Survey Sample Size

Based on prior studies performed by Navigant, the expected value of answers to the proposed survey questions, and a desired confidence/precision of 90/10 on binary questions, Navigant targeted 400 completed surveys divided evenly between participants and controls. The focus on the *difference* in responses between participants and controls reflects the understanding that it is this difference that indicates the effect of the HER program on respondent behaviors and attitudes.

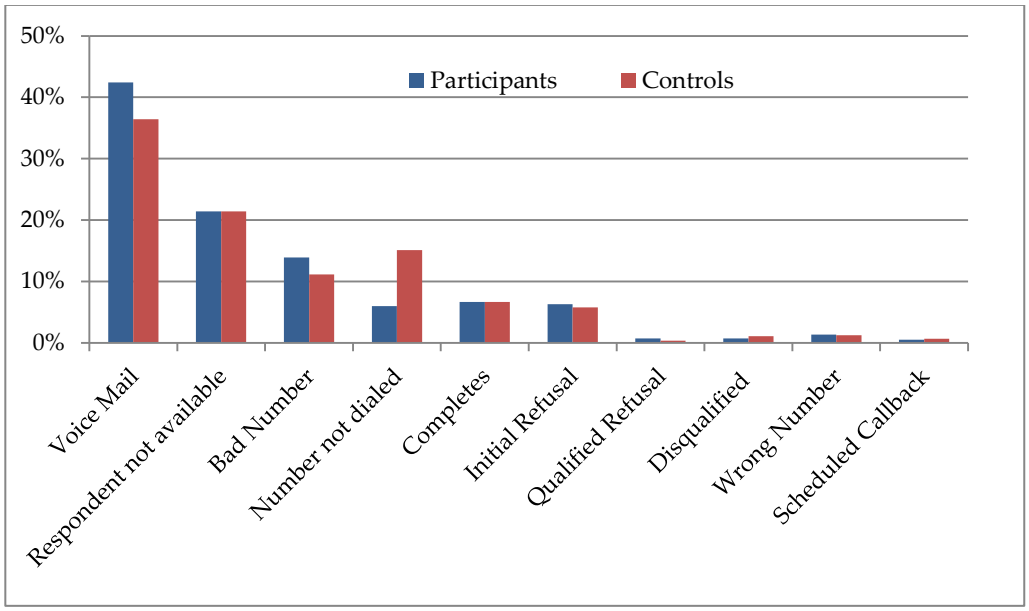
3.2 Survey Response Rates and Demographic Balance of Participant and Control Customers

To achieve the targeted sample of 200 surveys completed by participant households and 200 surveys completed by control households, Navigant provided DRG with a list of 3,000 randomly selecting participants and 3,000 randomly selected controls from the program. Figure 3-1 below presents the dispensation of these 6,000 customer contacts provided to DRG for the Rocky Mountain Power survey. If we define the response rate as the proportion of phone numbers dialed that generated a completed survey, then the response rate was about 7.1% for participants and 7.9% for controls.[7] If we instead define the response rate in terms of actually speaking to a household member, the response rate rises to 18.7% for participants and 19.1% for controls.[8]

[7] This value is found by dividing the proportion of the sample of 3,000 participant or control customers for which a survey was completed by the proportion for which a phone number was actually dialed. For instance, 6% of the sample of 3,000 participants were never dialed before the quota of 200 completed surveys was attained. It follows that 94% of the sample participants were dialed. Dividing the 6.7% completes (200/3,000) by 94% gives a completion rate of 7.1%.

[8] This value is found by dividing the proportion of the sample of 3,000 participant or control customers for which a survey was completed (6.67% for both participants and controls) by the proportion for which a household member was reached –the sum of the proportions for "Completes", "Respondent not available", "Initial refusal", "Scheduled Callback", and "Qualified refusal". For instance, for participants this involves dividing 6.7% by the sum of 6.7%, 21.4%, 6.3%, and 0.7% , generating a response rate of 18.7%.

