



Washington Home Energy Reports Program 2014-2015 Evaluation Report

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Pacific Power**

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EXECUTIVE SUMMARY

Program Description

Pacific Power Washington’s Home Energy Reports (HER) program is designed to generate energy savings by providing residential customers with information about their specific energy use as well as related energy conservation suggestions and tips. The information is provided in the form of bi-monthly mailed reports 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

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.¹

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 program design.

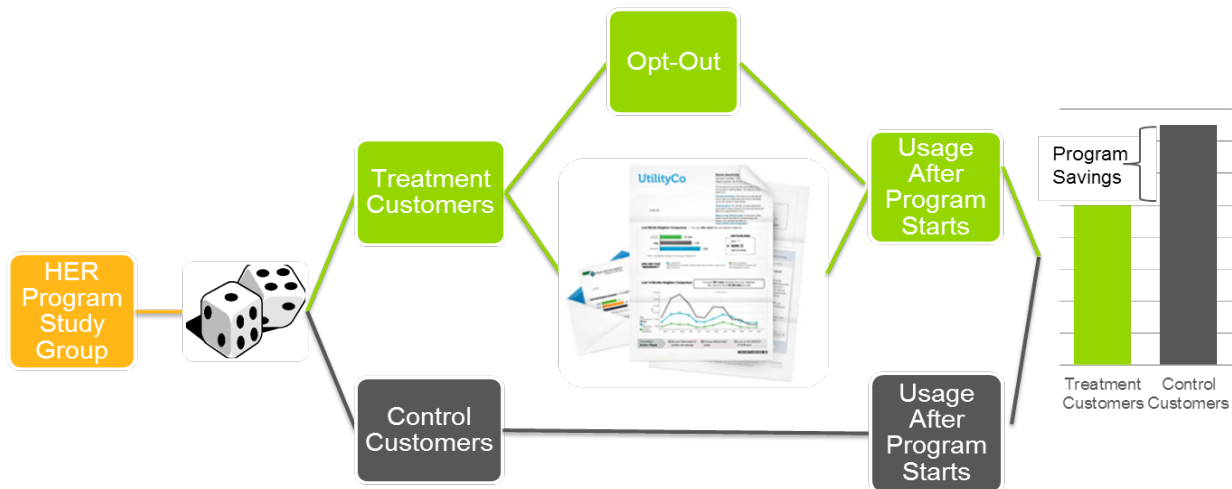
¹ See for example:

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.

Figure 1. HER Program Design



Source: Navigant

The HER program consists of the following three waves:

1. Legacy Wave launched in July 2012
2. Expansion Wave launched in September 2014
3. Refill Wave launched in December 2014

Total Savings by Wave and Year

Summaries of total evaluated program savings are shown in Table 1, which shows total program savings, and Table 2, which shows savings broken out by wave. Navigant considered three evaluation periods for each wave: 2014, 2015, and the two years combined. Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 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 2014 and year 2015. Since each time period was run as a separate analysis, the savings totals for year 2014 and year 2015 does not sum to the savings over the total combined time period of 2014-2015 together. In 2014, the Legacy Wave ran for all 12 months, but the Expansion Wave ran for only four months and the Refill Wave for just one month. The number of treatment customers is the number at the start of each evaluation period.

Table 1. Total Program Electric Savings in each Time Period†*

Type of Statistic	Total Across All Three Waves		
	2014	2015	2014-2015
Number of Treatment Customers	56,808	53,945	56,808
Verified Evaluation Savings (MWh)	5,139	9,199	14,417
Percent Savings	0.49%	1.09%	0.94%
Verified Net Savings (MWh)‡	5,111	9,295	14,487

†All savings are at the site.

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

‡Verified net savings are savings after netting out savings double-counted with other energy efficiency programs.

Source: Navigant analysis

Table 2. Program Electric Savings by Wave†*

Type of Statistic	Legacy Wave			Expansion Wave			Refill Wave††		
	2014	2015	2014-2015 (24 Months)	2014 (Sept.-Dec.)	2015	2014-2015 (16 Months)	2014 (Dec.)	2015	2014-2015 (13 Months)
Number of Treatment Customers	11,861	11,081	11,861	38,147	36,220	38,147	6,800	6,644	6,800
Verified Evaluation Savings (MWh)	4,872	4,941	9,811	269	4,033	4,375	-2	225	231
Percent Savings	1.81%	2.09%	1.94%	0.17%	0.90%	0.72%	-0.03%	0.47%	0.43%
Verified Net Savings (MWh)‡	4,835	4,903	9,736	278	4,163	4,516	-2	229	235

†All savings are at the site.

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

‡Verified net savings are savings after netting out savings double-counted with other energy efficiency programs.

††Refill Wave savings are not statistically significant.

Source: Navigant analysis

Program Cost-Effectiveness

The cost-effectiveness of utility-funded programs in Washington is typically analyzed using tests

prescribed by the California Standard Practice Manual.² While the program achieved strong results in 2014, one main driver affected the program’s cost-effectiveness in 2015. The avoided costs derived from PacifiCorp’s 2015 Class 2 DSM Decrement Study were significantly lower than those from the 2013 IRP. Detailed cost-effectiveness results are included in Section 7 of this report. Table 3 includes results from the cost-benefit tests for 2014, 2015, and for the two years combined.

Table 3. Cost-Benefit Results by Evaluation Period

Evaluation Period	PTRC	TRC	UCT	RIM	PCT
2014	1.40	1.27	1.27	0.49	-
2015	1.12	1.02	1.02	0.30	-
2014-2015	1.25	1.13	1.13	0.37	-

Source: Navigant analysis

The program passes all cost-effectiveness tests with the exception of the Ratepayer Impact test. The Total Resource Cost Test with a 10% adder (PTRC) is the primary criterion in Washington and the program remains cost-effective from this perspective over the 24 month evaluation period.

Key Findings and Recommendations

This section summarizes key findings and recommendations.

Impact Evaluation

Finding 1. Table 4 below shows the total evaluated energy savings in megawatt hours (MWh), after adjusting for uplift,³ for each wave in each time period. For the Legacy Wave, savings remained relatively stable across the two years, as this wave had been in place since 2012. Increases in Expansion and Refill Wave savings reflect the start of these waves in late 2014 and ramp-up into 2015.

² 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.

³ Uplift occurs when HER treatment customers participate in Pacific 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 and ensure accurate savings. Uplift is discussed in more detail in Section 2.3.

Table 4. Total MWh Savings by Wave and Year*

Wave	2014	2015	2014-2015
Legacy	4,835	4,903	9,736
Expansion	278	4,163	4,516
Refill†	-2	229	235
Total	5,111	9,295	14,487

†Refill Wave savings are not statistically significant in any of the three periods.

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

Source: Navigant analysis

Finding 2. Table 5 below shows energy savings as a percentage of baseline consumption for each wave in each time period. Looking at savings since program inception in 2012 the Legacy Wave appears to have leveled off, as is common for a mature program, at around 2% savings. Savings for the Legacy Wave from 2012 onwards are shown in Figure 5-2 in the main body of the report. The Expansion and Refill Waves demonstrate increased savings as is frequently found with newer waves.

Table 5. Percentage Savings by Wave and Year*

Wave	2014	2015	2014-2015
Legacy	1.81%	2.09%	1.94%
Expansion	0.17%	0.90%	0.72%
Refill†	-0.03%	0.47%	0.43%
Weighted Average	0.49%	1.09%	0.94%

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the percentage savings for year 2014 and year 2015 do not average to the percentage savings over the total combined time period of 2014-2015 together.

†Refill Wave savings are not statistically significant in any of the three periods.

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 3. Total double-counted savings were -70 MWh (or 0.2% of total savings) for the Appliance Recycling and Home Energy Savings (HES) programs across 2014 and 2015, which means that treatment customers were slightly less likely than control customers to participate in other Pacific Power energy efficiency programs, and thus, double-counting of energy savings does not appear to be 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 4. The program was cost-effective in 2014, 2015 and over the 2014-2015 evaluation period. However, lower avoided costs in 2015 impacted the program’s cost-effectiveness but the program remained cost-effective. The drop in 2015 also brought down the program’s cost-effectiveness results for the joint 2014-2015 evaluation period, however, the program remained cost-effective for the two-year period from most perspectives.

Process Evaluation

Finding 5. As shown in Table 6 below, survey respondents reported high levels of satisfaction with Pacific Power overall. Respondents in the Refill Wave reported the highest levels of satisfaction.

Finding 6. As shown in Table 6 below, related to HER program satisfaction, treatment respondents in the Legacy Wave reported low satisfaction (63%) compared to Expansion and Refill Wave respondents. The Legacy treatment group had less trust that the reports were accurate and often cited the neighbor comparisons as the least valuable component of the reports. Lower satisfaction ratings appear to be correlated with higher energy use, with Legacy Wave respondents (selected due to high average usage) reporting lower overall satisfaction with the HER program. This is a common finding for HER program evaluations. Control respondents were not asked this question because they do not receive reports from the HER program.

Finding 7. As shown in Table 6 below, treatment respondents across all three waves reported lower satisfaction with their homes’ energy usage than control respondents. One possible explanation for the lower satisfaction with energy consumption 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 feel less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

Table 6. Summary of Satisfaction Findings

	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Satisfaction with Pacific Power	86%	82%	86%	88%	93%	91%
Satisfaction with the HER program	-	63%	-	73%	-	85%
Satisfaction with home’s energy usage	61%	42%	76%	60%	81%	79%

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

Source: Navigant analysis

Finding 8. Treatment respondents in all three waves were significantly more likely to recall receiving information encouraging efficient bulb purchases from their utility than control respondents. Treatment respondents were also more likely to be familiar with the wattSmart brand. However, this higher recall did not translate into higher reported purchases or installation



of energy efficient lighting or into higher reported participation in other Pacific Power energy efficiency programs, which is also supported by the low double-counted savings estimated in the impact analysis.

1. INTRODUCTION

1.1 Program Description

Pacific Power's Washington Home Energy Reports (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 bi-monthly mailed reports 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 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.⁴

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 program design.

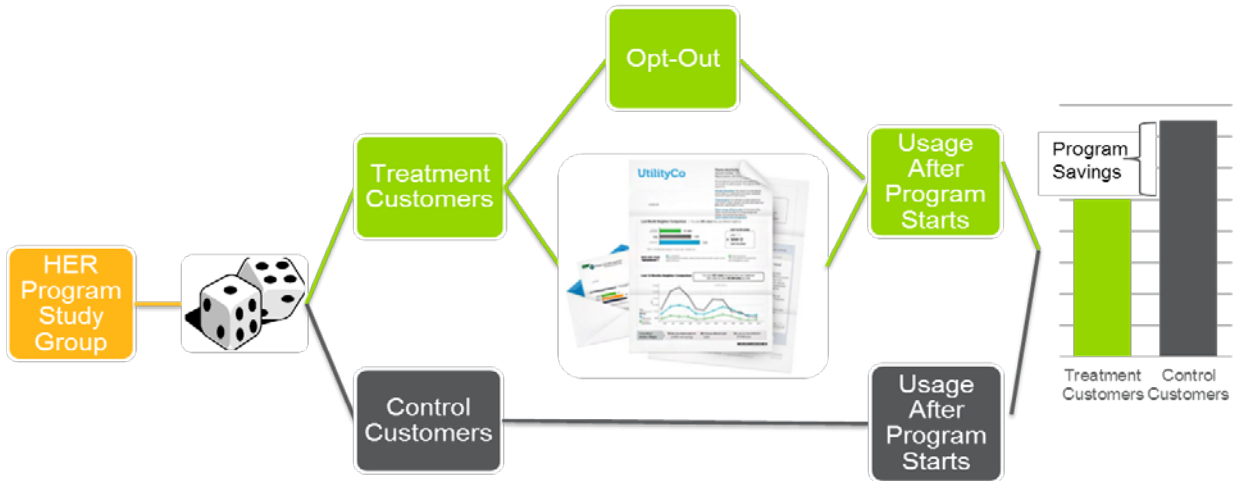
⁴ See for example:

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.

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Figure 1-1. HER Program Design



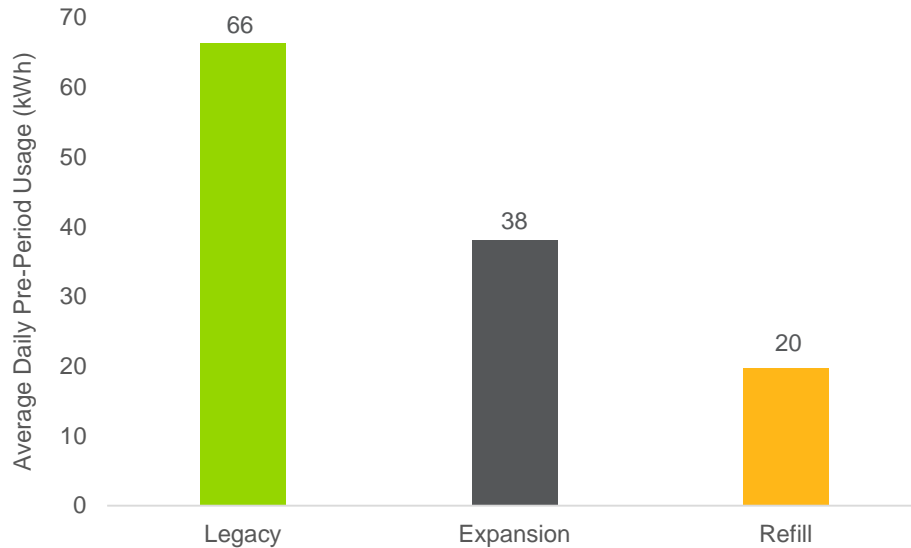
Source: Navigant

The HER program consists of the following three waves:

1. Legacy Wave launched in July 2012
2. Expansion Wave launched in September 2014
3. Refill Wave launched in December 2014

Figure 1-2 shows average usage during the year before the program began for each wave. The Legacy Wave is made up of the highest energy users who averaged 66 kWh per day in their pre-program period, which was July 2011 to June 2012. The Expansion Wave had lower usage customers with average usage of 38 kWh per day from September 2013 to August 2014. The Refill Wave was made up of the lowest users who averaged 20 kWh per day from December 2013 to November 2014.

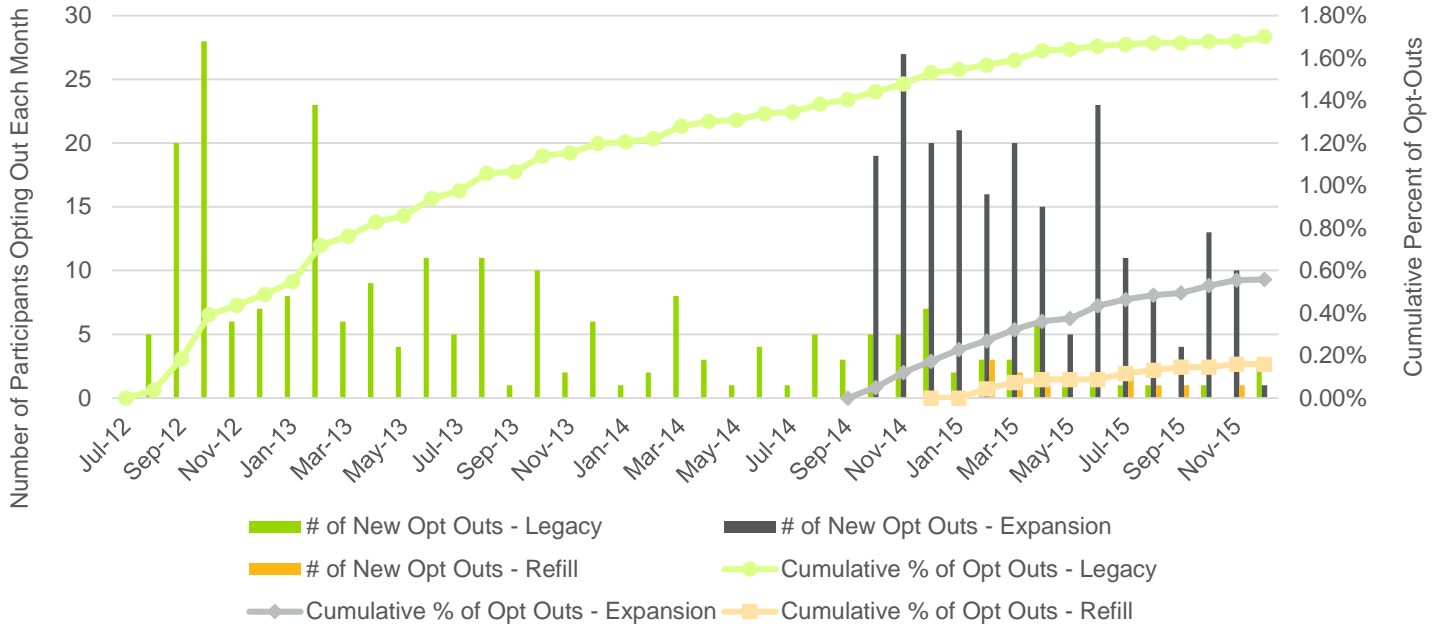
Figure 1-2. Average Daily Pre-Period Usage by Wave



Source: Navigant analysis

There are two sources of decay in program participation over time. The first is customers who opt out of the program. Figure 1-3 shows the number of treatment customers opting out of the program each month by wave and the cumulative percentage of opt-outs since the start of the program. Since the start of each wave, 1.70% of treatment customers have chosen to opt out of the Legacy Wave, 0.56% have opted out of the Expansion Wave, and 0.16% have opted out of the Refill Wave. After 12 months in the program, 0.86% of Legacy Wave treatment customers had opted out compared to 0.48% of Expansion Wave treatment customers and 0.16% of Refill Wave treatment customers, meaning the opt-out rate has gone down with each new wave. Two possible reasons why the opt-out rate has gone down with each new wave are that the type of customer in each wave is different as illustrated by their average pre-program usage, or that customers have become more accepting of energy efficiency programs over time such that they were less likely to opt out in 2014 and 2015 as compared to 2012.

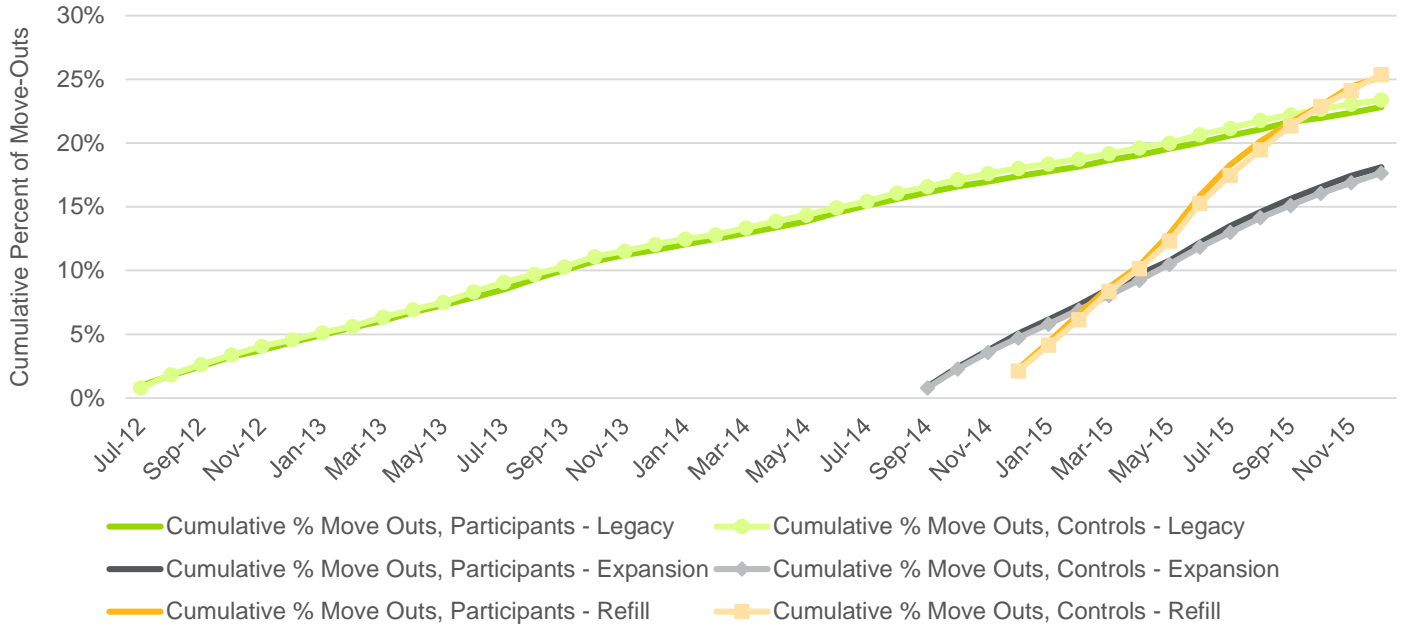
Figure 1-3. Customers Opting Out of the HER Program by Wave



Source: Navigant analysis

The second source of decay is customers who move from their residence. Figure 1-4 shows the cumulative percentage of move-outs by wave 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 in each wave, however, the move-out rate differs across waves. From the start of each wave to December 2015, approximately 23% of both treatment and control customers in the Legacy Wave, approximately 18% of the Expansion Wave, and approximately 25% of the Refill Wave had been shed from the program due to move-outs. Over the first 12 months of each wave, the Legacy Wave lost 8% of both treatment and control customers due to move outs, the Expansion Wave lost 14%, and the Refill Wave lost 24%. The later waves had a much higher move out rate than the Legacy Wave, which is likely due to differences in the type of customers in each wave—for example, customers with lower average energy usage may change residences more frequently than those with higher usage.

