Evaluation of Utah 2016-2017 Home Energy Reports Program

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Rocky Mountain Power

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ADM

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1. Executive Summary

This measurement and verification ("M&V") report provides the results from impact and process evaluation of the Home Energy Reports (HER) Program that Rocky Mountain Power implemented in its Utah service territory in 2016-2017.

1.1 Program Description

The 2016-2017 HER Program in Utah was implemented for Rocky Mountain Power by Oracle. Through the program, residential customers were provided tailored reports that included the following:

- Comparison of a customer's current energy use to past use;

- Comparison of a customer's energy use to that of similar homes in the area; and

- Tips on how customers could reduce their energy use, as well as information on Rocky Mountain Power energy efficiency programs

The program used a randomized control trial (RCT) experimental design. With this program design, pre-selected customers were randomly assigned to a treatment group or a control group. The program allowed treatment customers to discontinue receiving home energy reports (i.e., they could "opt out".) The control group serves as the basis for comparison to the treatment group in measuring the effects of the home energy reports.

The program included three waves:

- Legacy: launched in July 2012

- Expansion: launched in September 2014

- Refill: launched in August 2016

1.2 Evaluation Objectives

The objectives of the evaluation were as follows:

- Validate kWh savings impacts by wave for each program year;
- Obtain feedback from treatment group households as to their program experience; and
- Measure the effects of the program on knowledge of energy efficiency and other-program participation.

The main features of the evaluation approach were as follows.

- An RCT and a post-only regression model were used in the impact evaluation to estimate energy savings.

- For the process evaluation, surveys were conducted with the treatment and control groups to assess behavior and utility satisfaction and to determine actions taken by treatment participants after receiving home energy reports.

1.3 Verified Energy Savings

Table 1 lists the total numbers of customers who participated in the full program without moving out. Table 2 summarizes the verified energy savings across the three waves.

Table 1. Overall Savings Summary

Variable	2016	2017
Number of Treatment Customers	278,193	254,911
Number of Control Customers	80,827	74,523
Verified Net Savings (MWh)	**48,022**	**49,620**

Table 2. Savings by Wave and Year

Variable	Legacy		Expansion		Refill	
	2016	2017	2016	2017	2016	2017
Number of Treatment Customers	73,217	68,720	168,988	152,003	35,988	34,188
Number of Control Customers	23,358	21,929	40,375	36,378	17,094	16,216
Percent Realized Savings	2.04%	1.97%	1.32%	1.53%	0.84%	1.10%
Average Daily Savings per Customer	0.95	0.92	0.34	0.4	0.29	0.38
Verified Net Savings Before Double Count Adjustment (MWh)	25,394	22,999	21,200	21,991	1,573	4,692
Savings Counted in Other Energy Efficiency Programs (MWh)[1]	-41	-42	-91	7	-13	-27
Final Verified Net Savings (MWh)	**25,353**	**22,957**	**21,109**	**21,998**	**1,560**	**4,665**

Table 3 and Table 4 summarize realization rates[2] by program year. They are calculated by dividing the verified net savings (ex-post, see Table 2) by ex-ante savings provided to the Evaluator by the program implementer. The programs in aggregate had overall realization rates of 98% for each year and for the two years combined.

Table 3. Expected and Realized MWh Savings by Wave - 2016

Wave	Expected Savings	Evaluated Savings	Realization Rate
Legacy	24,434	25,353	104%
Expansion	22,872	21,109	92%
Refill	1,939	1,560	80%
Total	**49,245**	**48,022**	**98%**

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[1] These amounts are used to adjust the realized savings to account for energy savings measure implemented through other residential energy efficiency programs. A negative value indicates less of an effect (decreased consumption) from these programs as compared to the control group and thus their savings is subtracted to account for the difference. A positive value means the opposite.

[2] The ratio of ex-post to ex-ante savings.