Figure 3-1. Disposition of the 6,000 Customer Contacts in the Survey Sample

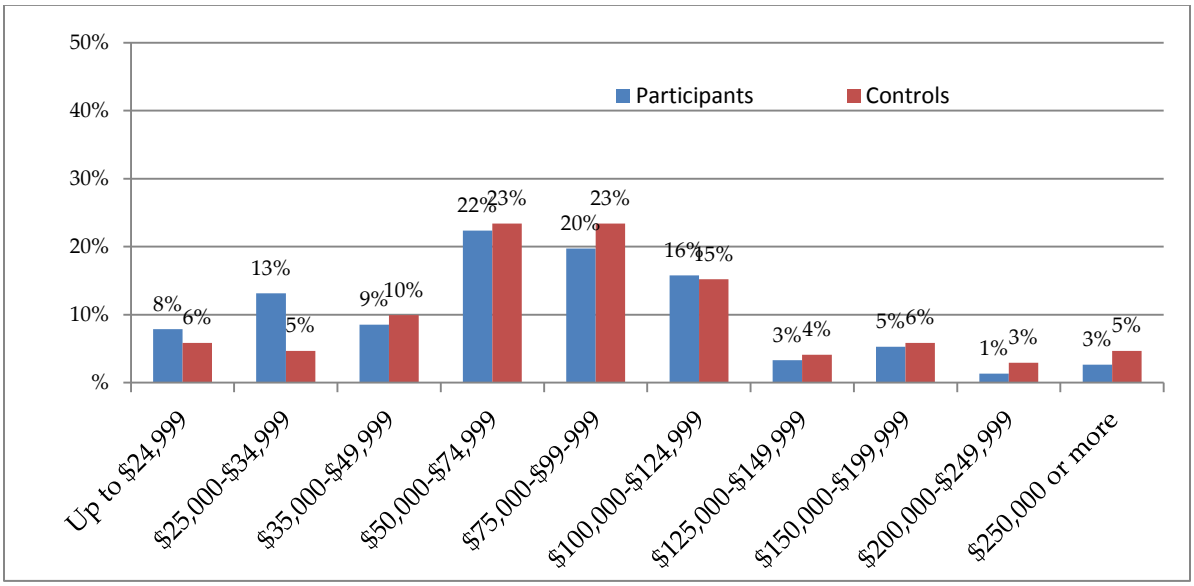


Source: 2014 Navigant HER Program Survey

Participants and controls are reasonably well balanced in the demographic variables. The mean square footage of survey participant and control customers is 3,330 and 3,160, respectively; the mean number of household members is 4.02 and 4.10, respectively. Figure 3-2 presents a histogram of income by category for the two groups. Although there are slight differences across categories, with more participant customers in the lower income categories, a Chi-square test leads to the conclusion that there is no statistical difference between the two groups in the distribution of customers across income categories at the 90% significance level.[9]

[9] A Chi-square test is a test for statistical significance applicable to categorical data.

Figure 3-2. Relative Distribution of Participants and Controls across Income Categories



4. Impact Evaluation Results

Navigant estimated the LFER and PPR models for three time periods:

- The first 18-months of the program (August 1, 2012 through January 31, 2014);
- 2012 (August 1, 2012 through December 31, 2012);
- 2013 (January 1, 2013 through December 31, 2013).

The LFER and PPR models generate very similar results for program savings in all three time periods. We use LFER results for reporting total program savings. Overall verified net program savings for the first 18-months of the program after excluding double-counted savings are 45,158 MWh.

4.1 Impact Parameter Estimates

Parameter estimates for the estimated models are presented Appendix B. Key findings include:

- For all three analysis periods the LFER *Post*Participant* parameter estimate is statistically significant at the 90% confidence level, as is the PPR *Participant* parameter estimate.
- The parameter estimates concerning energy savings generated by the LFER and PPR models are quite close, -0.836 and -0.885, respectively, and not statistically significantly different at the 90% confidence level.

Section 4.3 explains the calculation program savings.

4.2 Uplift of Savings in Other EE programs

LFER 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 towards either the HER program or the other EE programs, but not both programs. The uplift of savings in other EE programs was a small proportion of the total savings: 310 MWh or 0.7 %.

Table 4-1 presents the details of the calculation of the double-counted savings due to uplift in other EE programs. The programs included in the uplift analysis were the Appliance Recycling program and the Home Energy Savings program.

Table 4-1. Estimated Double-Counted Savings from Uplift in other EE Programs, First 18 Months

	Program	
	Appliance Recycling	Home Energy Savings
Median program savings (annual kWh per participant)	1,215	222
# HER participant households	94,005	94,005
annualized rate of participation (%)	2.12%	5.31%
Change in annualized rate of participation from pre-program year (%)	0.18%	3.20%
# HER control households	29,830	29,830
annualized rate of participation	1.82%	5.06%
Change in annualized rate of participation from pre-program year (%)	0.04%	2.96%
annualized DID statistic	0.14%	0.24%
DID statistic for 18 months	0.21%	0.35%
Change in program participation due to HER program	194	333
Statistically significant at the 90% confidence level?	Yes	Yes
Savings attributable to other programs (kWh)	**235,861**	**73,898**

Source: Navigant analysis.
Notes: We assume median annual program savings are equal to the mean annualized kWh impact for HER participants during the post period.

The estimate of double-counted savings is surely an *overestimate* because it presumes participation in the other EE programs occurs at the very start of the program year. Under the more reasonable assumption that participation occurs at a uniform rate throughout the year, the estimate of double-counted savings would be approximately 153 MWh, half the estimated value of 310 MWh. The upshot is that double counting of savings with other energy efficiency programs for which tracking data is available is not a significant issue for the HER program.