Figure 1-4. 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 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,⁵ 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 12-month period prior to the start of each program wave.⁶ 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 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.

The results of the analyses performed prior to this evaluation indicated that the allocation of program households across the treatment and control groups was consistent with an RCT design for each of the three program waves. The consistency of the Legacy Wave with an RCT was tested in the 18-month evaluation report.⁷ Navigant randomized the treatment and control customers for the Expansion and Refill Waves. These two waves were consistent with an RCT, and the results were delivered to Pacific Power in memos.⁸

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.

⁵ 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/>

⁶ The 12-month pre-period is July 2011 to June 2012 for the Legacy Wave, September 2013 to August 2014 for the Expansion Wave, and December 2013 to November 2014 for the Refill Wave.

⁷ Navigant Consulting, Inc. *Washington Home Energy Reporting Program 18 Month Evaluation Report (8/1/2012-1/31/2014)*. 2014. Presented to Pacific Power.

⁸ The results of the Expansion Wave randomization were delivered on 9/19/2014 in a memo titled, "Randomization of New Customers in Pacific Power's Home Energy Report Program." The results of the Refill Wave randomization were delivered on 12/17/2014 in a memo titled, "Randomization of Refill Customers in Pacific Power's Home Energy Report Program."

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 customers (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 2014, 2015, and the combined 2014-2015 period. Table 2-1 summarizes the analysis periods for each wave. For the Legacy Wave, the combined 2014-2015 analysis period included 24 months and covered the period 19 to 42 months (2.5 to 4.5 years) after the start of the wave in July 2012. The Expansion and Refill Waves ran for less than a full year in 2014; the Expansion Wave ran for four months of 2014 and the Refill Wave for one month of 2014. Thus, for the Expansion Wave, the combined 2014-2015 analysis period covered the first 16 months of the program and for the Refill Wave, the combined 2014-2015 analysis period covered the first 13 months of the program.

Table 2-1. Analysis Periods

Wave	Start Date	Analysis Periods
Legacy Wave	07-01-2012	2014
		2015
		24 months (2014-2015)
Expansion Wave	09-01-2014	Sept.-Dec. 2014
		2015
		16 months (Sept. 2014-2015)
Refill Wave	12-01-2014	Dec. 2014
		2015
		13 months (Dec. 2014-2015)

Source: Navigant analysis

Navigant estimated program impacts using two approaches: a post-program regression (PPR) analysis with lagged controls and a linear fixed-effects regression (LFER) analysis applied to monthly billing data. Although the two models are structurally different, both generate unbiased estimates of program savings in an RCT. Navigant estimated the PPR and LFER models for 2014, 2015, and the aggregation of the two years. Navigant used the PPR results for reporting total program savings but ran both models as a robustness check.⁹

The PPR 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

⁹ Navigant prefers to report out the PPR model for two reasons. One, the implementer is also using a post-only model for evaluation. Two, although both the LFER and PPR models generate unbiased estimates of program savings, as an empirical matter—based on Navigant’s past analyses and those in the academic literature—estimated savings from the PPR model tend to have lower standard errors than those from the LFER model, though the differences are usually very small.

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. PPR Model

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

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
- $ADUlag_{kt}$ = 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 autocorrelation¹⁰ 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 12-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 the last evaluation of this program,¹¹ Navigant tested whether there was a difference between a 12-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 PPR model, the fixed effect represents an attempt to control for any small systematic differences between the treatment and control

¹⁰ 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.

¹¹ See footnote 7.

groups that might occur due to chance. Specifically, Navigant estimated the regression model in Equation 2-2.

Equation 2-2. LFER Model

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

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 PPR model above. 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).

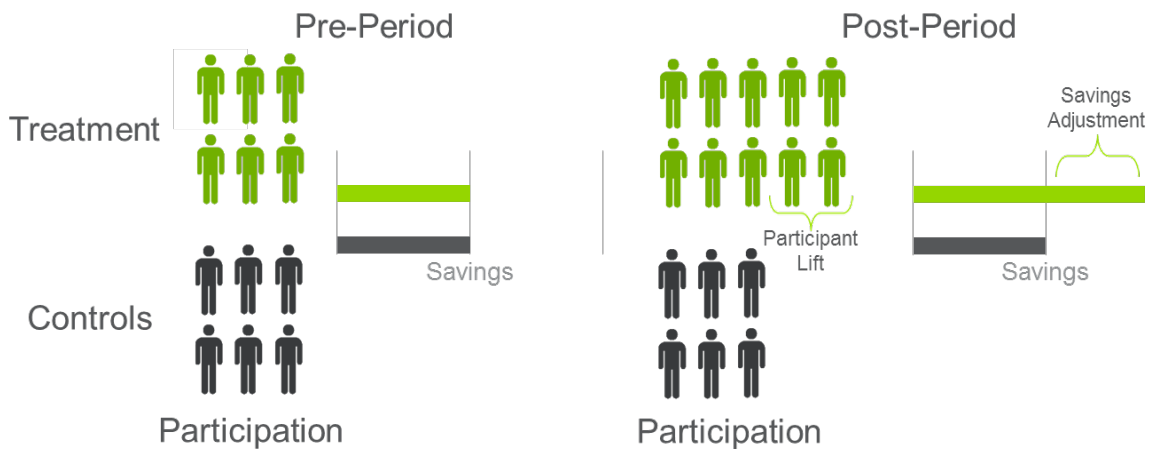
2.3 Uplift Analysis Methodology

The home energy reports include energy-saving tips, some of which encourage treatment customers to enroll in other energy efficiency programs offered by Pacific 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. 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 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 the value to customers of 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 2-1, to estimate uplift in Pacific Power’s Washington 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 5% for the treatment group and 3% for the control group and the rate of participation during the year before the start of the HER program was 2% for the treatment group and 1% for the control group, then the annualized rate of uplift due to the HER program was 1%, 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.

Figure 2-1. 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 program¹² to the double-counted savings in kWh.

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 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

¹² 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.

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 were calculated via Equation 2-3 below.

Equation 2-3. Calculation of Verified Net Savings

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

Where,

β_1 = Parameter from Equation 2-1 that indicates average daily impacts from the PPR 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.¹³

2.5 Data Used in the Impact Analysis

In preparation for the impact analysis, Navigant cleaned the data provided by the HER program implementer, Opower. 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. These customers had zero observations in the post period and thus had zero savings. Using this definition, the 2014 analysis and the combined 2014-2015 analysis had the same number of treatment customers, but the 2015 analysis had fewer due to customers who moved out before the start of 2015. The verified treatment customers for each wave are summarized in Table 2-2 below.

¹³ 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 because they might continue to generate savings after they opt-out.

Table 2-2. Verified Treatment Customers

Wave	Treatment Customers in Initial Dataset	Analysis Periods	Verified Treatment Customers in Each Analysis
Legacy Wave	13,515 Treatment 13,507 Control	2014	11,861 Treatment 11,795 Control
		2015	11,081 Treatment 10,993 Control
		24 months (2014-2015)	11,861 Treatment 11,795 Control
Expansion Wave	38,172 Treatment 12,341 Control	Sept.-Dec. 2014	38,147 Treatment 12,334 Control
		2015	36,220 Treatment 11,752 Control
		16 months (Sept. 2014-2015)	38,147 Treatment 12,334 Control
Refill Wave	6,883 Treatment 6,884 Control	Dec. 2014	6,800 Treatment 6,795 Control
		2015	6,644 Treatment 6,650 Control
		13 months (Dec. 2014-2015)	6,800 Treatment 6,795 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 12-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 outside impact on the regression results biasing the estimate of savings.¹⁴

¹⁴ As an example, the median usage for the 24-month analysis of the Legacy Wave was 57.2 kWh per day, and so observations with usage greater than 572 kWh or less than 5.72 kWh per day were excluded from the analysis.

3. PROCESS EVALUATION APPROACH

As part of Pacific Power's Washington 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. The evaluation team drew comparisons between treatment groups as well as between wave cohorts to determine the effects of the program over time. Secondary objectives included exploring 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 and branding.

The Navigant team wrote the survey and contracted with a research firm, The Dieringer Research Group (DRG), to program and field the survey between January and February 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 originally targeted 720 completed surveys divided evenly between the Legacy, Expansion, and Refill Waves and between the treatment and control groups. Due to limitations on the time period for data collection, the number of completed surveys was lower than the original target levels but remained high enough 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 six cohorts, Navigant provided DRG with a list of 3,000 randomly selected customers for each targeted cohort.

Table 3-1 below provides a summary of the completion outcome.

Table 3-1. Survey Targets and Achieved Completes

Cohort	Target	Achieved	Amount of Sample Provided	Total in Population
Legacy Control	120	95	3,000	11,795
Legacy Treatment	120	94	3,000	11,861
Expansion Control	120	99	3,000	12,334
Expansion Treatment	120	94	3,000	38,147
Refill Control	120	101	3,000	6,795
Refill Treatment	120	94	3,000	6,800
Total	720	577	18,000	87,732

Source: Navigant

4. COST-EFFECTIVENESS EVALUATION APPROACH

Program cost-effectiveness was evaluated for 2014, 2015, and the overall 24 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.¹⁵ The Total Resource Cost Test with a 10% adder (PTRC) is the primary criterion in Washington for evaluating a program's cost-effectiveness.

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

- Participant Cost Test (PCT)
- Utility Cost Test (UCT)
- Ratepayer Impact (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 were provided by Pacific Power staff, including data obtained from the 2013 IRP (for the 2014 analysis) and the 2015 Class 2 DSM Decrement Study (for the 2015 analysis), and include program cost inputs, program savings by measure, and measure life.

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.

¹⁵ 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.

Table 4-1. Details of Cost Effectiveness Tests¹⁶

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 with a 10% benefits adder.

Source: Navigant analysis

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

Parameters	2014	2015	2014-2015
Discount Rate for all B/C Tests	6.88%	6.66%	6.66%
Inflation Rate for all B/C Tests	1.90%	1.90%	1.90%
Line Loss Factor - Energy (%)	9.67%	9.67%	9.67%
Residential Energy Rate (\$/kWh)	\$0.0841	\$0.0885	-
Gross Customer Costs	\$0	\$0	\$0
Program Delivery	\$197,388	\$296,931	\$494,319
Utility Administrative	\$48,053	\$27,226	\$75,279
Evaluation, Marketing, Development	\$28,807	\$16,410	\$45,217
Incentive Costs	\$0	\$0	\$0

Source: Navigant analysis

¹⁶ "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>.

5. IMPACT EVALUATION RESULTS

This section includes results from the impact evaluation.

Overall verified net program savings from January 2014 to December 2015, after adjusting for uplift, was 14,487 MWh. Of this, 9,736 MWh (67%) were from the Legacy Wave, 4,516 MWh (31%) were from the Expansion Wave, and 235 MWh (2%) were from the Refill Wave. The LFER and PPR models generated similar results for program savings in all three time periods for each wave. Navigant uses the PPR model's results for reporting total program savings.

Table 5-1 shows total HER program savings across the three waves in each of the three evaluation time periods: 2014, 2015, and the two years combined. Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 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 2014 and year 2015. Since each time period was run as a separate analysis, the savings totals for year 2014 and year 2015 does not sum to the savings over the total combined time period of 2014-2015 together. In 2014, the Legacy Wave ran for all 12 months, but the Expansion Wave ran for only four months and the Refill Wave for just one month. 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	Total Across All Three Waves		
	2014	2015	2014-2015
Number of Treatment Customers	56,808	53,945	56,808
Verified Evaluation Savings (MWh)	5,139	9,199	14,417
Percent Savings	0.49%	1.09%	0.94%
Verified Net Savings (MWh)‡	5,111	9,295	14,487

Source: Navigant analysis

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

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 January 2014 to December 2015 were 14,487 MWh. Weighted average percentage savings across the three waves was 0.94%, meaning that on average the treatment group consumed 0.94% less energy than the control group in the analysis period. However, the average hides considerable variation across

the three waves. The Legacy Wave had average savings of 1.94%, the Expansion Wave of 0.72%, and the Refill Wave of 0.43%.

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

Type of Statistic	Legacy Wave			Expansion Wave			Refill Wave		
	2014	2015	2014-2015 (24 Months)	2014 (Sept.-Dec.)	2015	2014-2015 (16 Months)	2014 (Dec.)	2015	2014-2015 (13 Months)
Number of Treatment Customers [†]	11,861	11,081	11,861	38,147	36,220	38,147	6,800	6,644	6,800
Number of Controls [†]	11,795	10,993	11,795	12,334	11,752	12,334	6,795	6,650	6,795
Percent Savings	1.81%	2.09%	1.94%	0.17%	0.90%	0.72%	-0.03%	0.47%	0.43%
Standard Error	0.24%	0.28%	0.24%	0.24%	0.20%	0.19%	0.67%	0.39%	0.38%
90% Confidence Bound	[1.41%, 2.21%]	[1.63%, 2.55%]	[1.54%, 2.34%]	[-0.22%, 0.56%]	[0.57%, 1.23%]	[0.41%, 1.03%]	[-1.14%, 1.07%]	[-0.17%, 1.11%]	[-0.20%, 1.06%]
Average Daily Savings per Customer (kWh)	1.16	1.26	1.21	0.06	0.33	0.26	-0.01	0.11	0.10
Standard Error	0.16	0.17	0.15	0.08	0.07	0.07	0.20	0.09	0.09
90% Confidence Bound	[0.91, 1.42]	[0.99, 1.54]	[0.96, 1.46]	[-0.08, 0.20]	[0.21, 0.45]	[0.15, 0.37]	[-0.34, 0.32]	[-0.04, 0.25]	[-0.05, 0.25]
Verified Net Savings Prior to Uplift Adjustment (MWh)	4,872	4,941	9,811	269	4,033	4,375	-2	225	231
Standard Error	652	659	1,224	379	893	1,144	42	186	206
90% Confidence Bound	[3,798, 5,945]	[3,856, 6,025]	[7,797, 11,824]	[-354, 892]	[2,564, 5,501]	[2,493, 6,257]	[-71, 68]	[-81, 531]	[-107, 570]
Savings Uplift in Other Energy Efficiency Programs (MWh) [‡]	37	38	75	-9	-130	-141	0	-4	-4
Verified Net Savings (MWh)	4,835	4,903	9,736	278	4,163	4,516	-2	229	235

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

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

‡The savings uplift rate from the aggregated 2014-2015 analysis is applied to 2014 and 2015 to get uplift savings in each year.¹⁷

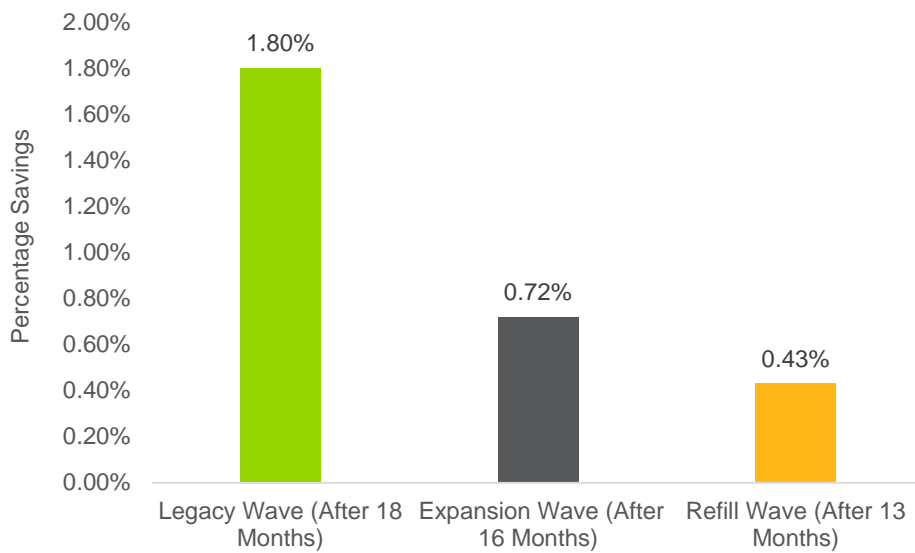
Source: Navigant analysis

There are two sources of variation across the three waves: the length of time they have been in the program and the baseline usage. The Legacy Wave had been in the program for 2.5 years at the start of

¹⁷ The uplift rate for the 2014-2015 analysis was calculated by dividing the 2014-2015 savings uplift by the 2014-2015 verified net savings prior to uplift. The savings uplift for 2014 and 2015 individually was calculated by multiplying the 2014-2015 uplift rate by the verified net savings prior to uplift for each year. For example, for the Legacy Wave the 2014-2015 uplift rate was $75 / 9811 = .0076$ (or 0.76%). Thus 2014 uplift was $4872 * 0.0076 = 37$ and 2015 uplift was $4941 * 0.0076 = 38$.

2014 and thus had plenty of time to ramp up before the start of this analysis. The Expansion and Refill Waves started in late 2014 and will likely continue to see savings ramp up into 2016. Additionally, the Legacy Wave is made up of the highest energy users who typically realize higher percentage savings as a result of home energy reports, as discussed in Section 5.5. Figure 5-1 shows the savings for the Legacy Wave after 18 months (from the previous evaluation) compared to the savings for the Expansion Wave after 16 months and the Refill Wave after 13 months. Although the timeframe for the Expansion and Refill Waves are slightly shorter, it is clear that they have lower savings than the Legacy Wave. This is likely because these waves are made up of lower usage customers.

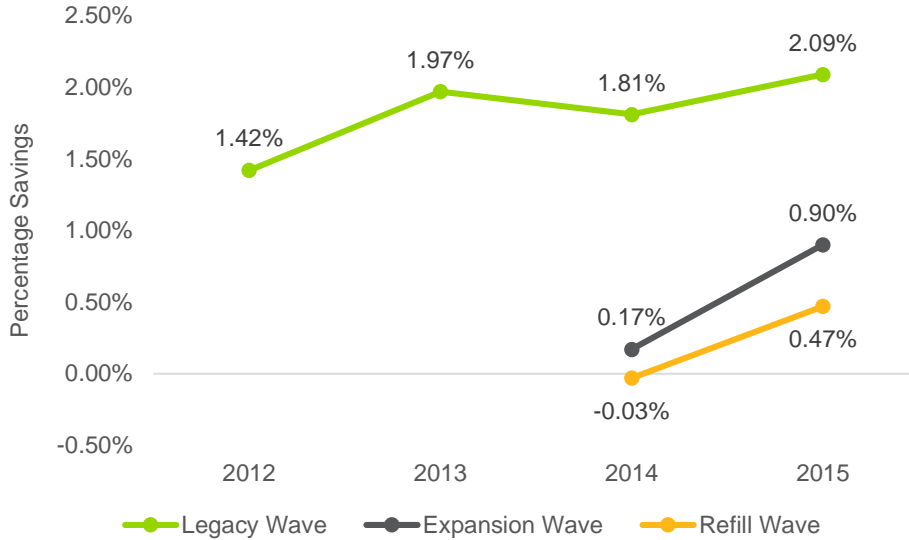
Figure 5-1. Comparison of Early Period Savings



Source: Navigant analysis

Figure 5-2 shows the evolution of savings over time for each wave. The Expansion and Refill Waves show similar ramp up from 2014 to 2015 as the Legacy Wave did from 2012 to 2013. The Legacy Wave had savings near 2% for 2013, 2014, and 2015, which suggests that savings may have reached a steady state for that wave and savings may continue to stay at about 2% for the next few years. If the Expansion and Refill Waves continues to mimic the pattern of the Legacy Wave, they might level off in 2016. However, Navigant has seen many HER programs continue to grow in savings throughout their second year and even into their third year. The Refill Wave, which is only 13 months old, could be expected to continue to see growing savings in 2016.

Figure 5-2. 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 estimates of savings from the PPR and LFER models were similar.

5.3 Uplift of Savings in Other Energy Efficiency Programs

PPR 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 2014-2015 evaluation period was a small proportion of the total savings: -70 MWh or 0.2%.

Navigant considered uplift for Pacific 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 Table 5-4 shows the double-counted savings in the HER program because of this change in participation. Detailed tables of the uplift results are included in Appendix C.