Table 4. Expected and Realized MWh Savings by Wave- 2017

Wave	Expected Savings	Evaluated Savings	Realization Rate
Legacy	22,656	22,957	101%
Expansion	22,993	21,998	96%
Refill	4,914	4,665	95%
Total	**50,563**	**49,620**	**98%**

Table 5. Expected and Realized MWh Savings by Wave– 2016 and 2017 Combined

Wave	Expected Savings	Evaluated Savings	Realization Rate
Legacy	47,090	48,310	103%
Expansion	45,865	43,107	94%
Refill	6,853	6,225	91%
Total	**99,807**	**97,642**	**98%**

The realization rate for the 2016 Refill wave is lower than for the other waves. However, the savings for this wave pertain only to the last five months of 2016, since reports to this wave were not fielded until August 2016. Studies of various home energy report programs have shown that the savings from the programs usually ramp over the first 6 to 12 months, with steady state savings being achieved after 12 to 18 months. Studies show the expected savings for the first 6 months of a program to range from 0.25 percent to 1 percent, but projections of savings can be uncertain because of customer characteristics and the time of year when the program begins. For example, savings for home energy report programs are generally higher in summer and winter months when demand for electric cooling or heating are higher. In this regard, the 2016 Refill wave received reports for several months when electric demand would be relatively low, thereby reducing the opportunity for significant savings. The realization rate for the Refill wave was 95 percent in 2017 when data for a full year were available for calculating savings.

1.4 Key Findings

1.4.1 Impact Evaluation Findings

■ **Expansion and Refill savings increased from 2016 to 2017; Legacy savings decreased over the same period.** Savings in the Expansion wave grew from 1.32% in 2016 to 1.53% in 2017. Refill savings grew from .84% in 2016 to 1.10% in 2017. Legacy savings decreased from 2.04% to 1.97%. This type of fluctuation is common.

1.4.2 Process Evaluation Findings

■ **Refill respondents indicated higher satisfaction with the program than did respondents in the Legacy and Expansion waves.** Refill respondents rated their satisfaction with the program at 3.89 out of 5.00, compared to 3.59 and 3.53 for the Expansion and Legacy waves, respectively.

- **Longer program tenure is correlated with a shorter time spent reading the reports.** An inverse linear relationship was reported between program tenure and time spent reading the report, as determined by the most common answer per treatment wave.

- **Satisfaction with Rocky Mountain Power does not differ across waves, or between Treatment and Control groups.** Neither between a wave's treatment and control respondents nor across all treatment groups was a statistically significant difference in utility satisfaction found.

- **Participants in the Refill wave have notably lower income, fewer home occupants, and a lower homeownership rate than prior program waves.** ADM identified statistically significant demographic indicators for the Refill wave compared to the Legacy and Expansion Waves in this respect.

1.5 Recommendations

- **Where possible, tailor program recommendations to demographics.** The Refill wave skews younger, with a lower homeownership rate and with 20% of respondents indicating an income less than $25,000 per year. Program materials sent to this wave should have messaging focused on tips more appropriate for renters and lower income households (e.g., focusing information on low-cost or no-cost efficiency options, rather than on higher -cost appliances).

- **Consider cross-referencing treatment customers with known low income screening tools (such as Low Income Home Energy Assistance Program (LIHEAP) registration) to spur outreach for Rocky Mountain Power low income programs.** These groups are to some extent pre-engaged with wattSmart, a program offering cash discounts and incentives to improve energy efficiency, via the home energy report and could be targeted for appropriate income-qualified programs.

1.6 Cost Effectiveness Results

Table 6 summarizes the results of the cost-effectiveness findings for the HER program.

Table 6. Cost/Benefit Ratios for the HER by Program Year

Program Year	UCT	PTRC	TRC	RIM	PCT
2016	0.95	1.04	0.95	0.32	n/a
2017	0.89	0.98	0.89	0.31	n/a
2016-2017	**0.92**	**1.01**	**0.92**	**0.31**	**n/a**

Program year 2016 was cost effective from the PTRC perspective. The program did not pass UTC or any other test in each individual year or combined.

2. Program Background

The 2016-2017 HER program for Utah was designed to generate quantifiable behavioral savings that cannot be feasibly attained through standard energy efficiency efforts. The program differs from standard energy conservation marketing efforts in that customized reports are sent to customers, comparing their billed energy use to similar homes in their area. The comparison is intended to leverage social norming effects. This is a long-known behavioral science tenet that individuals desire to be at a similar or better level than their peers, and thus, the reports are expected to induce high users to reduce their energy consumption.[3]

The HER program was first introduced to Rocky Mountain Power's Utah customers in August 2012, followed by two subsequent waves:

  Legacy Wave - onset August 2012
  Expansion Wave - onset September 2014
  Refill Wave - onset August 2016

The program was implemented as a randomized control trial (RCT). In this experimental design, a group of eligible customers are randomly assigned to treatment or control groups. Treatment households receive mailed or emailed home energy reports, which show the comparison of their use to homes with similar energy use in the area. The program is an opt-out implementation model; treatment customers who did not wish to participate could contact Rocky Mountain Power and request to be removed from the program at any time.