4.2.1 Double-counting of savings with the HES upstream energy efficient lighting program

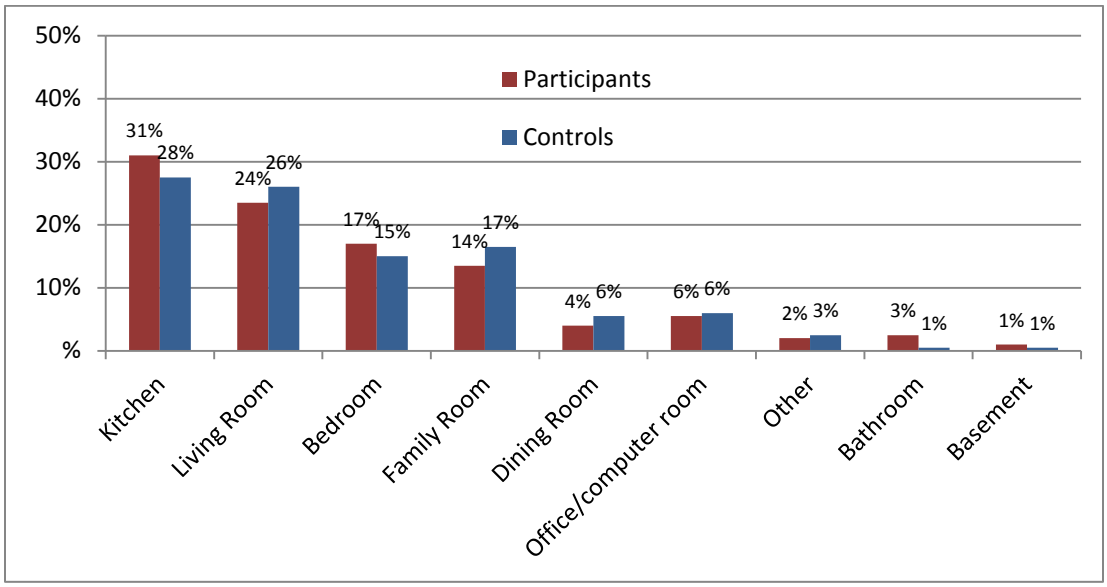
Due to a lack of tracking data, it is not possible to state definitively the double-counted savings of the HER program and the Home Energy Savings upstream energy efficient lighting (EEL) program. Navigant's approach to this issue is to use a set of survey questions to examine whether the HER program is in fact serving to increase the use of energy efficient lighting, and, if so, to derive an upper bound on the double-counting of savings, as described in section 2.3.

The first survey question relevant to this poses the following question about the lights in the room in which the survey respondent is located (question 2 in the survey, see the Appendix):

> *Please look around at the lights. How many of the light bulbs in the room are compact fluorescent lights, which are often called "CFL's"? I can wait if you need a minute to look around the room.*

The average installation of CFLs/room was 2.30 for participant customers and 2.52 for control customers; the difference between these values is not statistically different at the 90% significance level. Possibly this result is confounded by differences between participant and control customers in the distribution of types of rooms in which respondents were located; one might be concerned, for instance, that participant customers were more often in rooms with fewer lights, or with a lower likelihood of a CFL installation. To address this possibility, the survey asked respondents about the type of room in which they were located. Figure 4-1 shows that the distribution of rooms for both participant and control customers was quite similar. Still, to address the possibility that even these small differences were a source of bias in the group-wise average difference in CFL installations, we also calculated a weighted average estimate of CFLs/room, where the weighting is based on the sample distribution of room types. The objective is to remove differences between participants and controls in the distribution of rooms as a source of differences between them in the average number of CFLs. So, for instance, because 29.1% of all respondents took the survey in their kitchen, the weight allocated to the average installed CFLs for kitchens—2.60 for participants and 3.48 for controls—is 0.291. This sample-weighted average is virtually no different than the unweighted average: 2.31 for participant customers and 2.50 for control customers.

Figure 4-1. Room Where Respondent Took the Survey



Source: 2014 Navigant HER Program Survey

The second question used for this analysis is based on the actual use of CFLs, rather than their installation. The survey was conducted entirely in the evening hours between 6 PM and 10 PM, and asked the respondent to walk through the residence, counting the total number of all lights turned on, and to then repeat the walk-through, counting the number of CFLs turned on. In particular, the first of this pair of questions (question 3 in the survey, see the Appendix) stated,

> *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 CFL's.*
>
> *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.*

This was followed by the question (question 4 in the survey),

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

Double counting of savings is complicated by a potential behavioral response to the HER treatment: CFLs may be in lower use in participant households because these households are turning lights off more frequently. In fact, we found good evidence of this. The average number of lights turned on in participant households was 4.33, and the average number of lights turned on in control households was 4.95, a difference that is not statistically significant at the 90% level, but is suggestive of a difference. This behavioral effect tends to diminish the energy savings of the uplift in the EEL program due to the HER program; the HER program may increase the installation of CFLs in participant households, but their use may be no greater or even less than in control households. The survey revealed that the average difference between participants and controls in the use of CFLs was small and not statistically different at the 90% significance level: 1.98 and 1.91, respectively, suggesting no double-counting of savings.

Navigant also asked customers whether (a) they had seen materials encouraging them to purchase CFLs (question 5 in the survey); (b) they had purchased at least one CFL in 2014 (question 6); and (c) they had LED lights installed (question 8). 60% of participant customers and 54% of control customers answered "Yes" to the first question; 39% and 37% answered "Yes" to the second question; and 37% and 29% answered "Yes" to the third question. For none of these questions is the difference between participants and controls statistically significant at the 90% significance level, though the difference in the third case is close.

In summary, there appears to be little difference between participant and control customers in their installation of CFLs, nor in the lighting actually used in the evening that is provided by CFLs. There appears to be no difference between the two groups in purchases of CFLs since the start of the year, or in awareness of messaging to purchase CFLs. Navigant concludes from these survey results that the savings estimate for the HER program is not double counting savings attributable to the upstream lighting program.