Table 5-3. Change in Participation (People)

	Program		Total
	Appliance Recycling	HES	
Legacy	18	139	157
Expansion	-38	-255	-293
Refill	5	-27	-22
Total	-15	-143	-158

Source: Navigant analysis

Table 5-4. Double-Counted Savings (kWh)

	Program		Total
	Appliance Recycling	HES	
Legacy	10,505	64,647	75,152
Expansion	-22,271	-118,722	-140,993
Refill	3,011	-7,140	-4,129
Total	-8,755	-61,215	-69,970

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.¹⁸ The outcome is that double-counting of savings with other energy efficiency programs for which tracking data are available does not appear to be 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

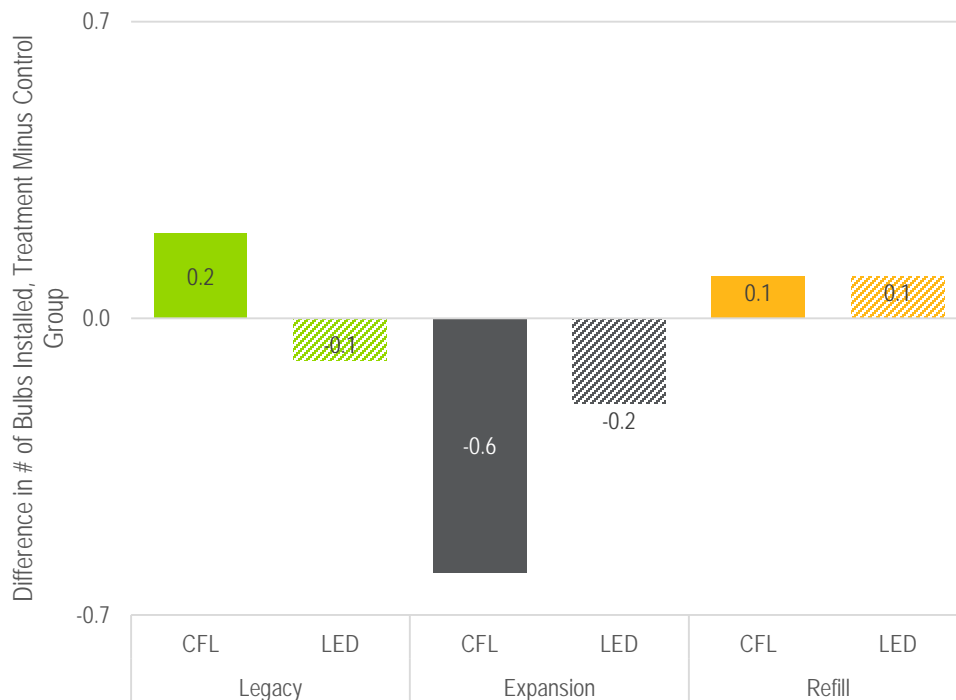
¹⁸ Under the assumption that participation in other programs occurred uniformly throughout the year, the double-counted savings would be approximately -35 MWh, half the estimate value of -70 MWh. The double-counted savings are small enough compared to the total HER savings that using -35, as opposed to -70, would not make a considerable difference in the total program savings.

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.

As part of this battery, the evaluation team also collected information on real-time thermostat usage, with results presented in Section 6.1.

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. For the Expansion Wave, the analysis revealed that treatment respondents have 0.6 fewer CFL bulbs installed than control respondents, which was statistically significant at the 90% confidence level. In the Legacy Wave, treatment respondents reported an average of 0.2 more CFLs installed than the control respondents, and in the Refill Wave, treatment respondents reported an average of 0.1 more CFL bulbs, but these differences were not statistically significant as shown by Figure 5-3. Across the Legacy and Expansion Waves, treatment respondents reported having fewer LED bulbs installed than the control respondents, with 0.1 fewer LED bulbs installed in the Legacy Wave and 0.2 fewer in the Expansion Wave; Refill Wave treatment respondents had 0.1 more LEDs installed. None of these differences across waves were statistically significant at the 90% confidence level.

Figure 5-3. Difference in Efficient Bulbs Installed, Treatment Compared to Control Group

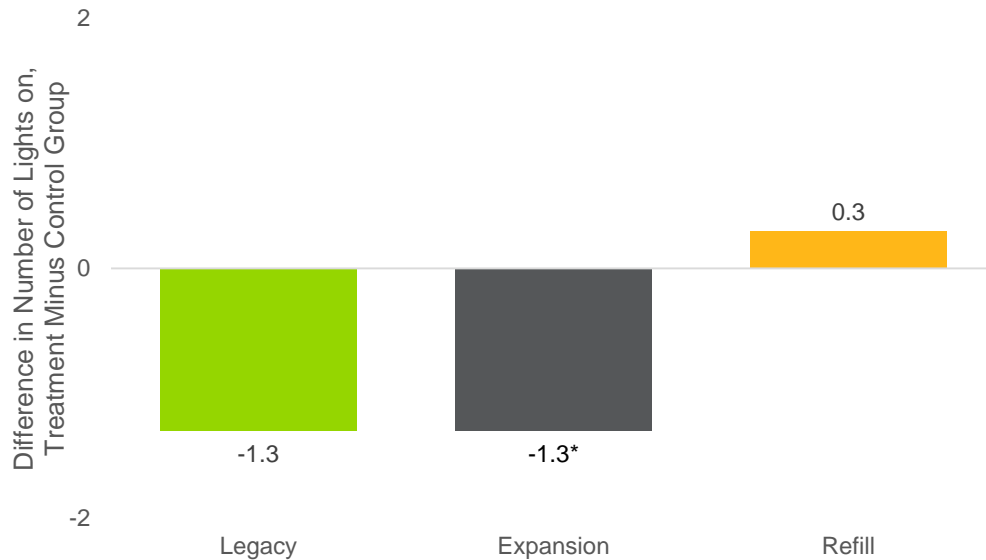


*Denotes a statistically significant difference between the treatment and control groups.

Source: Navigant analysis of customer survey; L2a and L2b

When looking at the number of lights of any type turned on in the entire home at the time of the survey, treatment respondents in the Legacy and Expansion Waves had fewer lights turned on than control respondents, but treatment respondents in the Refill Wave had more; however, only the Expansion Wave was statistically different from its control group at the 90% confidence level (see Figure 5-4). Legacy treatment respondents had 1.3 fewer lights turned on than the control group. The Expansion treatment respondents also had 1.3 fewer lights turned on compared to their respective control group. Refill treatment respondents had 0.3 more lights turned on than the control group. The evaluation team used these numbers to control for the number of CFL and LED bulbs turned on in the home to reduce variability across respondents and increase the accuracy of the comparison.

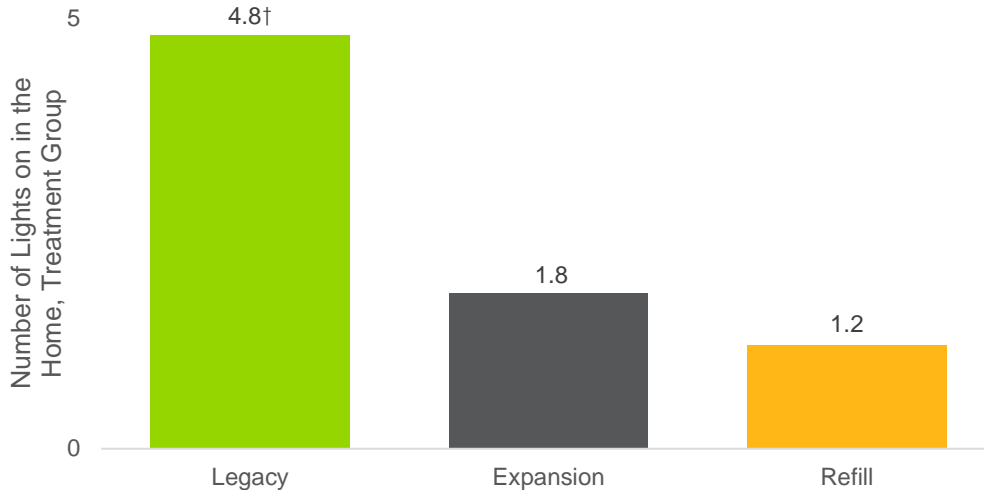
Figure 5-4. Difference in Number of Lights Turned On, Treatment Compared to Control Group



*Denotes a statistically significant difference between the treatment and control groups.
Source: Navigant analysis of customer survey; L3

Between waves, the analysis showed significant differences in the number of lights turned on in treatment respondents' homes. Expansion treatment respondents had an average of 1.8 lights turned on compared to 4.8 lights turned on for Legacy treatment respondents. Additionally, Refill treatment respondents only had 1.2 lights turned on. Both the Expansion and Refill treatment groups demonstrated statistically significant differences at the 90% confidence level when compared to the Legacy treatment group, as shown in Figure 5-5.

Figure 5-5. Average Number of Lights Turned On, Treatment Group



†Denotes a statistically significant difference between the Legacy treatment group compared to both the Expansion and Refill treatment groups

Source: Navigant analysis of customer survey; L3

For the number of CFL and LED bulbs turned on, none of the treatment groups differed significantly from their control counterparts. The only statistically significant difference in the number of efficient bulbs turned on was between Legacy and Expansion treatment groups; Expansion treatment respondents had an average of 0.4 more LED bulbs turned on than Legacy treatment respondents.

Navigant 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 2015; and whether (c) they had purchased at least one LED in 2015. Respondents in each of the treatment groups reported significantly higher levels of recall of receiving materials encouraging the purchase of energy efficient bulbs. Ninety-one percent of Legacy respondents answered “Yes” to the first question, as well as 86% of Expansion respondents and 79% of Refill respondents. For the control groups, 63%, 65% and 67% of the Legacy, Expansion and Refill respondents recalled these materials respectively. These differences are statistically significant at the 90% confidence level.

In regard to the purchase of energy efficient bulbs, respondents across all cohorts reported a higher uptake of CFL bulbs in the past 12 months compared to LEDs. For the Expansion wave, treatment customers were statistically significantly more likely to have purchased CFLs in 2015 compared to the Expansion control group. The other two groups were not statistically significant for CFLs and none of the groups had statistically significant differences for LEDs.

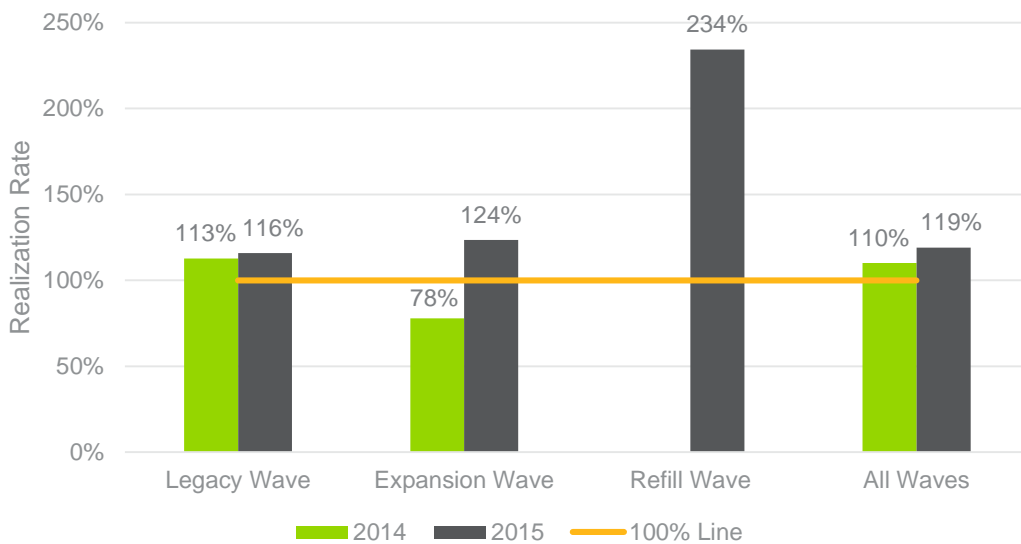
In summary, for the most part there appears to be little difference between treatment and control customers in their installation and use of energy efficient light bulbs. All three treatment groups showed higher awareness of marketing materials encouraging them to purchase CFL and LED bulbs. However, 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 Pacific Power's annual reports. Figure 5-6 shows the realization rate in each year. In 2014 there were no reported savings for the Refill Wave as the wave started just one month before the end of the year.

Figure 5-6. Realization Rates



Source: Navigant analysis

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

Table 5-5. Realization Rates

Year	Statistic	Legacy Wave	Expansion Wave	Refill Wave	All Waves
2014	Evaluation Savings (MWh)	4,872	269	-2	5,139
	Reported Savings (MWh)	4,325	345	-	4,670
	Realization Rate	113%	78%	-	110%
2015	Evaluation Savings (MWh)	4,941	4,033	225	9,199
	Reported Savings (MWh)	4,360	3,264	96	7,720
	Realization Rate	113%	124%	234%	119%

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 2014-2015 analysis period for each wave. Table 5-6 provides descriptive statistics and savings values for each of the three segments.

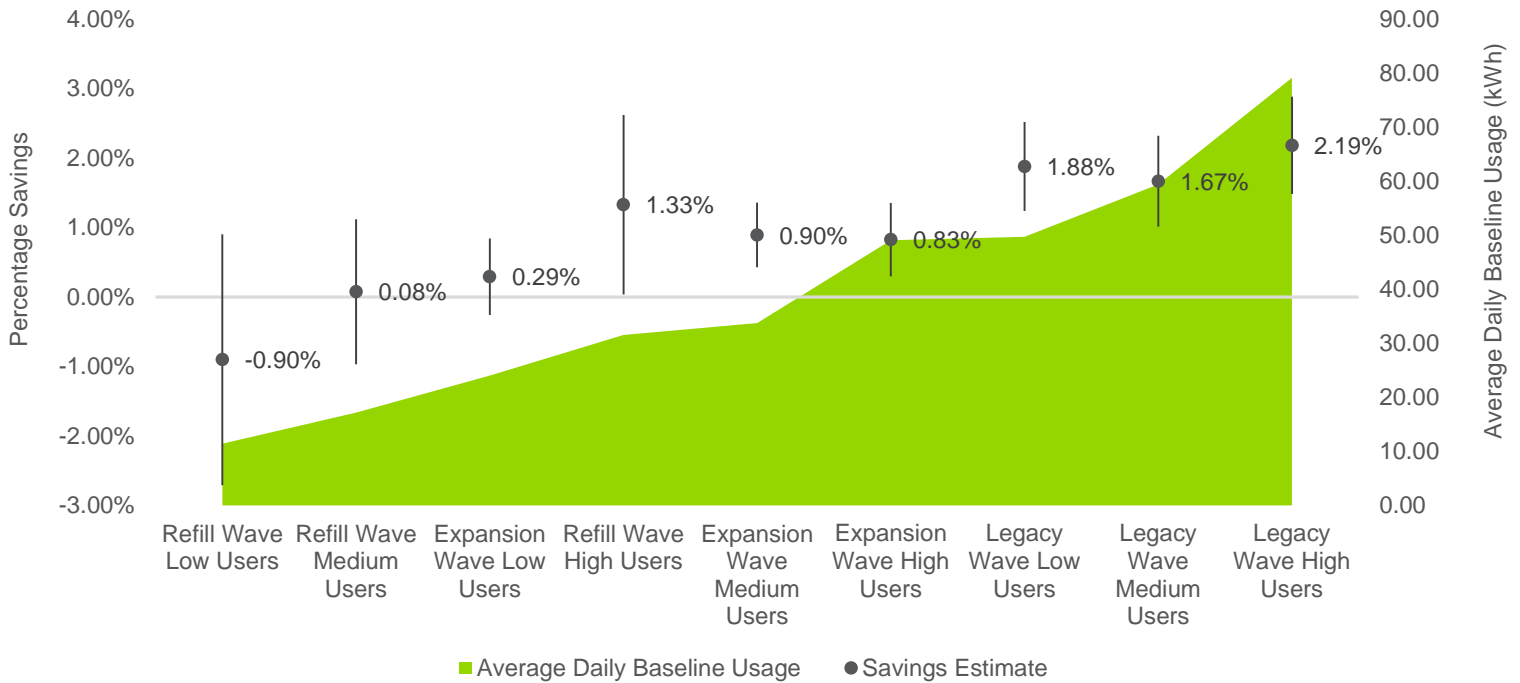
Table 5-6. Savings by Usage Level

Type of Statistic	Legacy Wave			Expansion Waves			Refill Wave		
	Low Usage	Medium Usage	High Usage	Low Usage	Medium Usage	High Usage	Low Usage	Medium Usage	High Usage
Number of Treatment Customers	3,927	3,933	3,929	12,340	12,367	12,368	2,206	1,995	1,963
Number of Controls	3,912	3,905	3,909	4,020	3,993	3,991	1,984	2,015	2,046
Pre-Program Daily Usage Range (kWh)	12.5 to 57.6	57.6 to 70.6	70.6 to 244.4	3.6 to 30.2	30.2 to 41.6	41.6 to 210.2	1.7 to 14.2	14.2 to 19.5	19.5 to 144.0
Pre-Program Daily Usage Mean (kWh)	49.3	59.0	78.3	24.0	33.5	48.9	11.5	17.2	31.2
Percent Savings	1.88%	1.67%	2.19%	0.29%	0.90%	0.83%	-0.90%	0.08%	1.33%
<i>Standard Error</i>	<i>0.39%</i>	<i>0.40%</i>	<i>0.43%</i>	<i>0.33%</i>	<i>0.28%</i>	<i>0.32%</i>	<i>1.10%</i>	<i>0.63%</i>	<i>0.79%</i>
<i>90% Confidence Bound</i>	<i>[1.24%, 2.52%]</i>	<i>[1.01%, 2.32%]</i>	<i>[1.48%, 2.89%]</i>	<i>[-0.26%, 0.84%]</i>	<i>[0.43%, 1.36%]</i>	<i>[0.30%, 1.36%]</i>	<i>[-2.71%, 0.91%]</i>	<i>[-0.97%, 1.12%]</i>	<i>[0.04%, 2.63%]</i>
Average Daily Savings per Customer (kWh)	0.94	0.99	1.73	0.07	0.30	0.41	-0.10	0.01	0.42
<i>Standard Error</i>	<i>0.19</i>	<i>0.24</i>	<i>0.34</i>	<i>0.08</i>	<i>0.10</i>	<i>0.16</i>	<i>0.13</i>	<i>0.11</i>	<i>0.25</i>
<i>90% Confidence Bound</i>	<i>[0.62, 1.25]</i>	<i>[0.60, 1.38]</i>	<i>[1.18, 2.29]</i>	<i>[-0.06, 0.20]</i>	<i>[0.15, 0.46]</i>	<i>[0.15, 0.67]</i>	<i>[-0.31, 0.10]</i>	<i>[-0.17, 0.19]</i>	<i>[0.01, 0.83]</i>

Source: Navigant analysis

The percentage savings for each usage group are shown in Figure 5-7. The results are arranged with the lowest average usage group on the left and the highest average usage group on the right. As expected, on average, higher users save more. Across the waves some of the differences may be due to ramp up based on the length of time the wave has been in the program. This suggests that the highest users should be targeted if the program continues to expand.

Figure 5-7. Percentage Savings by Usage Level with 90% Confidence Intervals



Source: Navigant analysis

6. PROCESS EVALUATION RESULTS

Navigant designed a customer survey of the treatment and control groups in the Legacy, Expansion, and Refill Waves 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 Pacific 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.

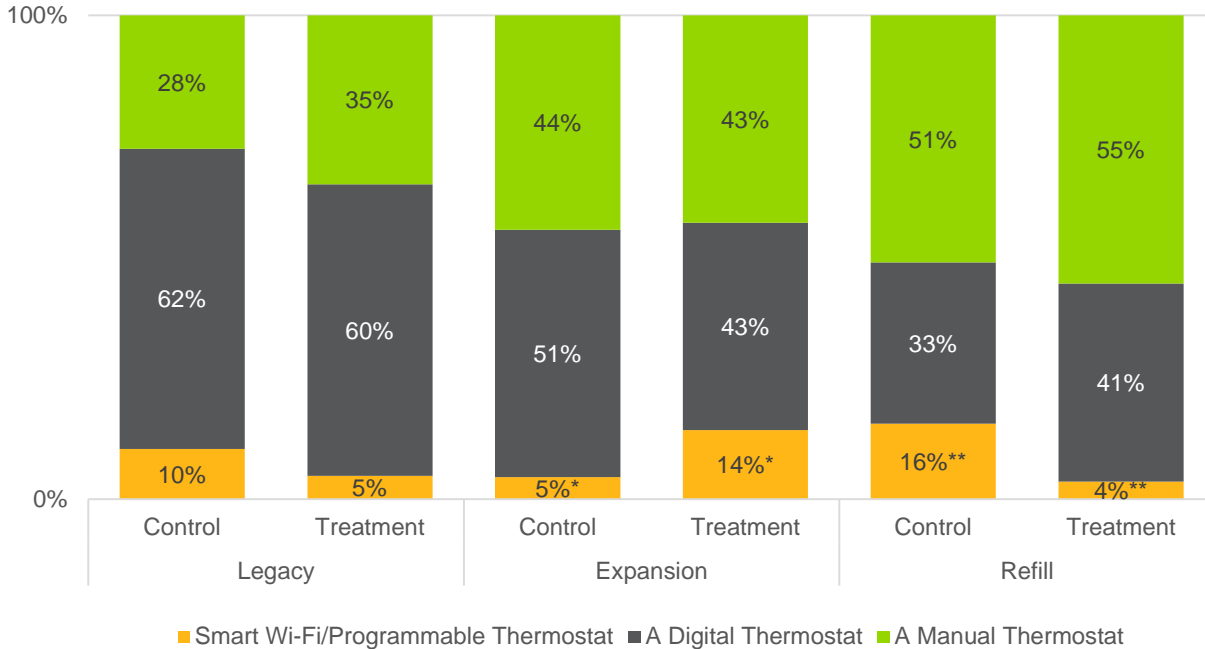
6.1 Real-Time Energy Efficiency Home Behavior

As part of the Live Audit battery, as discussed in Section 5.3.1, the evaluation team asked respondents a series of questions designed to determine real-time thermostat behavior practices. Navigant asked respondents to locate their thermostats during the survey and answer questions about the type of thermostat installed in their home 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.¹⁹

Most respondents have either a digital or manual 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 relatively common and found in up to 55% of households in the survey, most frequently in the Refill Wave. The most sophisticated thermostats are smart Wi-Fi/programmable thermostats (smart thermostats), which feature more advanced programming options and allow for remote thermostat control. Of treatment respondents in the Expansion Wave, 14% had smart thermostats compared to 5% of the control group; in the Refill Wave, 16% of control group respondents had a smart thermostat compared to 4% of the treatment group. Both of these differences were statistically significant at the 90% confidence level. The evaluation team found no statistical differences between thermostat types amongst the Legacy cohorts.