The Legacy wave of the program first targeted the highest users in Rocky Mountain Power's Utah service area. As shown in Figure 1, the Legacy wave customers used an average of 46 kWh per day during the baseline year (i.e. 12-month pre-period before a wave begins). The Expansion and Refill waves used averages of 26 and 34 kWh per day during the baseline year, respectively.
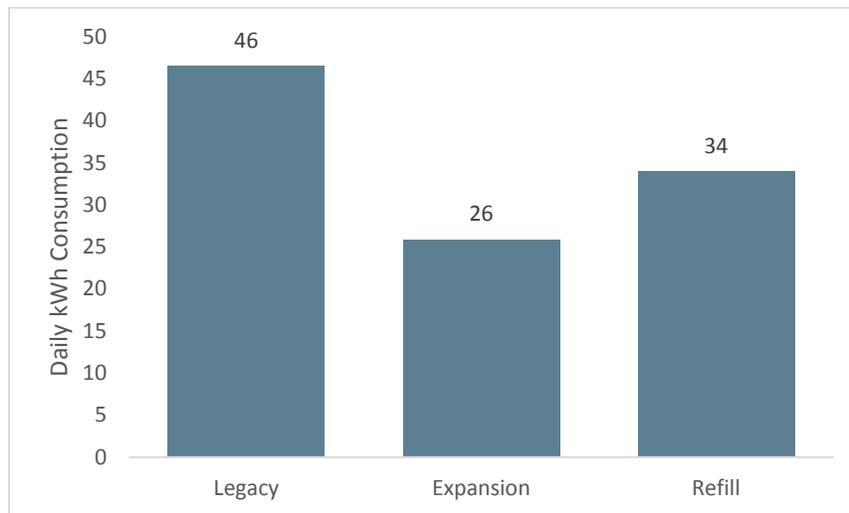
Figure 1. Average Daily Consumption by Wave during 12-Month Pre-Program Period

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

3. EM&V Methodology

The impact evaluation approach for this program is as follows:

1) Energy savings are estimated via regression modeling.

2) Excess savings from other-program-participation by the treatment group are accounted for and netted out of the program savings from the home energy reports program.

3.1 Decay

The tracking of treatment and control households can be affected by either move-outs or opt-outs (known collectively as 'decay').

3.1.1 Move-Outs

When an inhabitant moves, that household cannot be retained because the inhabitant/address link has been broken. The evaluation timespan for that household ends on the move out date. If a household's final bill was before November 2017, it was considered a move out household. To determine if a household became a move out at the very end of the year, additional 2018 data are needed to confirm the final billing date.
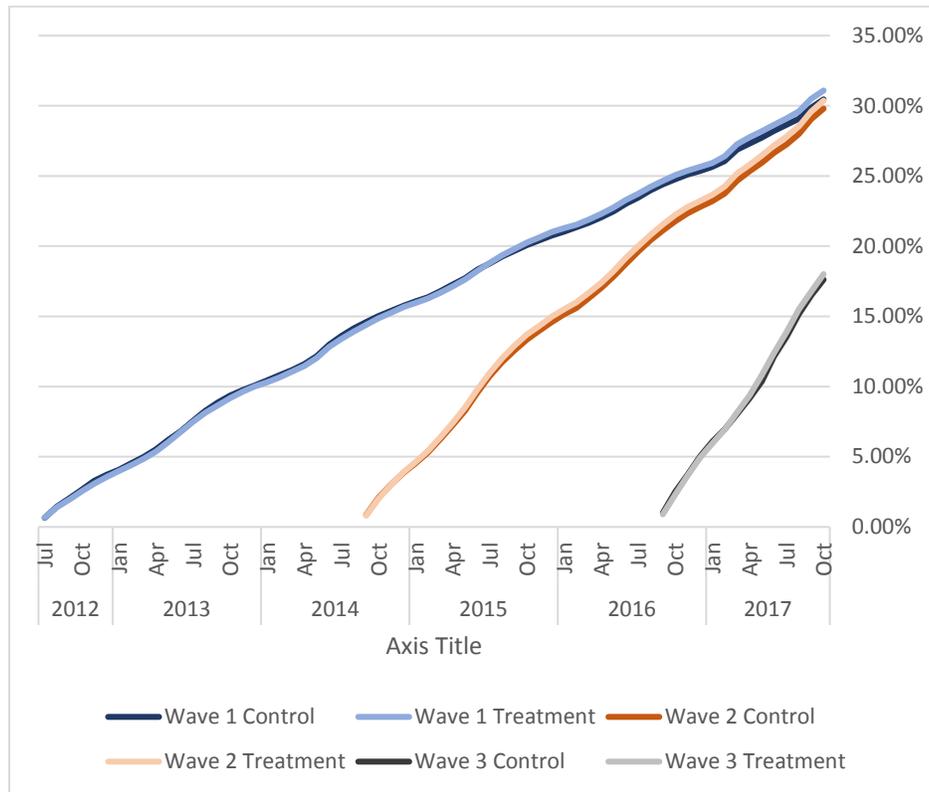
Figure 2. Move Outs by Treatment/Control and Wave