4.3 Verified Net Program Impact Results

Table 4-2 presents verified net savings results from the HER program. Savings are slightly higher than typical for first year behavior programs. On average participants reduced their usage by 2.05% during the first 18 months of the program. Verified net savings are calculated via the following equation:

Equation 4-1. Calculation of Verified Net Savings

$$Verified\ Net\ Savings = \frac{-\alpha_2 * Number\ of\ Program\ Days}{1000} - Double\ Counted\ Savings$$

Where α_2 is the parameter from Equation 2-1 that indicates average daily impacts from the LFER model in kWh (thus division by 1000 to convert the value to MWh), and the number of program days is the sum across all participants of the number of days during the specified period that a participant's account is active and they are receiving reports.[10] Total verified net program savings during the first 18 months of the program is 45,158 MWh.

Table 4-2. Net Program Savings and Uplift of Savings in Other EE programs

Type of Statistic	2012	2013	18 Months
Number of Participants†	92,797		
Number of Control Customers†	29,475		
Percent Savings	1.38%	2.29%	2.05%
Standard error:	*0.12%*	*0.12%*	*0.10%*
90% confidence bound:	*[1.19%, 1.58%]*	*[2.10%, 2.49%]*	*[1.87%, 2.22%]*
Average savings per customer (kWh)	96	361	484
Standard error:	*8*	*19*	*24*
90% confidence bound:	*[82, 109]*	*[322, 382]*	*[443,524]*
Verified Net Savings, Prior to Uplift Adjustment (MWh)‡	8,988	33,108	45,467
Standard error:	*785*	*1,698*	*2,303*
90% confidence bound:	*[7,697, 10,279]*	*[30,314, 35,901]*	*[41,679, 49,256]*
Savings Uplift in other EE programs (MWh)	86*	207*	310
Verified Net Savings (MWh)	**8,902**	**32,901**	**45,158**

†*The initial data set contained records for 94,042 participants and 29,830 controls. See Section 2.4 for the derivation of the customer counts presented here (and used in the analysis) from the raw customer counts.*
‡*Savings in terms of kWh are presented in Appendix C.*
**Savings uplift is a prorated value based on the analysis for the first 18 months of the program.*
Source: Navigant analysis.

[10]Customers who opt out of the program remain in the analysis because they might continue to generate savings after they opt out.

4.4 Realization Rates for 2012 and 2013

Reported savings are 7,860 MWh for 2012 and 32,299 MWh for 2013. [11] Comparing these to the verified net savings prior to uplift reported in Table 4-2 (8,988 MWh for 2012 and 33,108 MWh for 2013) generates realization rates of 1.14 for 2012 and 1.03 for 2013.

4.5 Analysis of Savings by Usage Level

Navigant analyzed how program savings vary with usage level by segmenting program participants and controls into three equal-sized groups based on their pre-program usage level. Table 4-3 provides descriptive statistics and 18-month savings values for each of the three segments. Both actual and percentage savings increase with usage, as illustrated in Figure 4-2.

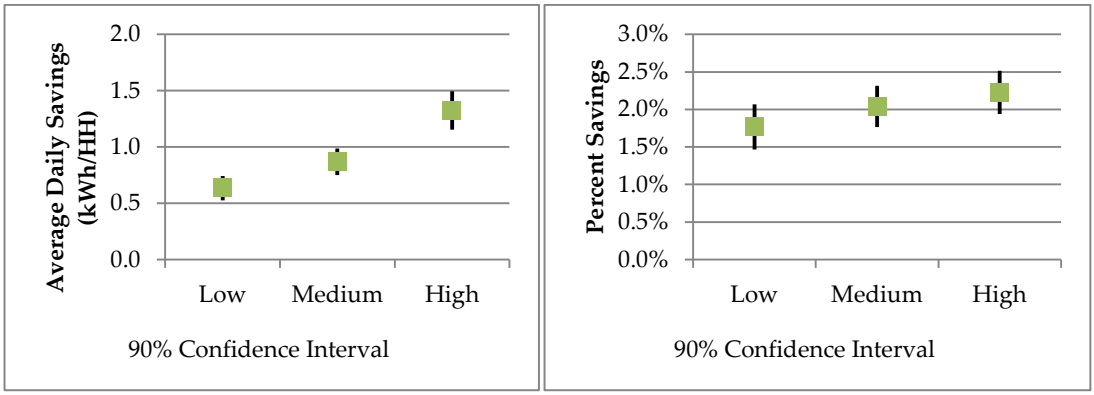
Table 4-3. 18-Month Savings by Usage Level

Type of Statistic *Standard errors are provided in italics*	Low Usage	Medium Usage	High Usage
Number of Participants	30,885	30,916	30,996
Number of Control Customers	9,739	9,874	9,862
Pre-Program Annual Usage (kWh)	2,312 - 14,150	14,150 - 17,250	17,250 - 75,870
Percent Savings	1.77% *0.18%*	2.04% *0.17%*	2.23% *0.17%*
Average 18-month savings per customer (kWh)	347 *36*	475 *39*	726 *57*

Source: Navigant analysis.

[11] Reported savings are available in annual reports at www.pacificorp.com/es/dsm.html.

Figure 4-2. Absolute and Percent Savings by Usage Level, with 90% Confidence Interval



Source: Navigant analysis

5. Survey Results

The primary objective of the survey was to determine whether program savings are double counting savings from the HES upstream energy efficient lighting program. Results pertaining to this objective were presented in section 4.2.1. Here we present a discussion of results pertaining to secondary objectives for the survey.