¹⁹ The evaluation team conducted surveys between 5 p.m. and 9 p.m. local time.

Figure 6-1. Home Thermostat Type



*Denotes a statistically significant difference between the Expansion treatment and control groups.

**Denotes a statistically significant difference between the Refill treatment and control groups.

Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; L5

The majority of respondents whose thermostats have programming capabilities use those capabilities. The exception is Refill Wave treatment customers, 54% of whom did not have their thermostat programmed. The Refill Wave treatment customers were statistically different from their controls, 71% of whom had their thermostat programmed. The Expansion control and treatment groups were also statistically different from one another, 72% of the treatment customers had their thermostat programmed compared to 58% of the controls. There was no difference between the Legacy control and treatment groups.

In concluding the Live Audit battery, Navigant gathered information on current temperature settings for each cohort. Almost all respondents had their thermostats turned on with the temperature set to an average of 67 to 70 degrees Fahrenheit. The actual temperature of respondents' homes ranged from 69 to 70 degrees Fahrenheit. There were no statistically significant differences in the thermostat settings or home temperature across the different groups.

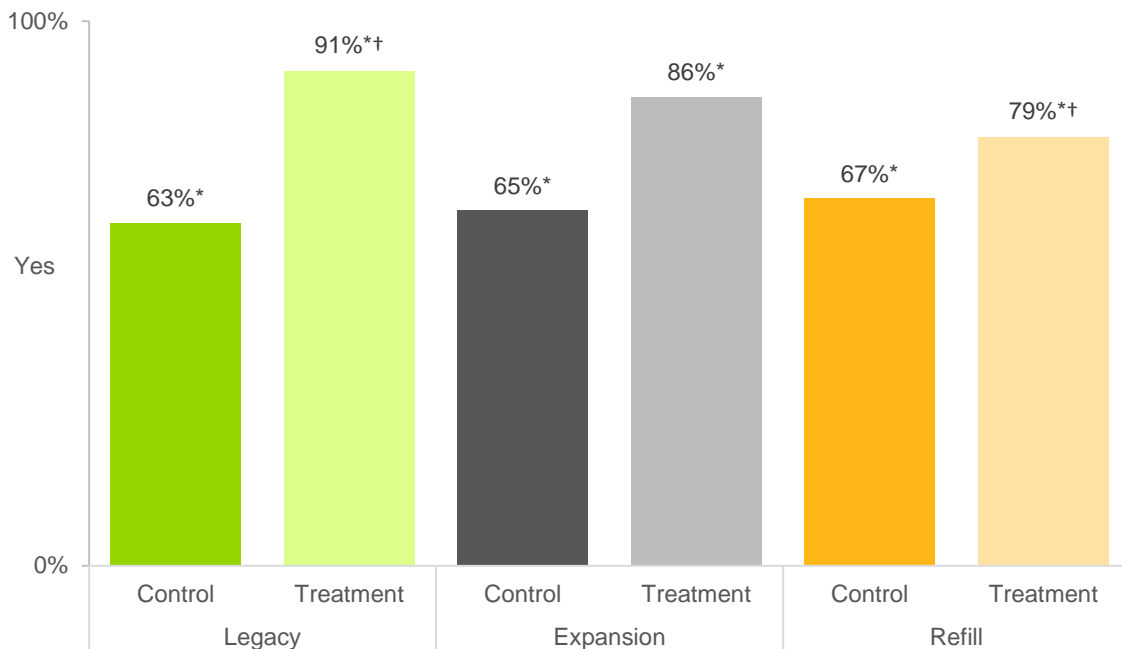
6.2 Efficient Lighting Awareness and Purchasing

The evaluation team asked all respondents a series of questions designed to assess their awareness of the EEL options available.

The majority of respondents recalled receiving information from Pacific Power encouraging them to replace incandescent light bulbs with CFL and LED bulbs. Respondents in the treatment groups in all three waves showed statistically significant differences at the 90% confidence level in how frequently they recalled EEL recommendations from their utility. As shown in Figure 6-2, a majority of treatment group customers (91%, 86%, and 79% from the Legacy, Expansion, and Refill Waves, respectively) recalled receiving information from Pacific Power. The percentage of treatment group respondents in all three waves who recalled receiving information was statistically significantly greater than control group respondents.

Between treatment groups, the percentage of Legacy treatment and Refill treatment respondents also showed a statistically significant difference: 91% of Legacy treatment respondents recalled information compared to 79% of Refill treatment respondents. Control group respondents gave similar responses, with approximately two-thirds of control group respondents from all three waves recalling information about EEL. The difference between control groups was not statistically significant.

Figure 6-2. Recall Information on Bulb Replacement



*Statistically significant differences between control and treatment groups for each wave.

†Statistically significant difference between Legacy and Refill treatment groups.

Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

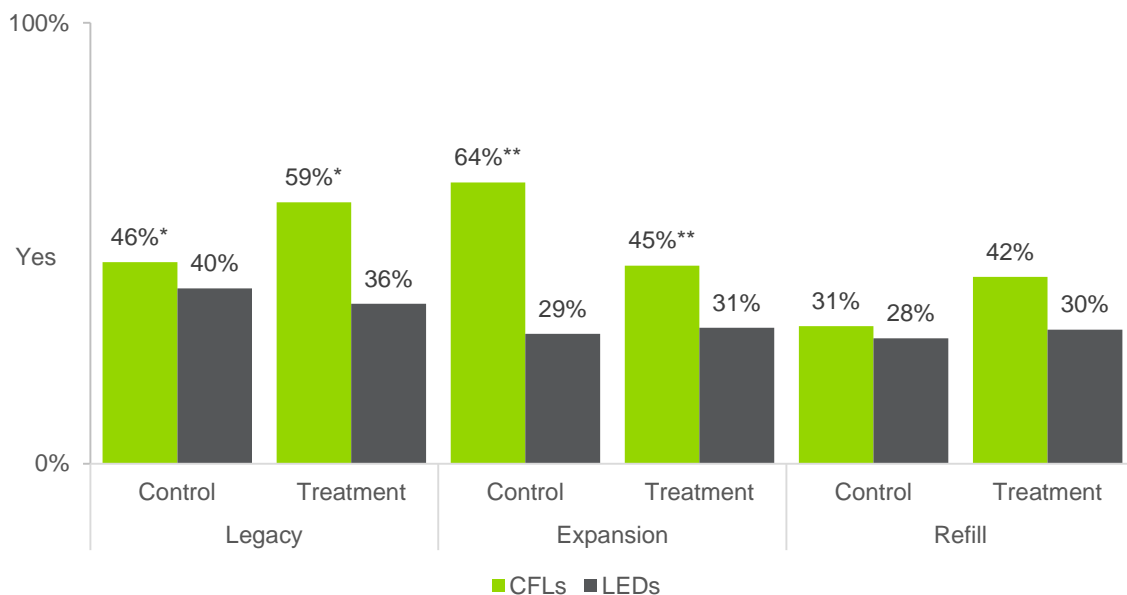
Source: Navigant analysis of customer survey; LP1

Respondents adopted EEL at a moderate level over the past year. In the previous 12 months, control group respondents purchased CFL bulbs at a higher rate than treatment group respondents across all three waves. LED purchases during this time period were consistent across all three waves for both treatment and control customers.

Figure 6-3 shows the percentage of respondents from all waves and groups who purchased EEL over the previous 12 months. The differences between the treatment and control groups was statistically significant in the Legacy Wave, in which 46% of control customers and 59% of treatment customers purchased CFLs, and in the Expansion Wave, in which more control customers purchased CFLs (64%) than treatment customers (45%). It was not statistically significant in the Refill Wave.

Across all three waves, a relatively low percentage of respondents purchased LEDs, with responses varying between 28% of the Refill control group and 40% of the Legacy control group.

Figure 6-3. Purchased CFLs or LEDs in Past 12 Months



*Statistically significant difference in Legacy Wave.

**Statistically significant difference in Expansion Wave.

Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; LP2, LP3

In addition to looking at whether or not a customer purchased a CFL or LED bulb, Navigant also considered the number of bulbs bought. Control group respondents purchased a higher volume of energy efficient light bulbs compared to treatment respondents for every wave and group except for the Refill Wave's CFL purchases. The difference between the groups' purchases was largest for CFL bulb purchases per household in the Expansion Wave: the number of CFLs purchased by Expansion Wave treatment respondents (5.9 CFLs) was statistically different from the control group (9.4 CFLs).

Control group respondents from the Legacy Wave purchased an average of 10.0 CFLs per household, and the treatment group purchased 8.2. This number is slightly higher than but not statistically different from Expansion and Refill Wave customers' CFL bulbs purchased per household. Expansion control and treatment respondents both purchased an average of 9.4 CFLs and Refill control respondents purchased an average of 4.9 CFLs while the treatment group purchased 5.9. The difference in mean purchases for

LED bulbs in the Legacy Wave was larger than for CFL bulbs, with the control group purchasing 13.2 LEDs compared to 9.0 for the control group. In the Expansion Wave, the control group purchased a mean of 7.3 LEDs per household compared to 6.2 in the treatment group. In the Refill Wave, the control group purchased a mean of 8.6 LEDs per household compared to 6.3 for the treatment group. None of these differences were statistically significant.

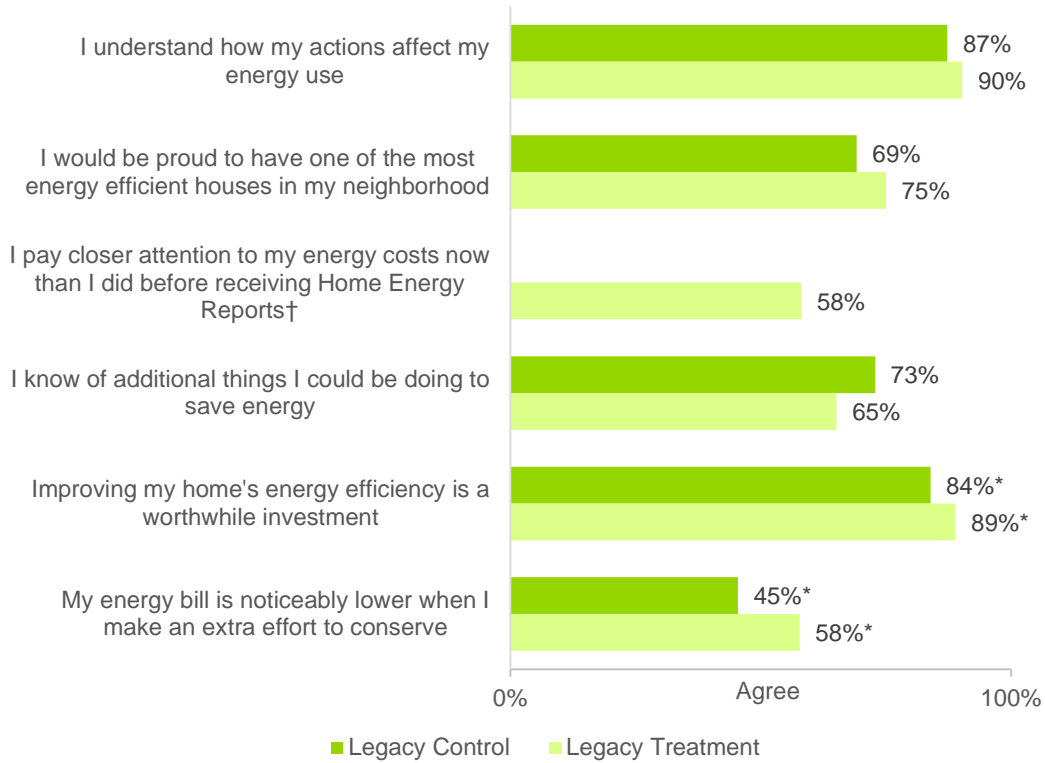
6.3 Energy Awareness and Attitudes

The evaluation team 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 designed the questions to identify differences in behavior and awareness between control and treatment group respondents.

Figure 6-4 shows Legacy Wave respondents' attitudes and awareness toward energy efficiency. When asked whether improving their home's energy efficiency was a worthwhile investment, Legacy treatment respondents said they saw efficiency as a worthwhile investment 89% of the time compared to 84% of the time for Legacy control respondents, a statistically significant difference. One possible explanation for this discrepancy is that the treatment group receives more granular and frequent information about their home's energy use with built-in comparisons month over month. Access to this data could mean that they are more attuned to changes in their energy use and thus may feel discouraged if savings are not as robust as they expected.

Treatment respondents in the Legacy Wave demonstrated some statistically significant differences from Expansion and Refill treatment respondents in their responses to whether they associated lower energy bills with energy-saving behaviors and whether they knew of additional energy-saving actions they could take. Refill treatment respondents indicated that they were more confident that their actions saved energy than Legacy treatment respondents: 75% of Refill treatment customers said they noticed lower energy bills when they made an effort to conserve, compared to 58% of Legacy treatment customers. Additionally, 83% of Expansion treatment respondents said they knew of additional energy-saving actions they could take, compared to 65% of Legacy treatment respondents. A possible explanation for this difference is that the Legacy Wave customers are higher energy users, so they may be less aware of ways to save energy than the other waves.

Figure 6-4. Energy Efficiency Attitudes and Awareness: Legacy Wave



†Asked only of treatment group respondents.

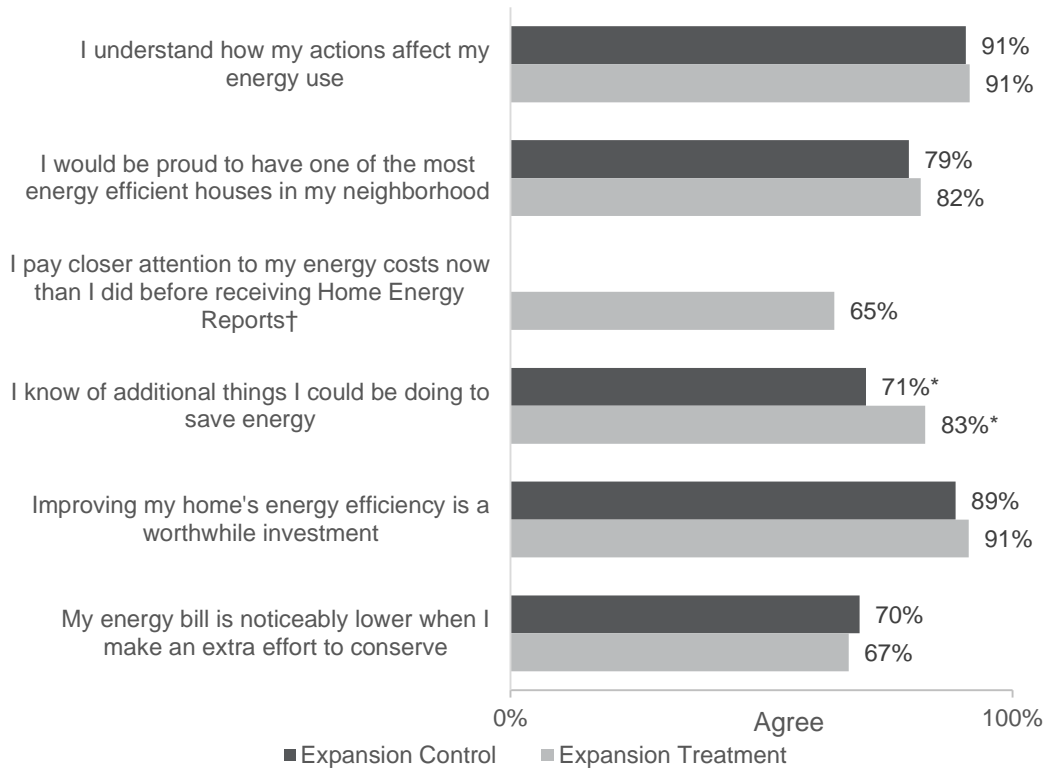
*Denotes a statistically significant difference between treatment and control groups.

Legacy Control n=95; Legacy Treatment n=94

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

Figure 6-5 shows Expansion Wave respondents' attitudes and awareness toward energy efficiency. Expansion Wave respondents had generally high awareness and positive attitudes toward energy efficiency, with respondents in both the control and treatment groups agreeing with the associated survey statements. The difference between the percentage of treatment and control group respondents who knew of additional energy-saving behaviors they could be doing was statistically significant, with 83% of treatment group customers saying they knew of additional actions compared to 71% of control group customers.

Figure 6-5. Energy Efficiency Attitudes and Awareness: Expansion Wave



†Asked only of treatment group respondents.

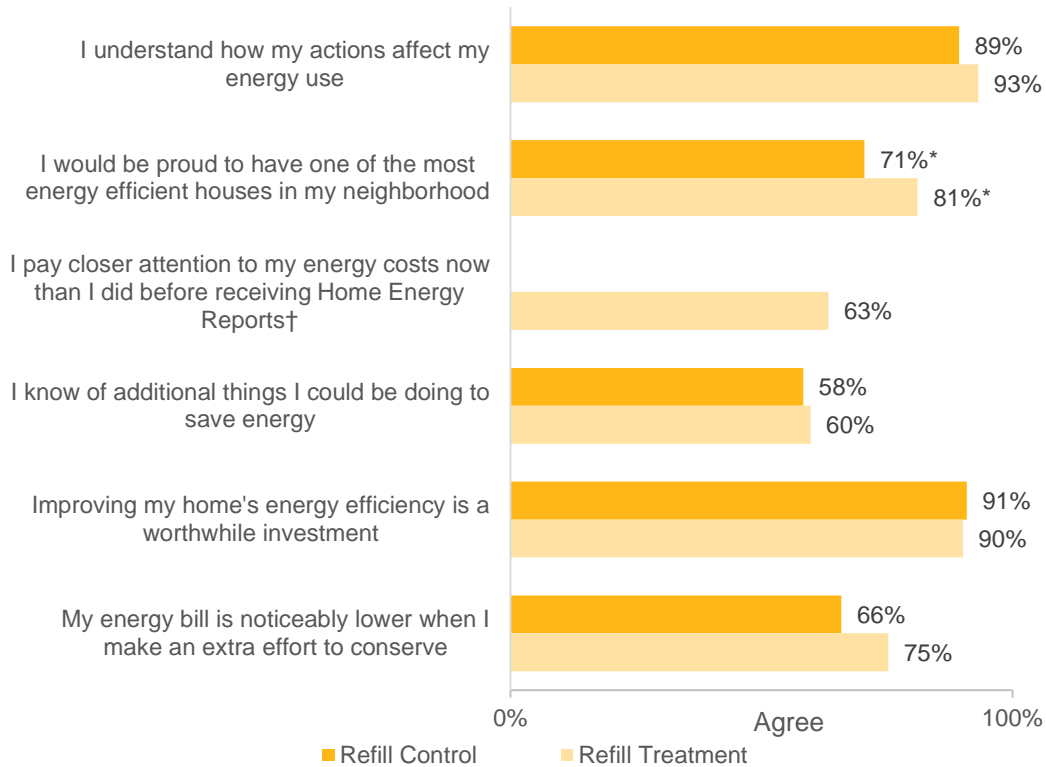
*Denotes a statistically significant difference between treatment and control groups.

Expansion Control n=99; Expansion Treatment n=94

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

Figure 6-6 shows Refill Wave respondents' attitudes and awareness toward energy efficiency. Similar to the Expansion Wave, Refill Wave respondents had generally high awareness and positive attitudes toward energy efficiency, with a majority of respondents in both the control and treatment groups agreeing with the associated survey statements. The difference between the percentage of treatment and control group respondents who would be proud to have one of the most energy efficient houses in their neighborhood was statistically significant, with 81% of treatment group customers agreeing with the survey statement compared to 71% of control group customers. This finding could be because treatment customers regularly receive comparisons between their household and their neighbors, which could contribute to a sense of competition or pride in having an efficient home.

Figure 6-6. Energy Efficiency Attitudes and Awareness: Refill Wave



†Asked only of treatment group respondents.

*Denotes a statistically significant difference between treatment and control groups.

Refill Control n=101; Refill Treatment n=94

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

To better assess respondents' feelings related to their home's energy consumption, Navigant asked respondents to rate their satisfaction with this consumption. Responses from the Legacy Wave fell into a lower range than responses from the Expansion and Refill Waves; this was likely because the Legacy Wave is made up of higher energy users than the other two waves.