From each wave's onset until November 2017, the Legacy wave experienced a 31.09% move out rate for the treatment group and 30.46% for the control group. The Expansion wave had move

out rates of 30.37% (treatment) and 29.80% (control). The Refill wave had move out rates of 18.01% (treatment) and 17.62% (control).

3.1.2 Opt-Outs

Households that received energy reports (treatment group) could opt-out and no longer receive the mailings at any time. While these participants may wish to opt out of receiving the report, however, they are retained as evaluation households. Treatment opt-outs are observed, but it is not possible to determine who in the control group would have opted out of receiving reports had they been in the treatment group, and thus no equivalent modification can be made. To prevent this from biasing results, the treatment group opt-outs are retained as evaluation households and the energy usage from the opt-outs in each group cancel each other out.

Error! Reference source not found. is a cumulative tally, by month and wave, of opt-outs over the program life.
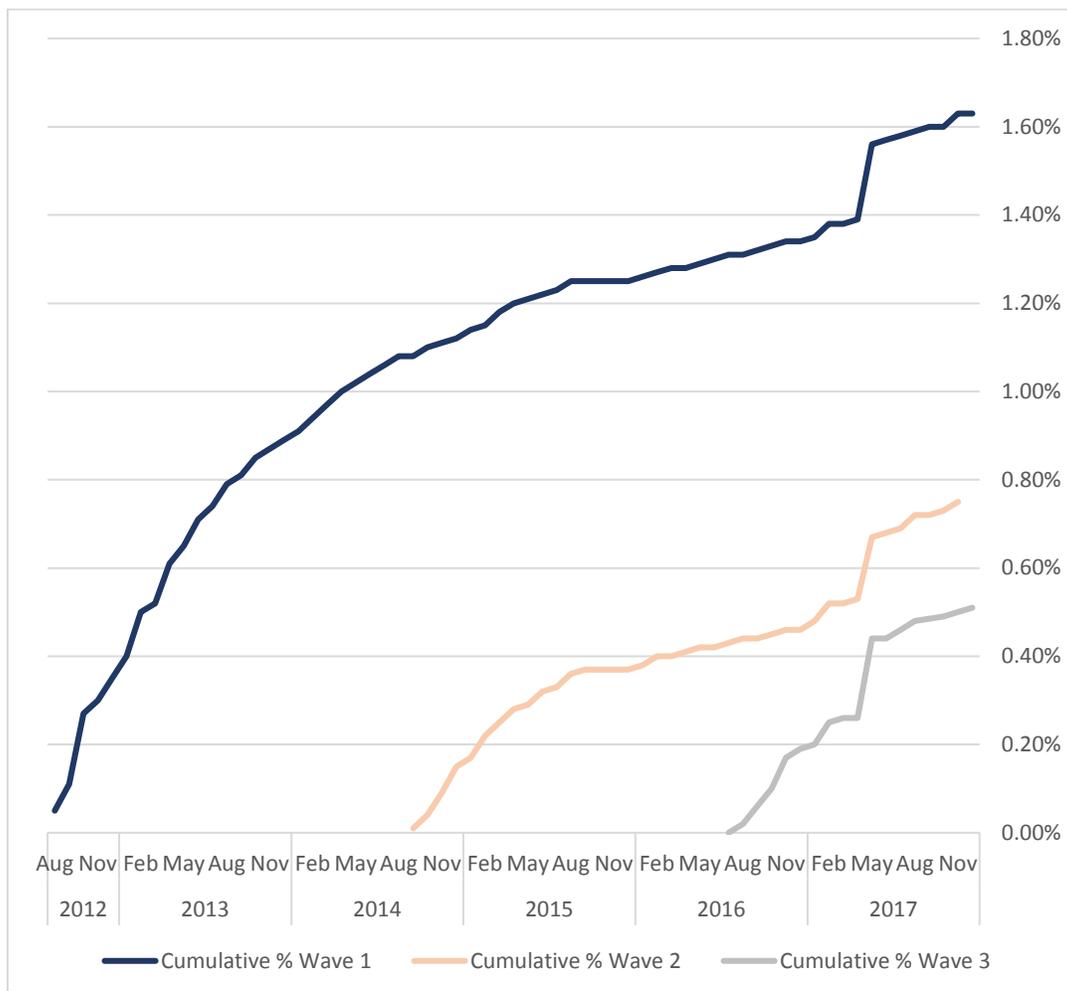
Figure 3. Cumulative Treatment Group Opt Outs by Wave