5.1 Energy Efficiency Awareness and Purchase Behavior

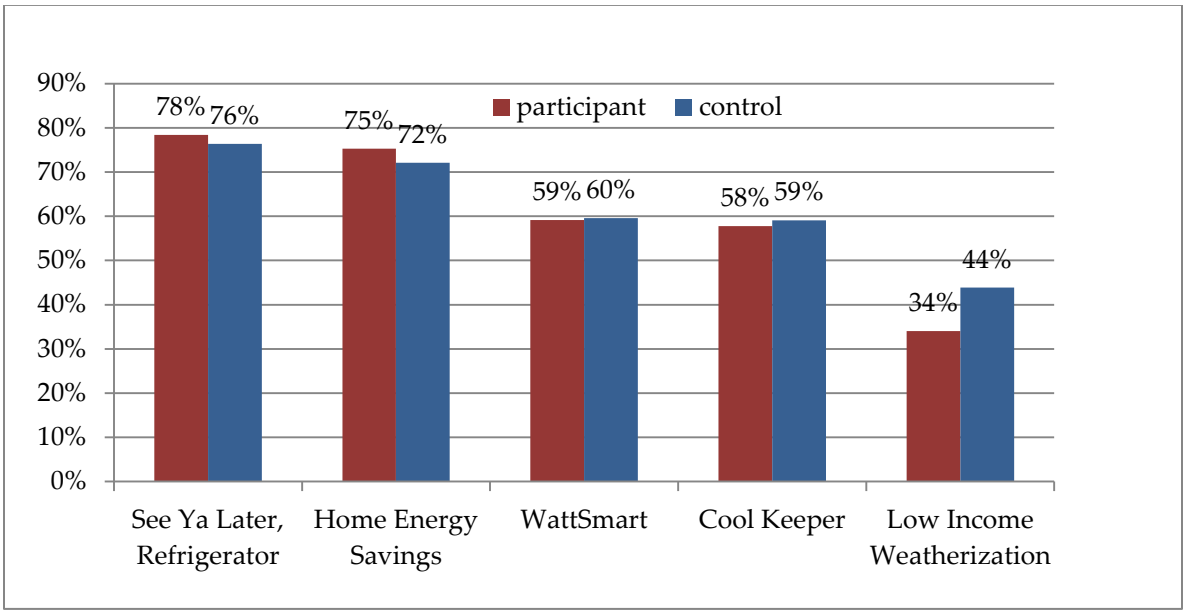
Navigant found no statistical differences between participant and control groups with respect to the following:

- Recollection of seeing material from Rocky Mountain Power encouraging the purchase of CFLs (60% of participant customers and 54% of control customers);
- Purchase of any CFLs since the start of 2014 (39% vs. 37%);
- The average number of bulbs purchased, conditional on a purchase since 2014 (8.20 bulbs vs. 8.33 bulbs);
- The presence of LEDs in the home (37% vs. 29%);
- Familiarity with the Energy Star label (88% vs. 88%);
- New television has an Energy Star label, conditional on having purchased a television over the past year (100% vs. 92%).

5.2 Awareness of Rocky Mountain Power's Energy Efficiency Programs

Figure 5-1 compares participant and control customers with respect to awareness of Rocky Mountain Power's energy efficiency programs. Customers were most aware of the 'See Ya Later, Refrigerator' and the Home Energy Savings programs. Only for the low income weatherization program did participants and controls reveal a statistically significant difference (90% level) in program awareness, with controls actually more aware of the program than participants.

Figure 5-1. Proportion of Customers Aware of Rocky Mountain Power Energy Efficiency Programs

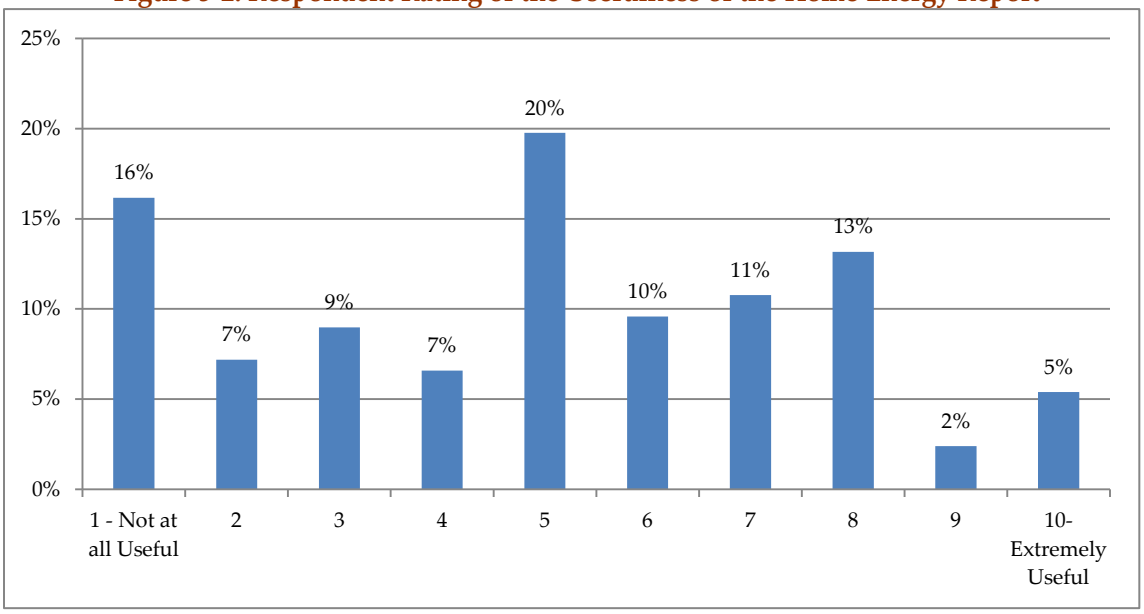


Source: 2014 Navigant HER Program Survey

5.3 Satisfaction with the HER program

Ninety percent of participants remembered receiving the HER reports. As illustrated in Figure 5-2, customer perceptions of the usefulness of the HER reports was fairly uniform on a 1-10 scale. Of those customers who remember receiving the reports, 39% rated the report usefulness as low (1-4 on the 10-point scale), 30% gave the reports an average rating, and 31% gave the reports a high rating (7-10 on the 10-point scale).