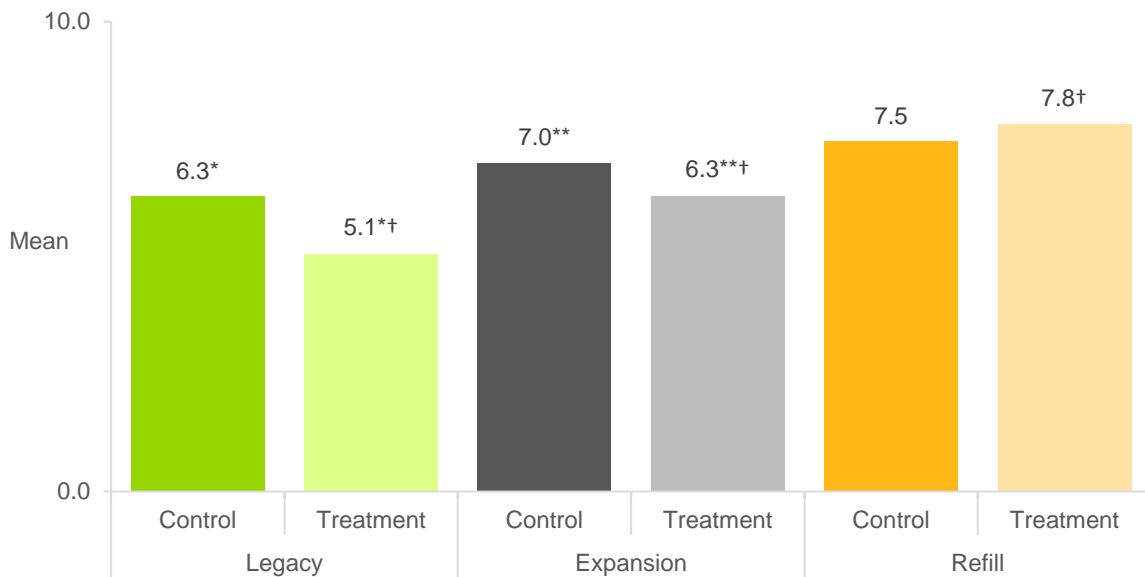
Among Legacy Wave respondents, the difference between the control and treatment groups was statistically significant: the control group gave a mean satisfaction rating of 6.3 compared to a mean of 5.1 for the treatment group. The difference between the Expansion Wave groups was also statistically significant, with the control group giving a mean rating of 7.0 compared to a mean of 6.3 for the treatment group. The difference between the Refill treatment and control responses was not statistically significant. Figure 6-7 shows respondents' mean satisfaction with their home's electric energy consumption on a scale from 1 to 10.

The differences between treatment groups' satisfaction ratings were also statistically significant across all three waves. Legacy treatment customers gave the lowest mean satisfaction rating, one that was statistically different from the ratings of the Expansion and Refill treatment groups. The difference

between the Expansion and Refill treatment groups' satisfaction was statistically significant as well.

One possible explanation for the lower satisfaction with energy consumption 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 feel less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

Figure 6-7. Satisfaction with Electric Energy Consumption



*Statistically significant difference between Legacy control and treatment groups.

**Statistically significant difference between Expansion control and treatment groups.

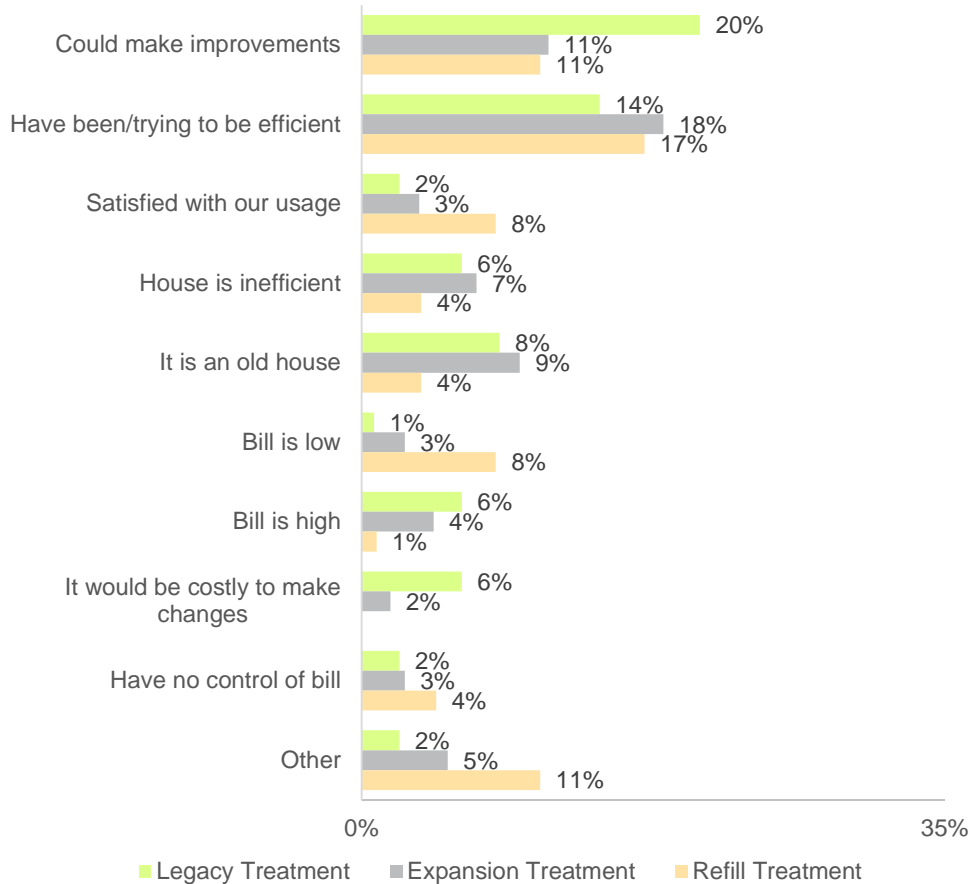
†Statistically significant differences between treatment groups in all waves.

Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; EA4

When asked to elaborate on their home energy use satisfaction rating, treatment group respondents in both waves most frequently said that they chose that rating because they could make improvements or that they were trying to be efficient; 20% of Legacy respondents say they could still make improvements, and 18% of Expansion and 17% of Refill respondents say that they were trying to be efficient. Additional reasons frequently mentioned by respondents included that their house was old, they were already satisfied with their usage, and that they had low bills. Figure 6-8 shows treatment group respondents' reasons for their respective satisfaction ratings. The question associated with this figure was open-ended and respondents could mention multiple reasons.

Figure 6-8. Reason for Satisfaction Rating: Treatment Group Only



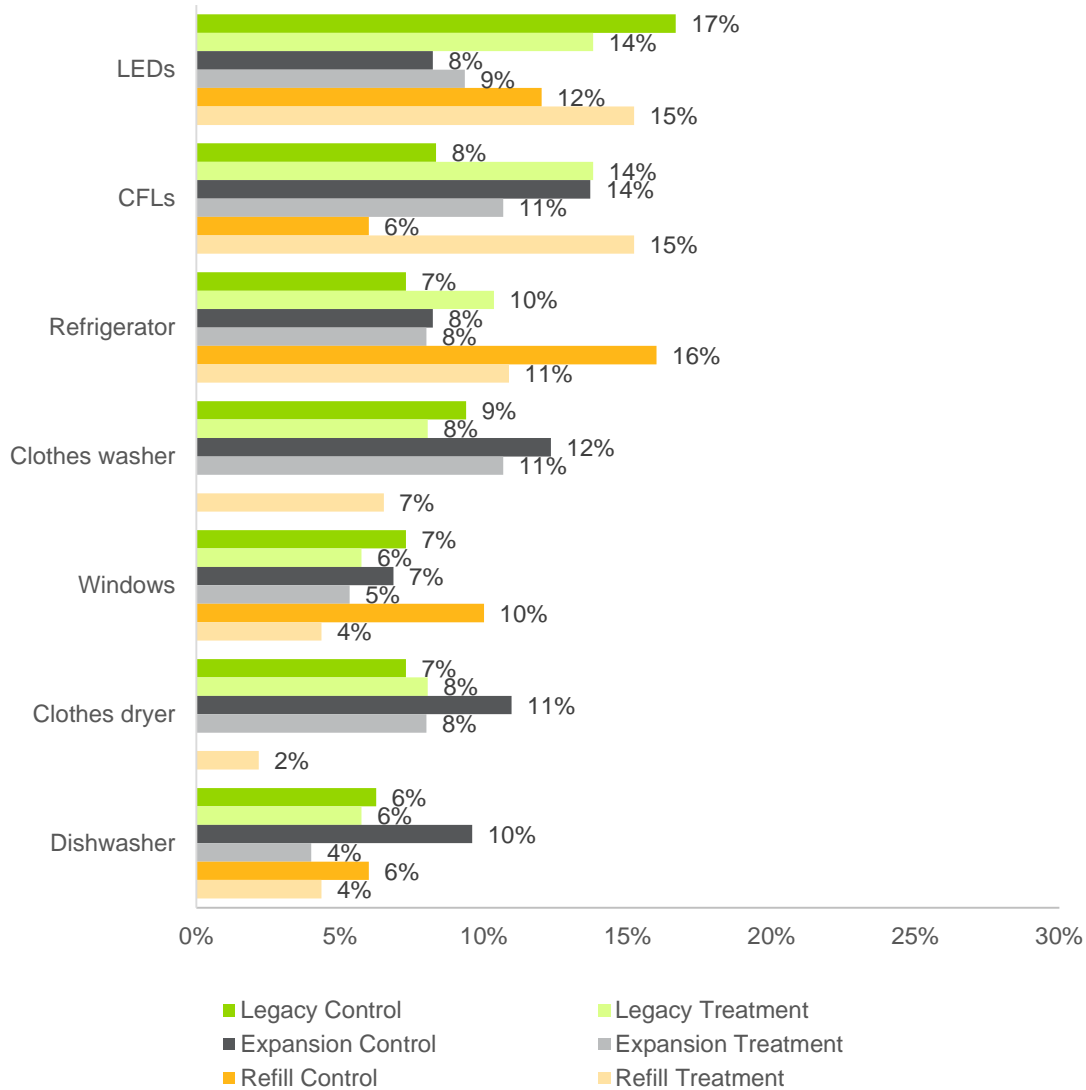
Multiple responses accepted; figure includes reasons mentioned by at least 5% of respondents.
 Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
 Source: Navigant analysis of customer survey; EA4a

Approximately half of Legacy Wave respondents and one-third of Expansion and Refill Wave respondents made energy efficient purchases or upgrades over the previous 12 months. In all three waves, respondents in the treatment group made purchases or upgrades slightly, but not statistically significantly, more frequently than those in the control group. For the Legacy Wave, 55% of treatment group respondents made energy efficient purchases or upgrades compared to 48% of control group respondents; in the Expansion Wave, 38% of treatment group respondents made energy efficient purchases or upgrades compared to 36% of control group respondents; and in the Refill Wave, 33% of the treatment group made purchases compared to 29% of the control group.

Figure 6-9 shows the most frequently purchased energy efficient appliances and equipment across all three waves and both groups. Survey respondents frequently purchased energy efficient light bulbs: in all waves and groups, except for the Refill Wave control group, respondents purchased CFL or LED light bulbs at a higher rate than other energy efficient products. In the Legacy Wave, 17% of control respondents purchased LEDs, and 14% of treatment group respondents purchased LEDs or CFLs. In the

Expansion Wave, CFLs were the most popular efficient product, with 14% of the control group and 11% of the treatment group purchasing these light bulbs. For Refill Wave customers, 15% of treatment respondents purchased CFLs and LEDs respectively, and 12% of control respondents purchased LEDs.

Figure 6-9. Purchases Made in Past 12 Months



Multiple responses accepted; figure includes purchases mentioned by more than 10% of respondents.
Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

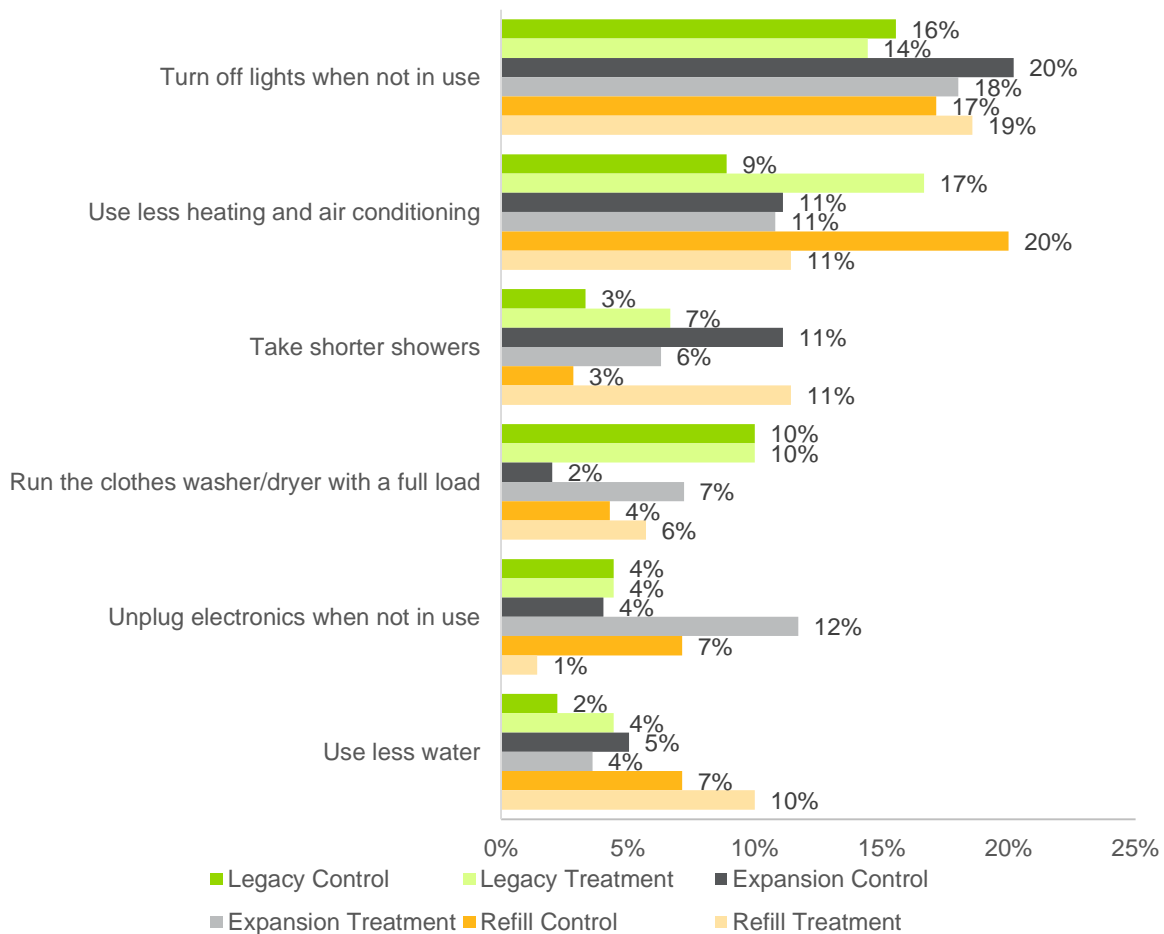
Source: Navigant analysis of customer survey; EA5b

The evaluation team found that approximately half of survey respondents had taken actions to reduce or minimize their electricity, gas, or water consumption over the previous year. Treatment group respondents in all three waves were more likely to have taken actions, though the differences were not statistically

significant. In the Legacy Wave, 53% of treatment group respondents had taken action compared to 47% of the control group; in the Expansion Wave, 55% of treatment group respondents had taken action compared to 47% of the control group; and in the Refill Wave, 46% of treatment group respondents had taken action compared to 41% of the control group.

Figure 6-10 shows the most frequently mentioned actions or behaviors taken over the past 12 months. The Legacy Wave control group, Expansion Wave control and treatment groups, and Refill Wave treatment groups most frequently said "Turn off lights when not in use" when asked which actions or behavior changes they had made over the past year. Among Legacy Wave treatment customers and Refill Wave control customers, respondents most frequently said "Use less heating and air conditioning."

Figure 6-10. Actions or Behavior Changes in Past 12 Months



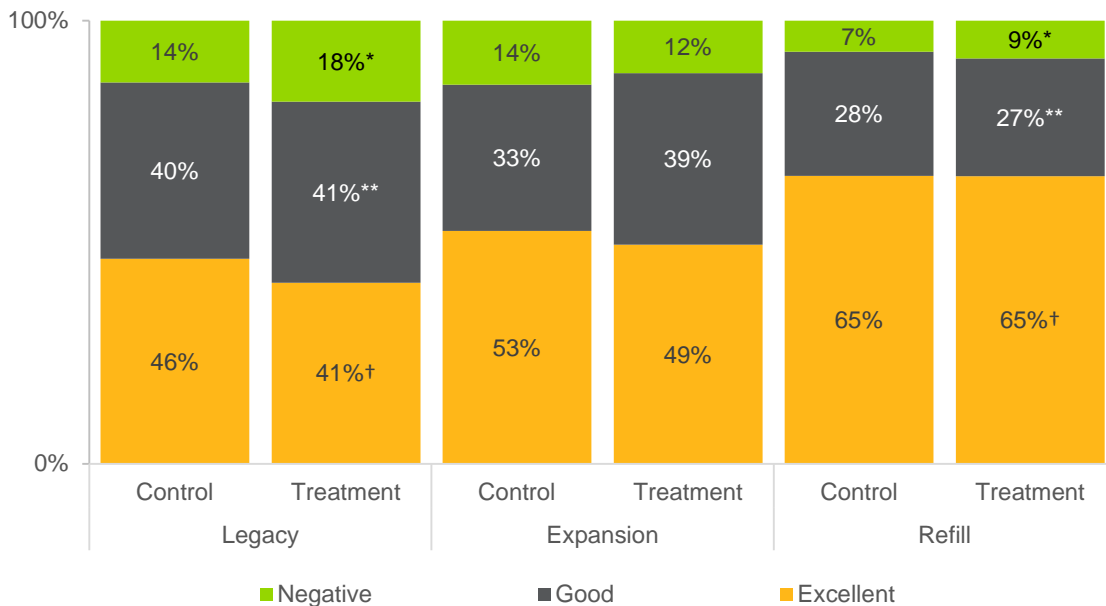
Multiple responses accepted; figure includes actions mentioned by more than 10% of respondents.
 Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101;
 Refill Treatment n=94
 Source: Navigant analysis of customer survey; EA6b

6.4 Satisfaction with Utility

Overall, Pacific Power customers are 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.

Among treatment group respondents, the difference between the Legacy and Refill Waves was statistically significant in all rating categories, with 41% of the Legacy treatment group rating their satisfaction as "Excellent" compared to 65% of the Refill treatment group. Legacy treatment customers also rated Pacific Power as "Good" 41% of the time compared to 27% of the time for Refill treatment customers. One possible explanation for this difference in satisfaction is that the Legacy Wave respondents are high energy users compared to the Refill Wave, suggesting that they likely have higher monthly electric bills. Across all three waves and groups, a large proportion of respondents were extremely satisfied, with more than 40% of respondents falling into this range. Figure 6-11 provides a breakdown of all satisfaction ratings, broken out into three categories to reflect "Excellent" ratings (9-10 rating), "Good" ratings (6-8), and "Negative" ratings (1-5).

Figure 6-11. Overall Satisfaction with Utility



The following symbols—*, **, and †—denote statistically significant differences.

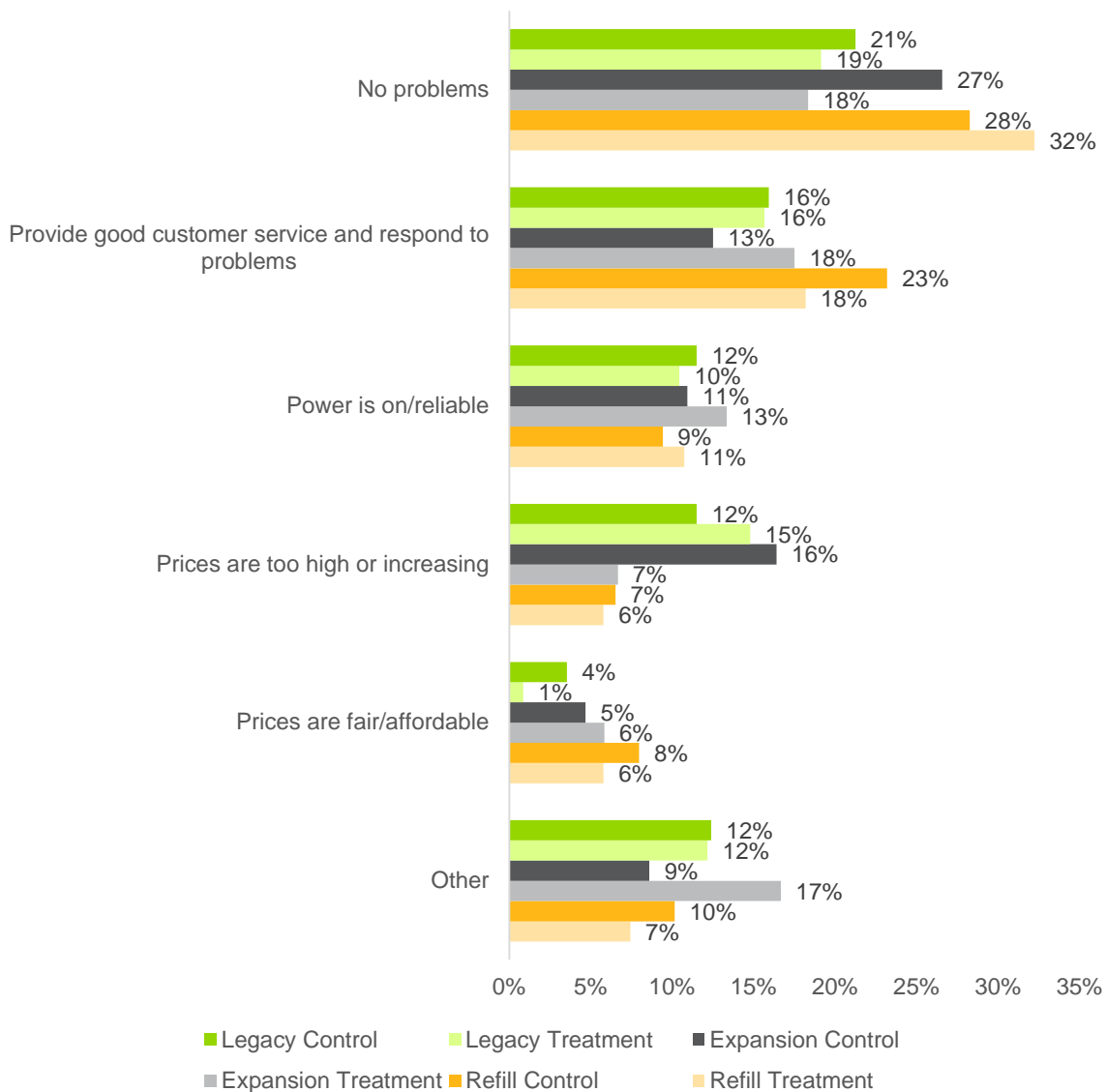
Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Note: The evaluation team recorded satisfaction ratings on a scale from 1 to 10. "Excellent" corresponds to a rating of 9-10, "Good" corresponds to 6-8, and "Negative" corresponds to 1-5.