Figure 5-2. Respondent Rating of the Usefulness of the Home Energy Report



Source: 2014 Navigant HER Program Survey

6. Program Cost Effectiveness

Program cost effectiveness was evaluated for 2012, 2013, and the first 18 months of the program, August 2012-January 2014. The cost effectiveness of utility-funded programs in the state is typically analyzed using tests prescribed by the California Standard Practice Manual.[12] 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 (RIM);
- Total Resource Cost Test (TRC); and
- PacifiCorp's Total Resource Cost Test (PTRC).

Table 6-1 presents details of these tests.

The evaluation team 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. The evaluation team 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 were provided by Rocky Mountain Power staff, including data obtained from the 2011 IRP (for the 2012 analysis) and 2013 IRP (for all other analyses), and include program cost inputs, program savings by measure, and measure life. Table 6-2 provides an overview of cost-effectiveness input values used by the evaluation team in the cost-effectiveness analysis.

[12] The California Standard Practice Manual is an industry accepted manual; it identifies the cost and benefit components and cost-effectiveness calculation procedures from five 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.

Table 6-1. Details of Cost Effectiveness Tests[13]

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	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 including 10% benefits adder.

Table 6-2. HER Program Cost Effectiveness Evaluation Input Values

Variable	2012	2013	2014	18 months
	Input			
Discount Rate	6.88%	6.88%	6.88%	6.88%
Inflation Rate	1.90%	1.90%	1.90%	1.90%
Residential Line Loss	9.32%	9.32%	9.32%	9.32%
Residential Retail Rate	$0.1036	$0.1056	$0.1076	$0.1054
Gross Customer Costs	$0	$0	$0	$0
Program Costs	$534,106	$802,595	$62,832	$1,399,533
Utility Administrative	$35,859	$28,073	$2,976	$66,908
Program Delivery	$498,247	$774,522	$59,856	$1,332,625
Incentives Costs	$0	$0	$0	$0

Source: Navigant analysis

[13] "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.

6.1 Cost Effectiveness Evaluation Results

The evaluation team calibrated and updated the cost-effectiveness models based on evaluated net savings prior to uplift adjustment, as reported in Table 4-2. We do not use saving after uplift adjustment because the adjustment reflects an issue of double counting with other programs, rather than an issue of overstating program savings. As Tables 6-3 to 6-5 indicate, for all three evaluation periods the program is cost effective for four of the five standard cost tests, with the exception being the Rate Impact Test (RIM).

Table 6-3. HER Program 2012 Benefit-Cost Ratios

Benefit/Cost Test Performed	Evaluated Gross Savings	Evaluated Net Savings	Evaluated Costs	Evaluated Benefits	B/C Ratio
Total Resource Cost Test (PTRC)	8,988,000	8,988,000	$534,106	$781,206	1.46
Total Resource Cost Test (TRC)	8,988,000	8,988,000	$534,106	$710,187	1.33
Utility Cost Test (UCT)	8,988,000	8,988,000	$534,106	$710,187	1.33
Rate Impact Test (RIM)	8,988,000	8,988,000	$1,482,896	$710,187	0.48
Participant Cost Test (PCT)	8,988,000	8,988,000	$0	$948,790	N/A

Source: Navigant analysis

Table 6-4. HER Program 2013 Benefit-Cost Ratios

Benefit/Cost Test Performed	Evaluated Gross Savings	Evaluated Net Savings	Evaluated Costs	Evaluated Benefits	B/C Ratio
Total Resource Cost Test (PTRC)	33,108,000	33,108,000	$802,595	$2,635,973	3.28
Total Resource Cost Test (TRC)	33,108,000	33,108,000	$802,595	$2,396,339	2.99
Utility Cost Test (UCT)	33,108,000	33,108,000	$802,595	$2,396,339	2.99
Rate Impact Test (RIM)	33,108,000	33,108,000	$4,365,228	$2,396,339	0.55
Participant Cost Test (PCT)	33,108,000	33,108,000	$0	$3,562,633	N/A

Source: Navigant analysis

Table 6-5. HER Program 18-Month Benefit-Cost Ratios

Benefit/Cost Test Performed	Evaluated Gross Savings	Evaluated Net Savings	Evaluated Costs	Evaluated Benefits	B/C Ratio
Total Resource Cost Test (PTRC)	45,467,000	45,467,000	$1,399,533	$3,690,393	2.64
Total Resource Cost Test (TRC)	45,467,000	45,467,000	$1,399,533	$3,354,902	2.40
Utility Cost Test (UCT)	45,467,000	45,467,000	$1,399,533	$3,354,902	2.40
Rate Impact Test (RIM)	45,467,000	45,467,000	$6,280,589	$3,354,902	0.53
Participant Cost Test (PCT)	45,467,000	45,467,000	$0	$4,881,056	N/A

Source: Navigant analysis

7. Key Findings and Recommendations

7.1 Impact Key Findings and Recommendations

This section summarizes the key findings and associated recommendations.