Source: Navigant analysis of customer survey; SAT1

Figure 6-12 shows respondents' reasons for their satisfaction rating with their utility. When asked to elaborate on this rating, survey respondents across all waves and treatment groups most frequently said that they did not have any problems with the utility. Other positive responses mentioned were that power was working and reliable, the utility has good customer service, and the prices are fair or affordable. The most frequently mentioned negative issue was that the prices are too high or increasing.

Figure 6-12. Reasons for Utility Satisfaction Rating



Multiple responses accepted; figure includes reasons mentioned by more than 5% of respondents.
Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; SAT1a

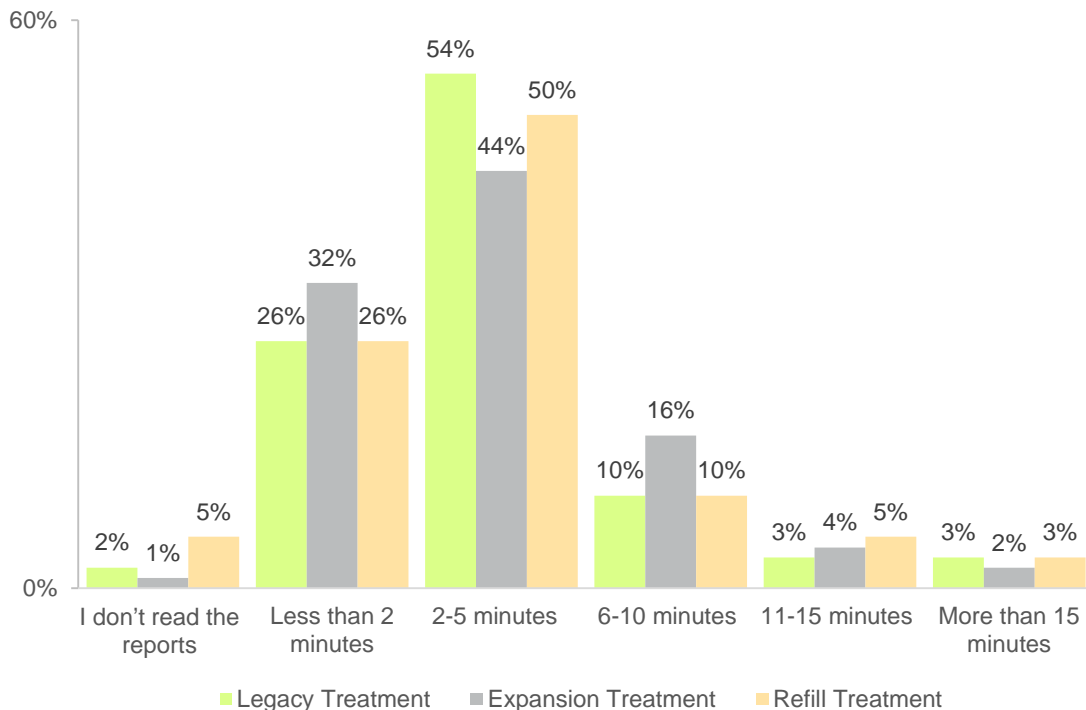
6.5 Experience with the HER Program

To better explore customer experience with the program, the evaluation team asked treatment customers in all three waves a series of questions specifically targeting the home energy reports and respondents' impressions of them.

On average, the majority of respondents receiving home energy reports spend less than five minutes reading the reports, with a large portion falling into the two to five minute range. Figure 6-13 provides a complete summary of time spent reading the report. Only 2% of the Legacy, 1% of the Expansion, and 5% of the Refill Waves reported that they discard the reports before reading them, indicating that almost all program treatment customers consistently review the reports.

Approximately three-quarters of treatment customers in all three waves report spending up to five minutes reading the reports. Beyond five minutes, Expansion respondents spend more time reading the reports than their Legacy or Refill counterparts, with 16% reporting that they read the reports for six to 10 minutes and another 6% reading for more than 10 minutes. None of these differences are statistically significant.

Figure 6-13. Length of Time Spent Reading Home Energy Reports



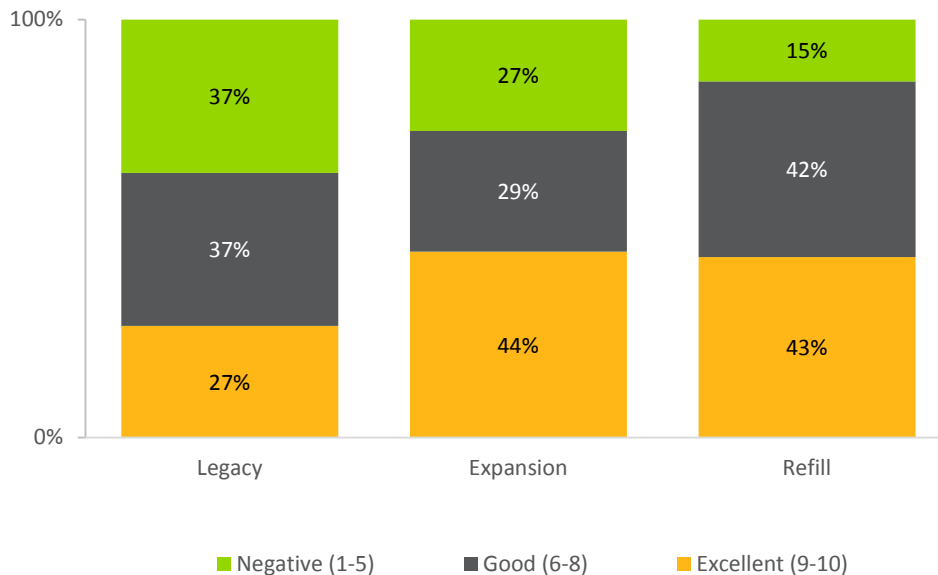
Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
Source: Navigant analysis of customer survey; H1

When it comes to respondent satisfaction with the reports, respondents in the Expansion and Refill Waves reported higher rates of satisfaction. The evaluation team asked respondents to rate their satisfaction with the reports on a scale from 1 to 10, where 1 was extremely dissatisfied and 10 was

extremely satisfied. For purposes of the evaluation, Navigant considered a rating of 6 or higher to indicate satisfaction. Respondents in the Refill Wave were the most satisfied, with 85% of treatment respondents indicating they were satisfied— a mean rating of 8.0. Legacy and Expansion Wave respondents were slightly less satisfied than the Refill Wave, with 64% of Legacy and 73% of Expansion Wave treatment respondents indicating satisfaction. Neither of these differences were statistically significant. Legacy Wave respondents gave a mean rating of 6.2 for the program, and Expansion Wave respondents gave a mean rating of 7.5, a statistically significant difference. One explanation for this discrepancy is that the Legacy Wave consists of higher users compared to the Expansion and Refill Waves; therefore, this group likely receives less favorable feedback from the reports.

Figure 6-14 provides a breakdown of all satisfaction ratings, broken out into three categories to reflect "Excellent" ratings (9-10 rating), "Good" ratings (6-8), and "Negative" ratings (1-5). Across all waves and groups, a large proportion of respondents rated the reports as "Excellent," with approximately one-quarter of Legacy customers and over 40% of Expansion and Refill customers falling into this high range.

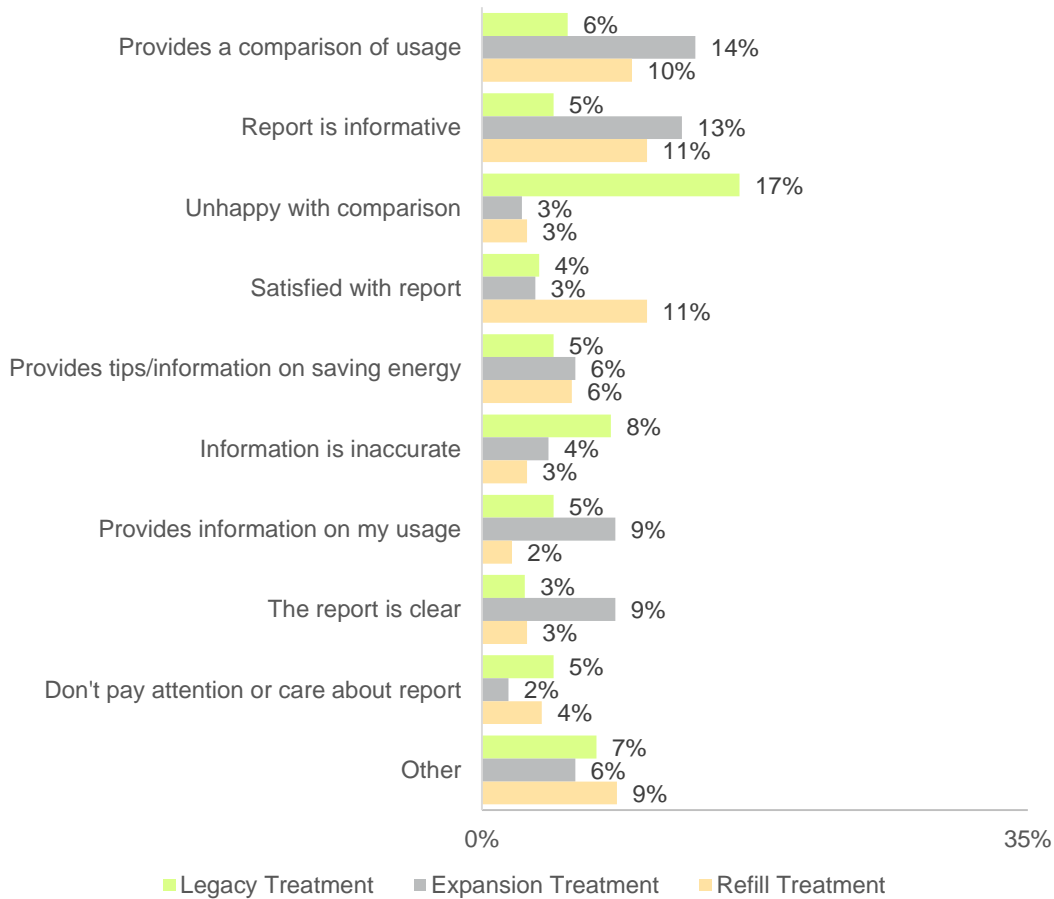
Figure 6-14. Satisfaction with the Home Energy Report Program: Treatment Group Only



Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
Source: Navigant analysis of customer survey; H2

Figure 6-15 provides detail on the explanations given by the respondents. Respondents in the Legacy Wave were more likely to indicate that they were unhappy with the household comparison, while Expansion Wave respondents were more likely to mention the usage comparison as a positive reason and to describe the report as informative. Refill Wave respondents most commonly mentioned that they found the report informative and satisfactory.

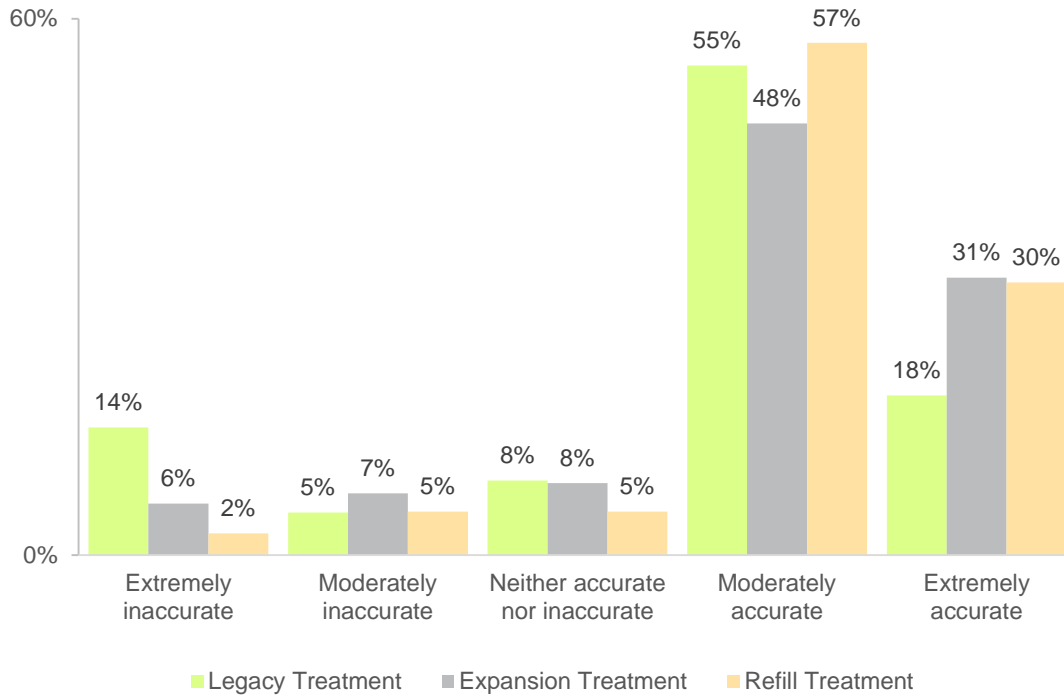
Figure 6-15. Reasons for Program Satisfaction Rating: Treatment Only



Multiple responses accepted; figure includes reasons mentioned by more than 5% of respondents.
 Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
 Source: Navigant analysis of customer survey; H2a

Concerning the perceived accuracy of the home energy reports in terms of household energy usage, the majority of respondents in all three waves considered the reports to be either extremely or moderately accurate. Respondents in the Refill Wave were most likely to consider the reports accurate, as shown by Figure 6-16. Taken together, 87% of Refill respondents considered the reports to be accurate compared to 73% of Legacy respondents and 79% of Expansion respondents. In contrast, 14% of Legacy respondents perceived the reports to be extremely inaccurate compared to only 6% of Expansion and 2% of Refill respondents. None of these differences were statistically significant. Similar to findings related to satisfaction, it is likely that respondents in the Legacy Wave receive less favorable comparisons against their neighbors due to their higher energy use, and this negative feedback results in less willingness to trust the reports' accuracy.

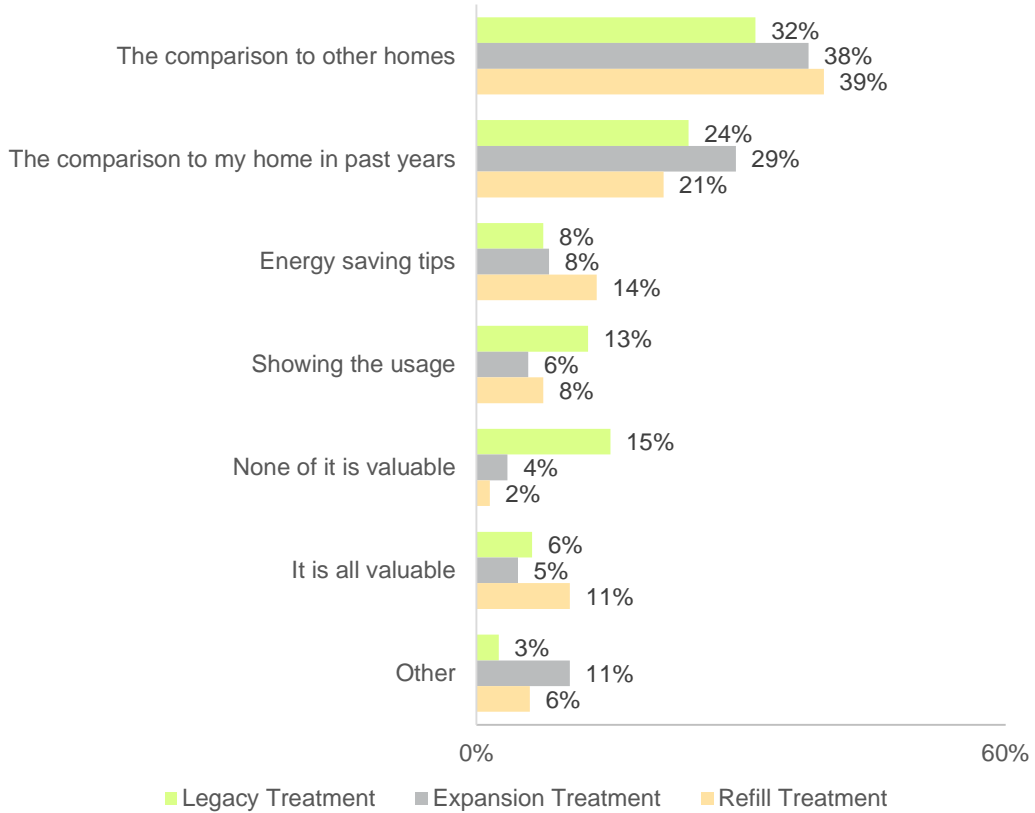
Figure 6-16. Perceived Accuracy of Home's Energy Usage in Reports: Treatment Only



Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
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 6-17, the Refill respondents were more likely to consider the comparison to their home in past years as the most valuable component of the report (39% of Refill respondents versus 32% of Legacy respondents and 38% of Expansion respondents). Other responses were similar across waves. None of these differences were statistically significant.

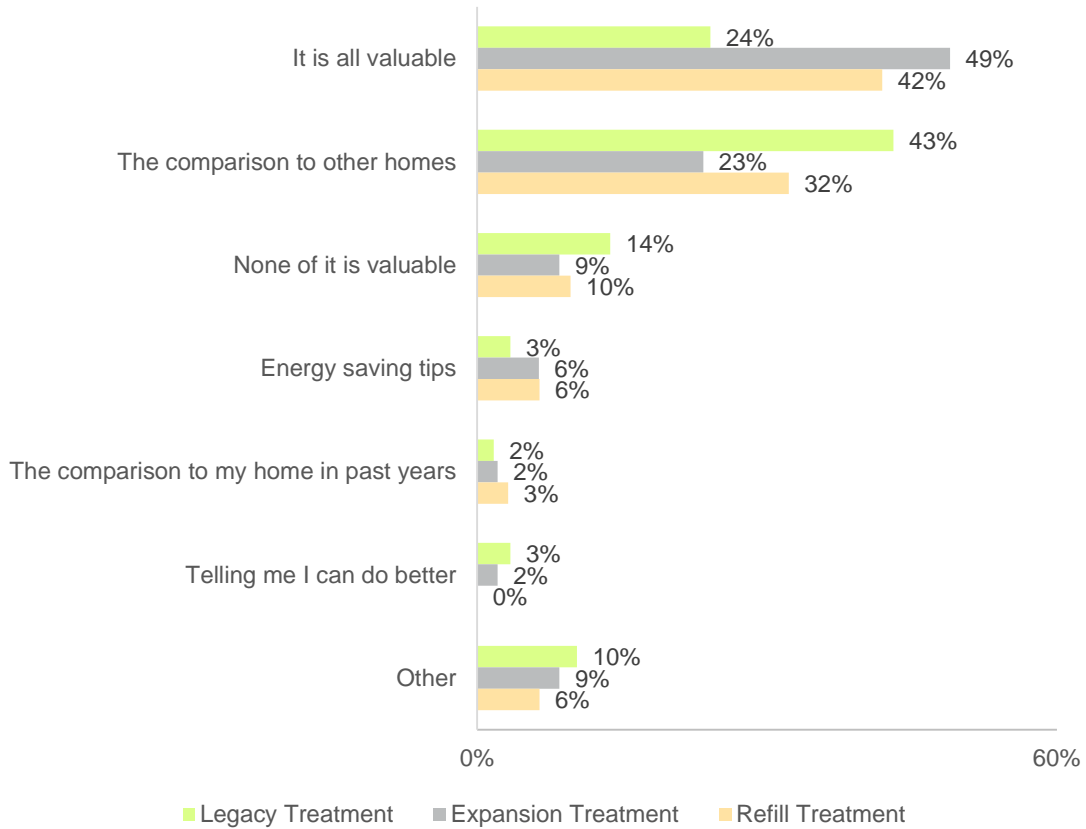
Figure 6-17. Most Valuable Component of the Home Energy Reports: Treatment Only



Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
Source: Navigant analysis of customer survey; H4

Similarly, Figure 6-18 shows that Legacy respondents were more likely to consider the comparison to other homes as the least valuable component of the reports than Expansion or Refill respondents. These findings are informative when combined with the satisfaction findings presented earlier in the report. Legacy treatment customers, characterized as high energy users, consistently view the neighbor comparisons where they likely receive negative feedback unfavorably.

Figure 6-18. Least Valuable Component of the Home Energy Report: Treatment Only



Legacy Treatment n=94; Expansion Treatment n=94; Refill Treatment n=94
Source: Navigant analysis of customer survey; H5

6.6 Other Program Awareness

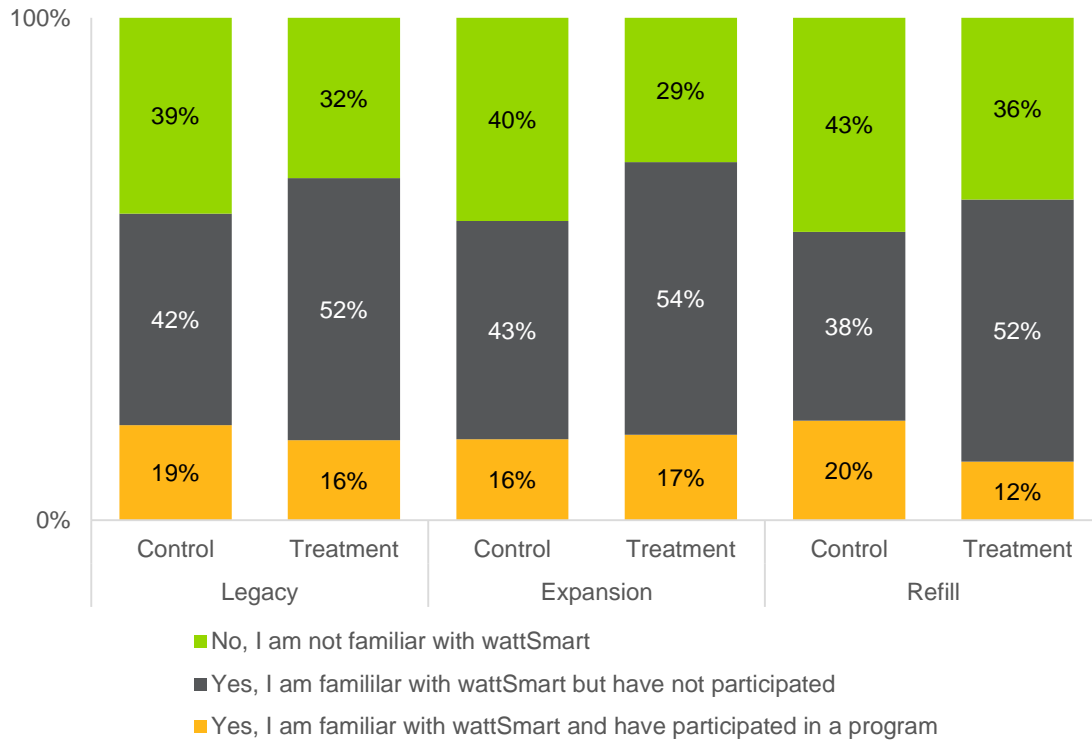
The evaluation team asked respondents about their familiarity with Pacific Power’s wattSmart brand, a branded umbrella title that encompasses all of the utility’s residential and business energy efficiency programs.

Overall, respondents reported moderate levels of familiarity with the wattSmart brand, with approximately 60% or more of all respondents indicating that they were familiar with the brand. Respondents in the treatment group for both waves reported slightly higher levels of familiarity overall, with 68% (Legacy), 71% (Expansion), and 64% (Refill) of the treatment groups reporting familiarity, compared to 61% (Legacy), 59% (Expansion), and 58% (Refill) of the control groups. None of these findings were statistically significant.

Less than one-fifth of all respondents indicated that they participated in at least one wattSmart program, as shown in Figure 6-19. The evaluation team found no significant differences in program participation

amongst any of the six cohorts, with participation ranging between 12% and 20% across all three waves and participation type.

Figure 6-19. Respondent Familiarity with the wattSmart Brand



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; PA4

7. COST EFFECTIVENESS EVALUATION RESULTS

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. As Table 7-1 indicates, the 2014 evaluation period 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 2014 Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized \$/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + Conversation Adder	\$0.0560	\$274,248	\$384,097	\$109,849	1.40
Total Resource Cost Test (TRC) No Adder	\$0.0560	\$274,248	\$349,179	\$74,931	1.27
Utility Cost Test (UCT)	\$0.0560	\$274,248	\$349,179	\$74,931	1.27
Rate Impact Test (RIM)		\$714,762	\$349,179	-\$365,583	0.49
Participant Cost Test (PCT)		\$0	\$400,224	\$400,224	-
Lifecycle Revenue Impacts (\$/kWh)				\$0.0000910853	
Discounted Participant Payback (years)					-

Source: Navigant analysis

As shown in Table 7-2 and Table 7-3 below, program benefits for the 2015 evaluation period and for the 24 month outlook, are lower than those estimated for 2014. While the analysis included the same methodology for each evaluation period, the exception is that the 2014 analysis used avoided costs from the 2013 IRP and the 2015 analysis used avoided costs from the 2015 Class 2 DSM Decrement Study. The 2014 avoided costs were significantly higher for a 1-year measure life (\$0.062/kWh) than in 2015 (\$0.034/kWh). However, even with the drop in avoided costs, the program remains cost-effective for all tests with the exception of the RIM test. The primary criterion for cost-effectiveness in Washington is the PTRC test.

Table 7-2. HER Program 2015 Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized \$/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + Conversation Adder	\$0.0388	\$340,566	\$382,606	\$42,040	1.12
Total Resource Cost Test (TRC) No Adder	\$0.0388	\$340,566	\$347,824	\$7,258	1.02
Utility Cost Test (UCT)	\$0.0388	\$340,566	\$347,824	\$7,258	1.02
Rate Impact Test (RIM)		\$1,169,913	\$347,824	-\$822,089	0.30
Participant Cost Test (PCT)		\$0	\$696,214	\$696,214	-
Lifecycle Revenue Impacts (\$/kWh)				\$0.0002047019	
Discounted Participant Payback (years)					-

Source: Navigant analysis

Table 7-3. HER Program 2014-2015 24-Month Benefit-Cost Ratios

Benefit/Cost Test Performed	Levelized \$/kWh	Costs	Benefits	Net Benefits	B/C Ratio
Total Resource Cost Test (PTRC) + Conversation Adder	\$0.0450	\$614,814	\$766,703	\$151,888	1.25
Total Resource Cost Test (TRC) No Adder	\$0.0450	\$614,814	\$697,003	\$82,188	1.13
Utility Cost Test (UCT)	\$0.0450	\$614,814	\$697,003	\$82,188	1.13
Rate Impact Test (RIM)		\$1,884,674	\$697,003	-\$1,187,672	0.37
Participant Cost Test (PCT)		\$0	\$1,096,438	\$1,096,438	-
Lifecycle Revenue Impacts (\$/kWh)				\$0.0002957328	
Discounted Participant Payback (years)					-

Source: Navigant analysis

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,²⁰ for each wave in each time period. For the Legacy Wave, savings remained relatively stable across the two years, as this wave had been in place since 2012. Increases in Expansion and Refill Wave savings reflect the start of these waves in late 2014 and ramp-up into 2015.

Table 8-1. Total MWh Savings by Wave and Year*

Wave	2014	2015	2014-2015
Legacy	4,835	4,903	9,736
Expansion	278	4,163	4,516
Refill†	-2	229	235
Total	5,111	9,295	14,487

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the savings totals for year 2014 and year 2015 do not sum to the savings over the total combined time period of 2014-2015 together.

†Refill Wave savings are not statistically significant in any of the three periods.

Source: Navigant analysis

Finding 2. Table 8-2 below shows energy savings as a percentage of baseline consumption for each wave in each time period. Looking at savings since program inception in 2012 the Legacy Wave appears to have leveled off, as is common for a mature program, at around 2% savings. Savings for the Legacy Wave from 2012 onwards are shown in Figure 5-2 in the main body of the report. The Expansion and Refill Waves demonstrate increased savings as is frequently found with newer waves.

²⁰ Uplift occurs when HER treatment customers participate in Pacific 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 and ensure accurate savings. Uplift is discussed in more detail in Section 2.3.

Table 8-2. Percentage Savings by Wave and Year*

Wave	2014	2015	2014-2015
Legacy	1.81%	2.09%	1.94%
Expansion	0.17%	0.90%	0.72%
Refill†	-0.03%	0.47%	0.43%
Weighted Average	0.49%	1.09%	0.94%

* Navigant estimated each time period (i.e. year 2014, year 2015, and 2014-2015 together) as a separate analysis; the percentage savings for year 2014 and year 2015 do not average to the percentage savings over the total combined time period of 2014-2015 together.

†Refill Wave savings are not statistically significant in any of the three periods.

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 3. Total double-counted savings were -70 MWh (or 0.2% of total savings) for the Appliance Recycling and Home Energy Savings (HES) programs across 2014 and 2015, which means that treatment customers were slightly less likely than control customers to participate in other Pacific Power energy efficiency programs, and thus, double-counting of energy savings does not appear to be 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.

8.2 Cost-Effectiveness Evaluation

Finding 4. The program was cost-effective in 2014, 2015 and over the 2014-2015 evaluation period. However, lower avoided costs in 2015 impacted the program’s cost-effectiveness but the program remained cost-effective. The drop in 2015 also brought down the program’s cost-effectiveness results for the joint 2014-2015 evaluation period, however, the program remained cost-effective for the two-year period from most perspectives.

8.3 Process Evaluation

Finding 5. As shown in Table 8-3 below, survey respondents reported high levels of satisfaction with Pacific Power overall. Respondents in the Refill Wave reported the highest levels of satisfaction.

Finding 6. As shown in Table 8-3 below, related to HER program satisfaction, treatment respondents in the Legacy Wave reported low satisfaction (63%) compared to Expansion and Refill Wave respondents. The Legacy treatment group had less trust that the reports were accurate and often cited the neighbor comparisons as the least valuable component of the reports. Lower satisfaction ratings appear to be correlated with higher energy use, with Legacy Wave respondents (selected due to high average usage) reporting lower overall satisfaction with

the HER program. This is a common finding for HER program evaluations. Control respondents were not asked this question because they do not receive reports from the HER program.

Finding 7. As shown in Table 8-3 below, treatment respondents across all three waves reported lower satisfaction with their homes' energy usage than control respondents. One possible explanation for the lower satisfaction with energy consumption 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 feel less satisfied after receiving this messaging. Navigant has observed similar outcomes in other HER program evaluations.

Table 8-3. Summary of Satisfaction Findings

	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Satisfaction with Pacific Power	86%	82%	86%	88%	93%	91%
Satisfaction with the HER program	-	63%	-	73%	-	85%
Satisfaction with home's energy usage	61%	42%	76%	60%	81%	79%

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

Source: Navigant analysis

Finding 8. Treatment respondents in all three waves were significantly more likely to recall receiving information encouraging efficient bulb purchases from their utility than control respondents. Treatment respondents were also more likely to be familiar with the wattSmart brand. However, this higher recall did not translate into higher reported purchases or installation of energy efficient lighting or into higher reported participation in other Pacific Power energy efficiency programs, which is also supported by the low double-counted savings estimated in the impact analysis.

APPENDIX A. SURVEY INSTRUMENT

PacifiCorp HER Participant and Non-Participant Telephone Survey Guide – Utah and Washington (Legacy and Expansion Waves) FINAL

December 15, 2015

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 [UTILITY NAME] about energy efficiency programs that [UTILITY NAME] offers its customers to save energy. I want to emphasize that this is not a sales call; [UTILITY NAME] 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]

[UTILITY NAME] 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 [UTILITY NAME]'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]

S2. Great, thanks. Are you the person in the household who reads the mail from [UTILITY NAME]? 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 [UTILITY NAME]?"*

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

[ASK OF NON-PARTICIPANTS ONLY]

S3a. Do you recall receiving reports from [UTILITY NAME] in the mail that describe your home's electric energy use? They are different from your electric utility bill. They arrive in a different envelop, are printed on one piece of paper, include color charts and graphs about your electric energy use, and feature a neighbor comparison.

- 1 Yes [CONTINUE]
- 2 No [SKIP TO SCREENER BEFORE S4]
- 98 Refused [SKIP TO SCREENER BEFORE S4]
- 99 Don't know [SKIP TO SCREENER BEFORE S4]

S3b. Just to clarify, the reports you receive are from [UTILITY NAME]? And you receive them via the mail, not through a web portal?

- 1 Yes [CONTINUE]
- 2 No [RETURN TO S3a]
- 98 Refused [CONTINUE]
- 99 Don't know [CONTINUE]

S3c. How often do you receive these reports? [ASK OPEN ENDED]

- 1 Monthly [TERMINATE]
- 2 Quarterly [TERMINATE]
- 3 Annually [TERMINATE]
- 98 Refused [TERMINATE]
- 99 Don't know [TERMINATE]

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 [UTILITY NAME] 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]

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.

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?

[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 [UTILITY NAME] 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

EA2/3. 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. (*Note – numbering reflects an earlier version of the survey instrument*)

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

- 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.
- 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]
- 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
- 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.)

- 1 Yes
- 2 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.)

- 1 Line-dry clothes
- 2 Run the clothes dryer with a full load
- 3 Run the clothes washer with a full load
- 4 Wash laundry in cold water

- 5 Air dry dishes
- 6 Run dishwasher with a full load

- 7 Adjust settings to energy efficient settings
- 8 Use power save modes on computers
- 9 Shut down computer at night
- 10 Plug electronics into smart strip
- 11 Unplug chargers when not in use
- 12 Unplug electronics when not in use
- 13 Play video games for fewer hours per day
- 14 Use computer for fewer hours per day
- 15 Use electronics [unspecified type] for fewer hours per day
- 16 Watch TV for fewer hours per day

- 17 Change AC filter
- 18 Change furnace filter
- 19 Clean refrigerator coils
- 20 Clear areas around heating and cooling vents
- 21 Keep ac unit clear of debris
- 22 Maintain equipment to run efficiently

- 23 Insulate water heater and/or pipes (i.e., install a water heater blanket, insulate water pipes)
- 24 Seal leaks and drafts (i.e., leaky doors, windows, refrigerator seals, fireplaces, air ducts, air conditioner units, outlets and light switches)
- 25 Set heating to lower temperature, set air conditioner to higher temperature
- 26 Take shorter showers
- 27 Turn off lights when not in use
- 28 Use less air conditioning
- 29 Use window shades (i.e., to let heat from sun in on cold days, and/or keep heat from sun out on warm days)

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

- 32 Other [SPECIFY]
- 98 Don't know
- 99 Refused

EA7. Next, I'd like to shift gears and ask you if you own a business? (DO NOT READ LIST.)

- 1 Yes
- 2 No
- 98 Don't know
- 99 Refused

[IF EA7=1, CONTINUE. ELSE SKIP TO SAT1.]

EA8a. Have you made any energy efficient purchases for your business in the past 12 months? (DO NOT READ LIST.)

- 1 Yes
- 2 No
- 98 Don't know
- 99 Refused

[IF EA8A=1, CONTINUE. ELSE SKIP TO SAT1.]

EA8b. What purchases or upgrades have you made? (DO NOT READ LIST. ENTER ALL THAT APPLY.)

- 1 Air to air heat exchanger
- 2 Boiler
- 3 Boiler controls
- 4 Boiler tune-up
- 5 Ceiling insulation
- 6 CFL/LED bulbs
- 7 Chiller
- 8 Door gaskets on walk-in coolers and freezers
- 9 Double pane windows

- 10 ECM motor
- 11 Energy management system
- 12 ENERGY STAR freezers
- 13 ENERGY STAR refrigerators
- 14 Furnace tune-up
- 15 Gas furnace
- 16 Hot water boiler pipe wrap
- 17 Hot water boilers
- 18 Hot water heater tune-up
- 19 Hot water heating system
- 20 HVAC controls
- 21 Infrared heater
- 22 LED exit signs
- 23 LED refrigerated case lighting
- 24 Lighting controls
- 25 Occupancy sensors
- 26 Roof insulation
- 27 Steam boiler pipe wrap
- 28 Strip curtains on walk-in cooler and freezer doors
- 29 Variable frequency drives
- 30 Wall insulation
- 31 Other [SPECIFY]
- 98 Don't know
- 99 Refused

[ASK IF EA8a = 1 AND IF PARTICIPANT TYPE = 1]

EA9. On a scale from 1-10, where 1 is not at all influential and 10 is extremely influential, how influential was information received through your home energy reports on your decision to make these upgrades?

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

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 [UTILITY NAME]?

[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]

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 [UTILITY NAME] 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.]

PA2. Have you ever heard of or participated in the watts*Smart* energy efficient program offered by Rocky Mountain Power? Rocky Mountain Power offers financial incentives for energy efficient measures for residential and business customers.

- 1 Yes, I am familiar with watt*Smart* and have participated in a program
- 2 Yes, I am familiar with watt*Smart* but have not participated in a program
- 3 No, I am not familiar with watt*Smart*
- 98 Refused
- 99 Don't know

[IF PACIFIC POWER CUSTOMERS, CONTINUE. ELSE SKIP TO D1.]

PA4. Have you ever heard of or participated in the following energy efficient programs offered by Pacific 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:** offers cash incentives for home insulation, energy efficient electrical appliances, lighting and more..
- b. **Low Income Weatherization Program:** provides free weatherization services to income-qualifying customers.
- c. **wattsmart Business Program:** provides financial incentives for businesses.

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
- 100

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

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 and over
- 98 Don't know
- 99 Refused

D6. [RECORD RESPONDENT GENDER – DO NOT READ]

- 1 Man
- 2 Woman

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

APPENDIX B. REGRESSION COEFFICIENT ESTIMATES

Table B-1. PPR Parameter Estimates, Legacy Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
treatment	-1.164	-7.468	-1.263	-7.495	-1.211	-8.017
yrmo201401	17.853	25.116	-	-	17.876	25.154
yrmo201402	20.474	30.187	-	-	20.498	30.239
yrmo201403	14.334	22.826	-	-	14.352	22.852
yrmo201404	12.710	28.921	-	-	12.726	29.006
yrmo201405	8.480	21.218	-	-	8.493	21.229
yrmo201406	5.885	15.730	-	-	5.905	15.812
yrmo201407	9.723	27.791	-	-	9.739	27.857
yrmo201408	12.035	31.863	-	-	12.047	31.941
yrmo201409	7.989	24.283	-	-	8.006	24.397
yrmo201410	6.790	17.864	-	-	6.807	17.948
yrmo201411	8.968	15.967	-	-	8.986	16.005
yrmo201412	27.812	40.944	-	-	27.839	41.007
yrmo201501	-	-	20.577	30.521	20.552	30.551
yrmo201502	-	-	19.719	34.170	19.694	34.202
yrmo201503	-	-	18.448	35.189	18.423	35.205
yrmo201504	-	-	16.558	36.403	16.531	36.456
yrmo201505	-	-	8.423	18.890	8.397	18.897
yrmo201506	-	-	8.555	18.870	8.528	18.849
yrmo201507	-	-	15.089	33.874	15.063	33.937
yrmo201508	-	-	11.360	28.295	11.329	28.345
yrmo201509	-	-	9.116	26.829	9.090	26.928
yrmo201510	-	-	8.643	22.372	8.615	22.432
yrmo201511	-	-	12.891	24.645	12.865	24.708
yrmo201512	-	-	19.309	26.701	19.275	26.719
yrmo201401:pre.kwh	0.797	110.655	-	-	0.798	110.656
yrmo201402:pre.kwh	0.822	109.108	-	-	0.822	109.109
yrmo201403:pre.kwh	0.790	94.561	-	-	0.790	94.562
yrmo201404:pre.kwh	0.647	90.267	-	-	0.647	90.296
yrmo201405:pre.kwh	0.762	86.687	-	-	0.762	86.699
yrmo201406:pre.kwh	0.862	97.977	-	-	0.862	98.005
yrmo201407:pre.kwh	0.891	118.122	-	-	0.891	118.138
yrmo201408:pre.kwh	0.896	121.410	-	-	0.896	121.475
yrmo201409:pre.kwh	0.754	115.931	-	-	0.754	115.990
yrmo201410:pre.kwh	0.749	88.344	-	-	0.749	88.366
yrmo201411:pre.kwh	0.725	83.027	-	-	0.725	83.027

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
yrmo201412:pre.kwh	0.628	83.893	-	-	0.628	83.874
yrmo201501:pre.kwh	-	-	0.685	101.339	0.685	101.338
yrmo201502:pre.kwh	-	-	0.625	98.401	0.625	98.401
yrmo201503:pre.kwh	-	-	0.555	80.845	0.555	80.846
yrmo201504:pre.kwh	-	-	0.531	71.993	0.531	71.986
yrmo201505:pre.kwh	-	-	0.747	77.432	0.747	77.433
yrmo201506:pre.kwh	-	-	0.875	82.416	0.875	82.412
yrmo201507:pre.kwh	-	-	0.965	101.258	0.965	101.258
yrmo201508:pre.kwh	-	-	0.827	106.141	0.827	106.155
yrmo201509:pre.kwh	-	-	0.697	103.635	0.697	103.638
yrmo201510:pre.kwh	-	-	0.687	80.437	0.687	80.443
yrmo201511:pre.kwh	-	-	0.600	73.226	0.600	73.228
yrmo201512:pre.kwh	-	-	0.704	88.940	0.704	88.944

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, Legacy Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Post	-2.727	-23.983	-6.835	-54.738	-4.671	-42.160
Post * Treatment	-1.156	-7.147	-1.283	-7.284	-1.226	-7.800