Finding 1. The participant and control groups had similar usage prior to the start of the program. Therefore Navigant employed a statistical method appropriate for use with RCTs to quantify the energy savings for the program.

Finding 2. The program generated 45,158 MWh of electric energy savings during the first 18 months of the program. On average, participants reduced their electricity usage by 2.05%. The savings appear to be typical for behavioral programs of this type.

Finding 3. The program is cost-effective.

Recommendation. Expand the HER program in its current form. If the program is expanded, Navigant (or another third party) should receive the billing data for the new participant and control households for the year before these households are added to the program, *before* the home energy reports are initially sent to the new participant households. Navigant (or third party) can verify that the allocation of households across the two groups is consistent with a randomized controlled trial.

Finding 4. Program savings, both in terms of kWh and percentage, increase with customer usage.

Recommendation. Future expansions of the program should continue to target high users to achieve the greatest program savings.

Recommendation. Consider an evaluation of program demand savings. It is possible that customer energy savings are greater than average during peak demand hours. If the interval data necessary to estimate these savings is available, a fairly simple statistical analysis that takes advantage of the experimental design of the program could be used to estimate peak demand savings.

Appendix A. Survey Instrument

Rocky Mountain Power HER Program Pilot Participant and Non-participant Telephone Survey Guide, March 4, 2014

Introduction I

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

May I speak with [CONTACT NAME]? (**IF NOT AVAILABLE, SAY:** May I speak with the person within the [LAST NAME] household who is most knowledgeable about your energy bill?) **[IF NO ONE AVAILABLE FROM HOUSEHOLD, SCHEDULE A CALL BACK.] [IF AVAILABLE INDIVIDUAL IS NOT FROM THE HOUSEHOLD LISTED IN THE CONTACT LIST, THANK AND TERMINATE]**

Introduction II

[SKIP THIS SECTION IF THE PERSON WHO INITIALLY ANSWERED THE PHONE IS ALSO THE RESPONDENT]

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

Introduction III

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.

Several of the questions that we ask concern the amount of energy efficient lighting in the 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. Is this a good time for that, or should we schedule a call for later? **[(IF RESPONDENT ASKS, SAY: The survey will take about 10** minutes, depending on your answers.) **IF NECESSARY, SCHEDULE A CALL BACK. THE CALL BACK NEEDS TO BE IN THE EVENING, WHEN LIGHTS ARE ON.] IF THERE IS A QUESTION ABOUT THE LEGITIMACY OF THE SURVEY THE PARTICIPANT MAY CALL SHAWN GRANT AT 801-220-4196.**

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**.**

CFL Bulbs

1. I want to start by asking you about the lights in the room that you're currently in.

   What type of room is it? (Don't Read)

   1-Kitchen

2-Dining Room
3-Living Room
4-Bedroom
5-Family Room
6-Bathroom
7-Basement
8-Garage
9-Other: _____

2. Please look around at the lights. How many of the light bulbs in the room are compact fluorescent lights, which are often called "CFL's"? I can wait if you need a minute to look around the room.

   Number: ____

3. 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 CFL's.

   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].**

   Number of lights on: ____
   88 - Don't Know
   99 - Refused

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

   Number of CFL's on: _____
   88 - Don't Know
   99 - Refused

5. Since the start of 2014, do you recall seeing information from Rocky Mountain Power that encourages you to replace traditional incandescent light bulbs with CFLs to save energy?

   1-Yes
   2-No
   88 - Don't Know

99 - Refused

6. To the best of your recollection, has your household purchased Compact Fluorescent Light Bulbs (CFLs) since the start of 2014?

   1-Yes
   2-No
   88 - Don't Know
   99 - Refused

7. [IF YES on question 6, ask:] About how many CFLs has your household purchased in 2014?

   Number of CFL's purchased in 2014: _____

   88 - Don't Know
   89 99 - Refused

8. Do you have any LED lights installed?

    1-Yes
    2-No
    88 - Don't Know
    99 - Refused

9. Are you familiar with the "Energy Star" label for appliances that meet national energy efficiency standards? Energy Star appliances could include such as televisions, dishwashers, washers and dryers.

    1-Yes - CONTINUE
    2-No – GO TO Q12
    88 - Don't Know – GO TO Q12
    99 - Refused – GO TO Q12

IF YES TO Q9:

10. Did you purchase a new television since January, 2013?

    1-Yes
    2-No – GO TO Q12
    88 - Don't Know – GO TO Q12
    99 - Refused - GO TO Q12

IF YES TO Q10:

11. Did the new television carry the Energy Star label?

    1-Yes
    2-No
    88 - Don't Know
    99 - Refused

Usefulness of Home Energy Reports (SKIP THIS SECTION FOR NON-PARTICIPANTS)

12. Some customers of Rocky Mountain Power are in a program in which they receive home energy reports every two months. These reports provide customers with information on their energy use, how their energy use compares to similar customers, and gives customers energy-saving tips. Do you recall receiving any of these reports in the past 12 months?

    1-Yes
    2-No – GO TO Q14
    88 - Don't Know – GO TO Q14
    99 – Refused – GO TO Q14

13. If "Yes" on Question 12: On a scale of 1 to 10, with 1 being "not at all useful" and 10 being "extremely useful," how would you rate the average usefulness of the home energy reports for helping you to save energy? You may use any number from 1 to 10.

    •

Not at all useful __ Extremely useful

1 2 3 4 5 6 7 8 9 10

88 – Don't Know (DO NOT READ)
99 – Refused (DO NOT READ)

Satisfaction with Rocky Mountain Power

14. How would you rate your overall satisfaction with Rocky Mountain Power? Would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?

    1-Very Satisfied

    2-Somewhat Satisfied

    3-Neither Satisfied nor Dissatisfied

    4-Somewhat Dissatisfied

    5-Very Dissatisfied

    88 - Don't Know

    99 - Refused

Awareness of Rocky Mountain Power's other energy efficiency programs

15. Have you ever heard of the following energy efficient programs offered by Rocky Mountain Power?

    a) **Cool Keeper**: Rocky Mountain power installs a device that turns the air conditioner unit on and off in 15-minute segments during summer peak-usage hours.

    - 1-Yes
    - 2-No
    - 88 - Don't Know
    - 99 – Refused

    b) **Home Energy Savings:** 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.

    - 1-Yes
    - 2-No
    - 88 - Don't Know
    - 99 – Refused
    -

c) **See Ya Later, Refrigerator/Refrigerator Recycling:** Company picks up and recycles your old working refrigerator or freezer. Participants receive $30

- 1-Yes
- 2-No
- 88 - Don't Know

99 – Refused

d) **Wattsmart:** Rocky Mountain Power campaign to promote energy-efficiency and conservation and to educate customers on saving money on their utility bills.

- 1-Yes
- 2-No
- 88 - Don't Know
- 99 – Refused

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

- 1-Yes
- 2-No
- 88 - Don't Know

99 – Refused

Just a few more questions and we will be finished.

Demographics

16. What is the total square footage of your home's living space? Your best estimate will be fine.

_____ Square feet

88 - Don't Know
99 - Refused

17. How many people lived in your home during 2013?

Number: ____
88 - Don't Know
99 - Refused

18. What was your approximate household income in 2013? Please stop me when I say the answer that best reflects your approximate household income.

    1. Up to $24,999
    2. $25,000 - $34,999
    3. $35,000 - $49,999
    4. $50,000 - $74,999
    5. $75,000 - $99,999
    6. $100,000-$124,999
    7. $125,000-$149,999
    8. $150,000-$199,999
    9. $200,000-$249,999
    10. $250,000 or more

    88 - Don't Know
    99 - Refused

That is all of the questions I have for you today. Thank you very much for your time.

Appendix B. Regression Coefficient Estimates

Table B-1. LFER Parameter Estimates

Variable	2012		2013		18 Months	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Post	-3.102	-63.18	-0.562	-12.01	-0.450	-10.81
Post * Participant	-0.643	-11.45	-1.044	-19.50	-0.941	-19.74

Source: Navigant analysis.

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

Table B-2. PPR Parameter Estimates

Variable	2012		2013		18 Months	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
ADClag1	0.828	427.56	0.887	328.92	0.859	455.23
ADClag2	-	-	0.811	373.56	0.818	376.34
Participant	-0.637	-11.83	-1.064	-19.98	-0.957	-19.45
August 2012	13.386	112.51	-	-	11.791	97.94
September 2012	7.777	72.88	-	-	6.381	59.51
October 2012	4.275	50.19	-	-	3.286	39.08
November 2012	4.443	53.69	-	-	3.498	42.86
December 2012	4.200	43.21	-	-	2.979	31.41
January 2013	-	-	7.941	59.08	9.298	94.87
February 2013	-	-	8.193	66.97	9.417	104.15
March 2013	-	-	4.974	43.43	6.101	72.22
April 2013	-	-	3.875	37.92	4.834	63.22
May 2013	-	-	3.208	31.40	4.151	54.23
June 2013	-	-	3.259	26.83	4.389	49.03
July 2013	-	-	16.120	135.46	15.662	131.00
August 2013	-	-	11.305	85.32	10.793	81.25
September 2013	-	-	6.685	55.63	6.214	51.64
October 2013	-	-	3.336	35.29	2.966	31.82
November 2013	-	-	4.041	43.76	3.681	40.66
December 2013	-	-	6.277	57.56	5.853	55.48
January 2014	-	-	-	-	8.120	72.31

Source: Navigant analysis.

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

Appendix C. Program Savings in kWh

Type of Statistic *Standard errors are provided in italics*	2012	2013	18 Months
Number of Participants	92,797		
Number of Control Customers	29,475		
Percent Savings	1.38% *0.12%*	2.29% *0.12%*	2.05% *0.10%*
Average savings per customer (kWh)†	96 *8*	352 *18*	484 *24*
Verified Net Savings, Prior to Uplift Adjustment (kWh)	8,987,652 *784,720*	33,107,593 *1,697,995*	45,467,419 *2,302,827*
Savings Uplift in other EE programs (kWh)	86,044	206,506	309,759
Verified Net Savings (kWh)	**8,901,608**	**32,901,087**	**45,157,659**

†*All reported savings in this table are at site*