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-3. PPR Parameter Estimates, Expansion Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
treatment	-0.059	-0.710	-0.333	-4.530	-0.260	-3.824
yrmo201409	3.359	20.398	-	-	3.511	21.875
yrmo201410	4.478	23.104	-	-	4.630	24.117
yrmo201411	5.473	24.860	-	-	5.630	25.694
yrmo201412	9.927	49.932	-	-	10.075	51.400
yrmo201501	-	-	8.588	38.970	8.555	40.325
yrmo201502	-	-	9.223	48.720	9.223	51.085
yrmo201503	-	-	8.240	47.550	8.171	47.833
yrmo201504	-	-	5.976	31.020	5.908	30.706
yrmo201505	-	-	4.232	21.730	4.170	21.349
yrmo201506	-	-	5.234	22.390	5.335	24.427
yrmo201507	-	-	7.525	39.000	7.551	40.547
yrmo201508	-	-	4.448	24.880	4.472	26.450
yrmo201509	-	-	4.873	25.040	4.817	24.678
yrmo201510	-	-	5.070	21.280	5.009	20.909
yrmo201511	-	-	6.647	28.720	6.568	28.440
yrmo201512	-	-	8.792	40.110	8.761	41.028
yrmo201409:pre.kwh	0.807	164.790	-	-	0.807	164.773
yrmo201410:pre.kwh	0.756	110.585	-	-	0.756	110.556
yrmo201411:pre.kwh	0.813	121.034	-	-	0.813	120.979
yrmo201412:pre.kwh	0.725	177.120	-	-	0.725	177.126
yrmo201501:pre.kwh	-	-	0.769	173.450	0.769	179.427
yrmo201502:pre.kwh	-	-	0.656	168.720	0.655	175.782
yrmo201503:pre.kwh	-	-	0.645	150.520	0.646	152.415
yrmo201504:pre.kwh	-	-	0.766	118.510	0.768	119.342
yrmo201505:pre.kwh	-	-	0.834	111.380	0.835	111.444
yrmo201506:pre.kwh	-	-	0.928	106.270	0.924	113.831
yrmo201507:pre.kwh	-	-	0.977	172.250	0.975	177.398
yrmo201508:pre.kwh	-	-	0.817	176.570	0.815	188.116
yrmo201509:pre.kwh	-	-	0.726	122.030	0.727	122.149
yrmo201510:pre.kwh	-	-	0.709	82.610	0.710	82.588
yrmo201511:pre.kwh	-	-	0.720	101.330	0.722	101.754
yrmo201512:pre.kwh	-	-	0.737	159.710	0.737	163.763

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-4. LFER Parameter Estimates, Expansion Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Post	-3.795	-44.453	-2.134	-30.590	-2.548	-40.535
Post * Treatment	-0.031	-0.315	-0.240	-2.990	-0.186	-2.575

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-5. PPR Parameter Estimates, Refill Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
treatment	0.010	0.047	-0.107	-1.209	-0.100	-1.124
yrmo201412	0.000	12.029	-	-	3.743	14.190
yrmo201501	-	-	3.315	11.860	3.291	11.835
yrmo201502	-	-	3.703	15.121	3.699	15.138
yrmo201503	-	-	3.362	16.374	3.359	16.398
yrmo201504	-	-	2.818	11.737	2.814	11.745
yrmo201505	-	-	2.514	10.384	2.513	10.395
yrmo201506	-	-	3.163	11.756	3.161	11.760
yrmo201507	-	-	6.072	20.514	6.075	20.522
yrmo201508	-	-	3.389	16.019	3.383	15.980
yrmo201509	-	-	2.782	14.424	2.781	14.682
yrmo201510	-	-	2.353	11.945	2.350	11.931
yrmo201511	-	-	3.546	16.897	3.543	16.891
yrmo201512	-	-	4.491	14.896	4.532	15.015
yrmo201412:pre.kwh	0.000	55.066	-	-	0.797	55.536
yrmo201501:pre.kwh	-	-	0.831	58.414	0.832	58.751
yrmo201502:pre.kwh	-	-	0.718	56.302	0.718	56.301
yrmo201503:pre.kwh	-	-	0.702	56.704	0.702	56.705
yrmo201504:pre.kwh	-	-	0.811	44.508	0.811	44.507
yrmo201505:pre.kwh	-	-	0.839	41.410	0.839	41.409
yrmo201506:pre.kwh	-	-	0.980	46.488	0.980	46.480
yrmo201507:pre.kwh	-	-	0.964	59.205	0.964	59.164
yrmo201508:pre.kwh	-	-	0.827	85.607	0.828	85.603
yrmo201509:pre.kwh	-	-	0.855	74.538	0.855	75.962
yrmo201510:pre.kwh	-	-	0.853	63.037	0.853	63.029
yrmo201511:pre.kwh	-	-	0.780	69.840	0.780	69.839
yrmo201512:pre.kwh	-	-	0.762	47.105	0.760	46.911

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-6. LFER Parameter Estimates, Refill Wave

Variable	2014		2015		2014-2015	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Post	-0.596	-3.788	1.896	24.904	2.498	31.088
Post * Treatment	0.045	0.204	-0.069	-0.626	-0.060	-0.519

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

APPENDIX C. DETAILED UPLIFT TABLES

Table C-1. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs, Legacy Wave: 2014-2015

	Program	
	Appliance Recycling	HES
Median Program Savings (Annual kWh per Treatment Customer)	583	465
No. of HER Treatment Households	13,516	13,516
Annualized Rate of Participation (%)	0.81%	2.69%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.58%	-17.56%
No. of HER Control Households	13,508	13,508
Annualized Rate of Participation (%)	0.74%	2.57%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.50%	-18.14%
DID Statistic for 24 Months	0.13%	1.03%
Annualized DID Statistic	0.07%	0.51%
Change in Program Participation due to HER Program	18	139
Statistically Significant at the 90% Confidence Level?	No	Yes
Double-Counted Savings (kWh)	10,505	64,647
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	12%	27%

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

Source: Navigant analysis

Table C-2. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs, Expansion Wave: Sept. 2014-2015

	Program	
	Appliance Recycling	HES
Median Program Savings (Annual kWh per Treatment Customer)	583	465
No. of HER Treatment Households	37,493	37,493
Annualized Rate of Participation (%)	0.46%	2.10%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.40%	-16.41%
No. of HER Control Households	12,137	12,137
Annualized Rate of Participation (%)	0.54%	1.94%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.49%	-15.93%
DID Statistic for 24 Months	-0.10%	-0.68%
Annualized DID Statistic	-0.08%	-0.51%
Change in Program Participation due to HER Program	-38	-255
Statistically Significant at the 90% Confidence Level?	No	Yes
Double-Counted Savings (kWh)	-22,271	-118,722
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	-17%	-18%

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

Source: Navigant analysis

Table C-3. Estimated Double-Counted Savings from Uplift in Other Energy Efficiency Programs, Refill Wave: Dec. 2014-2015

	Program	
	Appliance Recycling	HES
Median Program Savings (Annual kWh per Treatment Customer)	583	268
No. of HER Treatment Households	6,801	6,801
Annualized Rate of Participation (%)	0.15%	9.79%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.13%	3.90%
No. of HER Control Households	6,797	6,797
Annualized Rate of Participation (%)	0.10%	9.52%
Change in Annualized Rate of Participation from Pre-Program Year (%)	0.06%	4.24%
DID Statistic for 24 Months	0.08%	-0.39%
Annualized DID Statistic	0.07%	-0.36%
Change in Program Participation due to HER Program	5	-27
Statistically Significant at the 90% Confidence Level?	No	No
Double-Counted Savings (kWh)	3,011	-7,140
Percentage Change in Energy Efficiency Program Participation Rate for HER Treatment Customers	100%	-3%

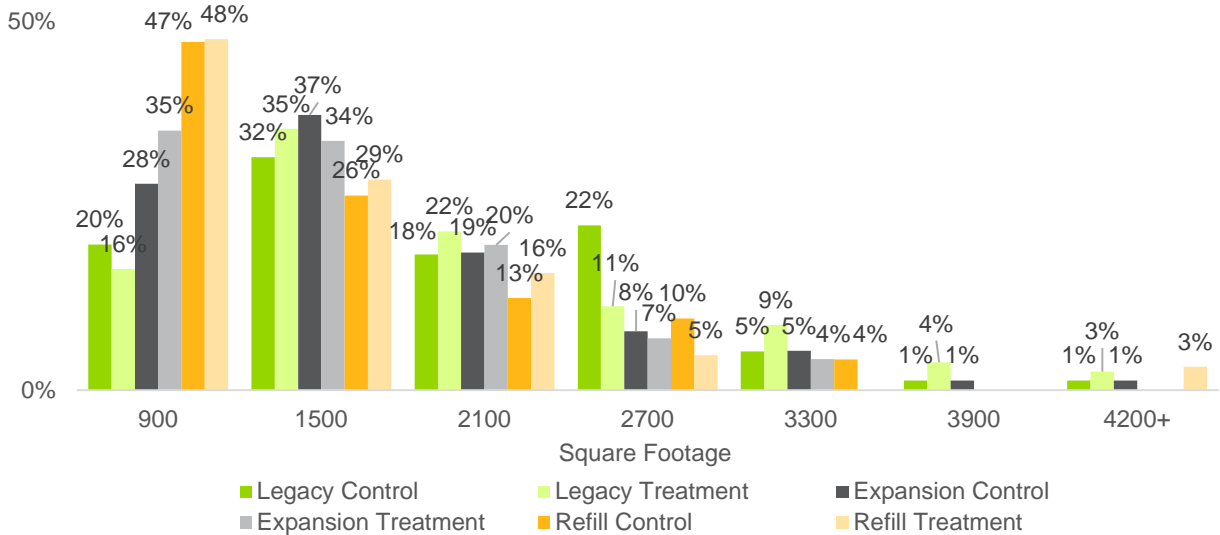
Note: Median program savings are equal to the median kWh impact for HER treatment customers during the post-program period.

Source: Navigant analysis

APPENDIX D. DEMOGRAPHICS

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

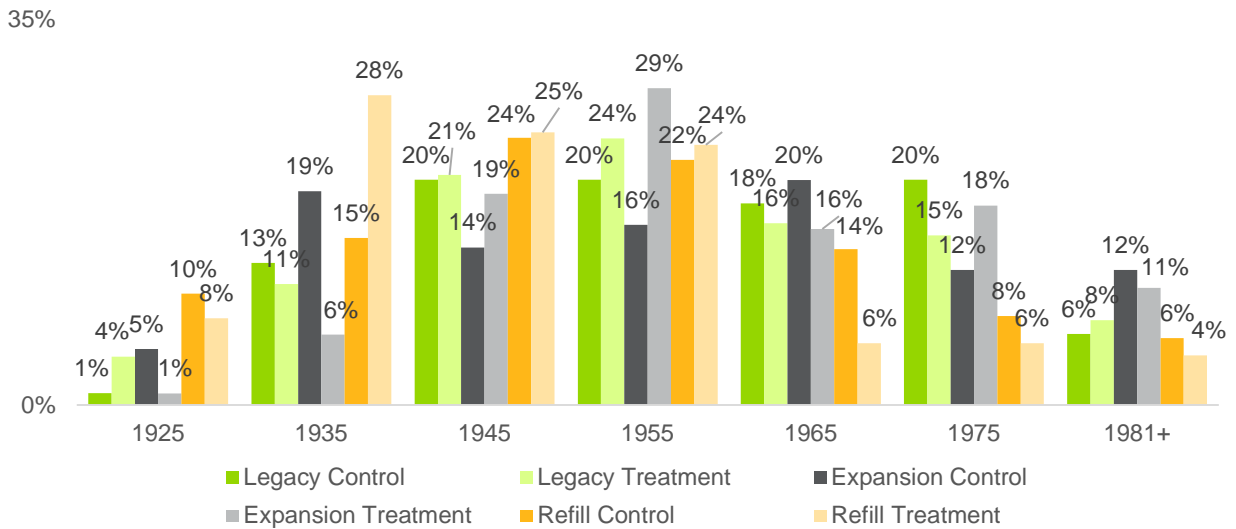
Figure D-1. Household Square Footage



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D1

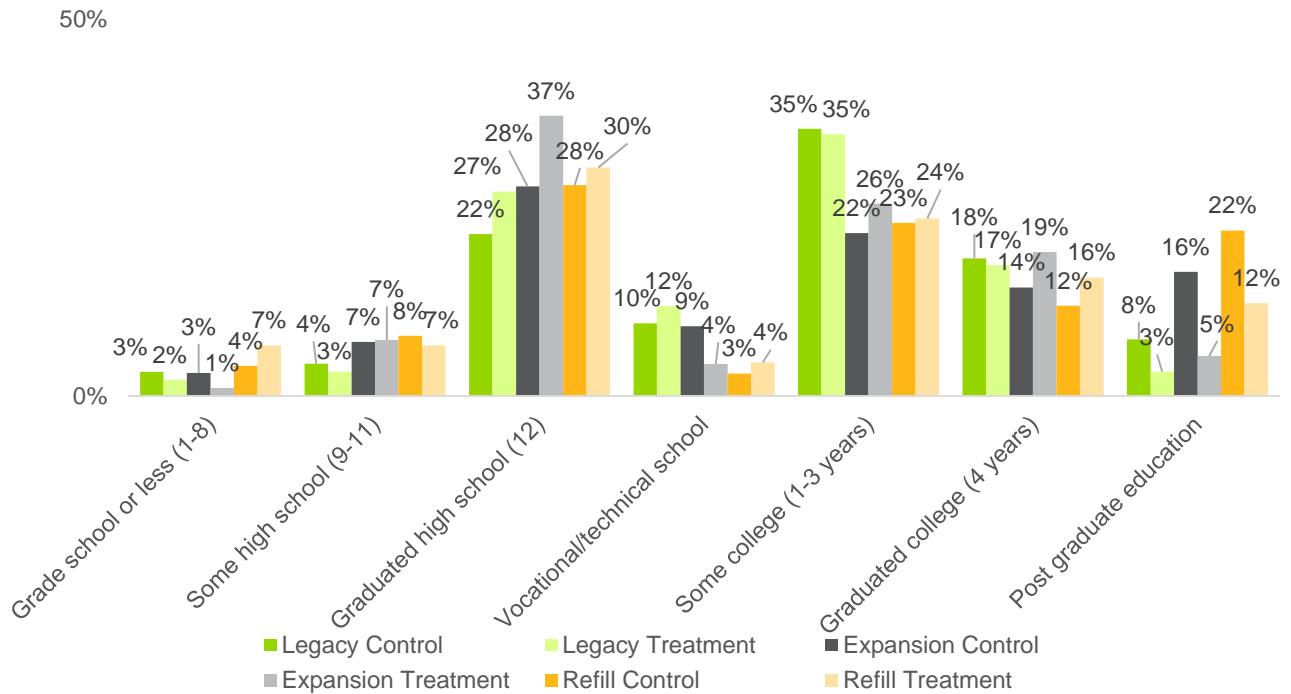
Figure D-2. Birth Year



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D2

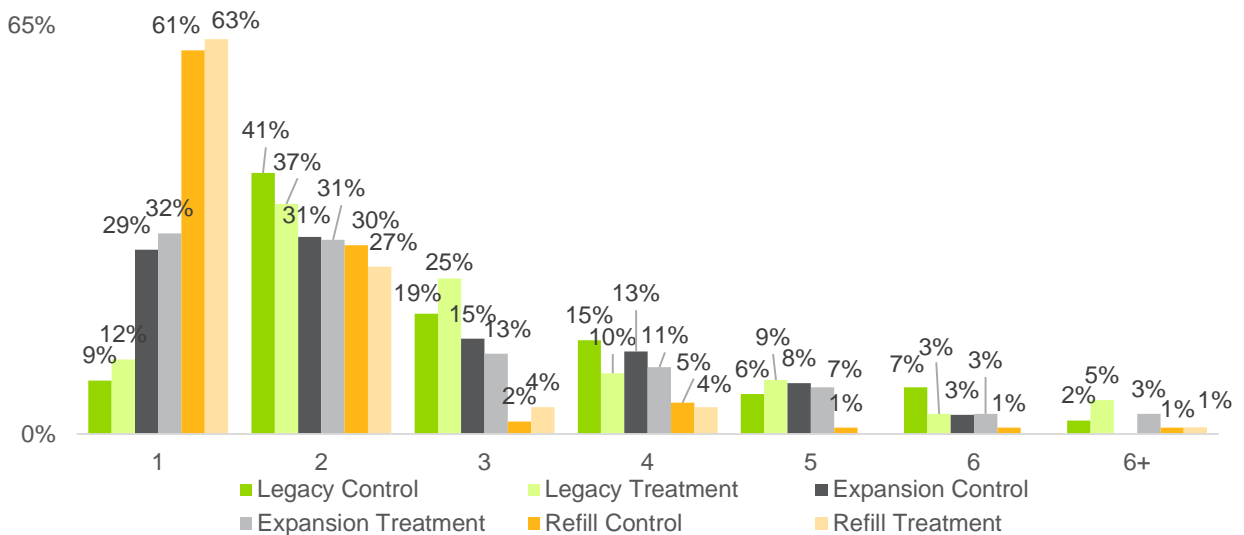
Figure D-3. Educational Background



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D3

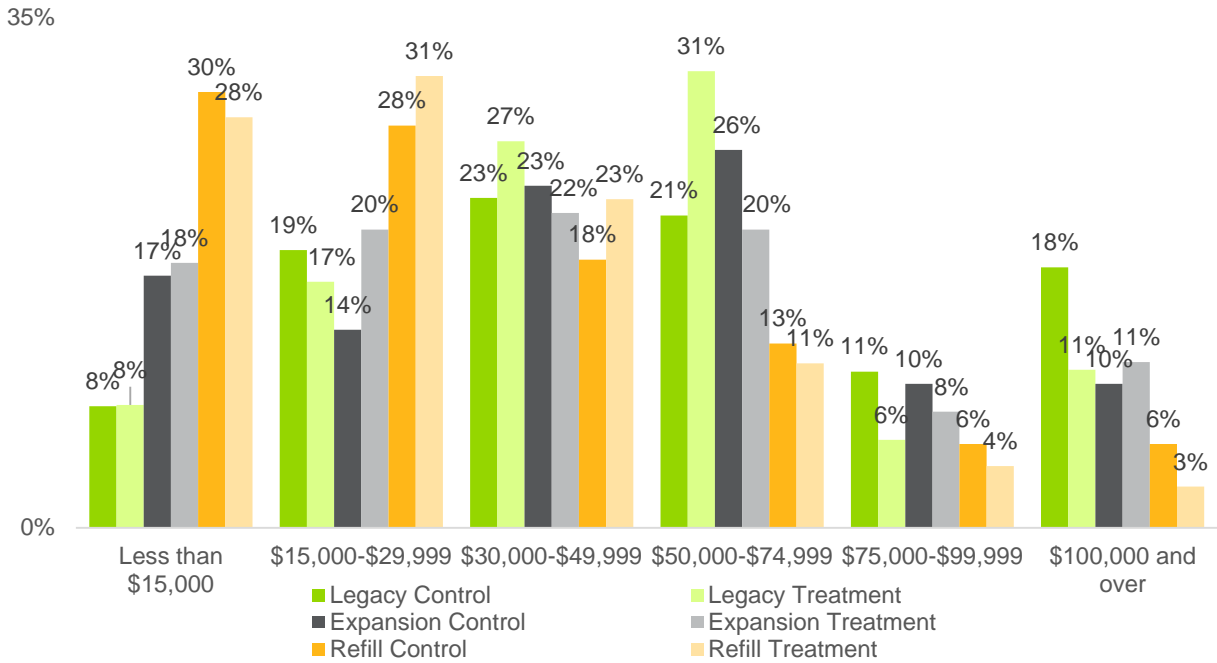
Figure D-4. Number of People in Household



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D4

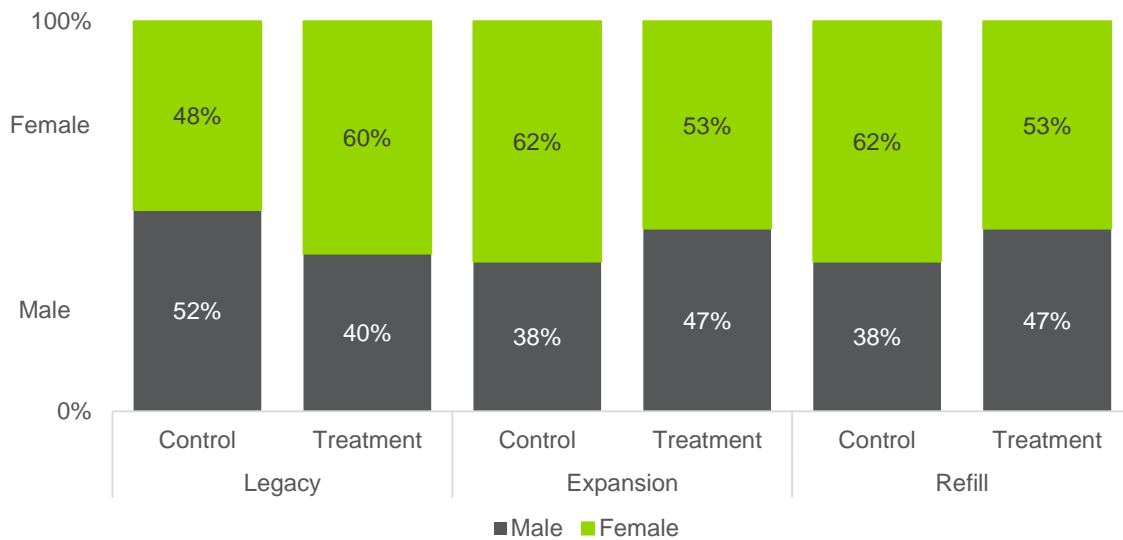
Figure D-5. Household Income



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D5

Figure D-6. Gender



Legacy Control n=95; Legacy Treatment n=94; Expansion Control n=99; Expansion Treatment n=94; Refill Control n=101; Refill Treatment n=94

Source: Navigant analysis of customer survey; D6