From the onset of the Legacy Wave to December 2017, 1.63% of treatment customers have chosen to opt out. The Expansion and Refill waves had opt-out rates of 0.75% and 0.51%, respectively.

3.2 Savings Calculation Methodologies

For the impact evaluation, several types of multiple regression analyses were run to determine wave-specific savings. These included post-only regression (PO), post-program regression (PPR) and linear fixed effects regression (LFER). Each regression model was run for each of the three waves (Legacy, Expansion and Refill) and for both years (2016 and 2017).

ADM compared the results of the three models, particularly comparing R-squared and standard error statistics. The post-only (PO) model with pre-usage controls had the best fit and is used for reporting savings. This model is recommended in the National Renewable Energy Laboratory (NREL) Uniform Methods Project (UMP)[4].

3.2.1 Specification for Post-Only Regression

The specification for the post-only regression model is as follows:

$$Usage_{it} = \alpha_0 + \beta * treatment_i$$

$$+\alpha_1 * PreUsage_i$$

$$+\alpha_2 * PreSummer_i$$

$$+\alpha_3 * PreWinter_i$$

$$+\gamma * mm_t$$

$$+\delta_1 * mm_t * PreUsage_i$$

$$+\delta_2 * mm_t * PreSummer_i$$

$$+\delta_3 * mm_t * PreWinter_i$$

$$+\varepsilon_{it}$$

where

- i denotes the ith customer
- t denotes the first, second, third, etc. month of the post-treatment period
- $Usage_{it}$ is the average daily use for read t for household i during the post-treatment period
- $PreUsage_i$ is the average daily usage across households $i's$ available pre-treatment billing reads.
- $PreWinter_i$ is the average daily usage over the months of December January, February, and March over household $i's$ available pre-treatment meter reads.

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[4] https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

- *PreSummer$_i$* is the average daily usage over the months of June, July, August, and September over household *i's* available pre-treatment meter reads.
- *mm$_t$* is a vector of month-year dummies

Parameter definitions are:

- α_0 is an intercept term
- α_1, α_2, α_3 are effects of control variables *PreUsage$_i$, PreWinter$_i$, PreSummer$_i$* on *Usage$_{it}$* in the reference month.
- $\delta_1, \delta_2, \delta_3$ is the effect of the control variables in each month-year (*mm$_t$*) of the post period.
- ε_{it} is an error term

3.2.2 Specification for Post-Program Regression

The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the participant and control customers. In particular, energy use in calendar month *t* of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between participants and controls will be reflected in differences in their past energy use, which is highly correlated with their current energy use. The version estimated includes monthly fixed effects and interacts these monthly fixed effects with the pre-program energy use variable. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

Formally, the model specification is:

$$ADC_{kt} = \sum_J \beta_{1j} Month_{jt} + \sum_J \beta_{2j} Month_{jt} \cdot ADClag_{kt} + \beta_3 Participant_k + \varepsilon_{kt} \,,$$

where

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

$Month_{jt}$ = A binary variable taking a value of 1 when j=t and 0 otherwise;[5]

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

$Participant_k$ = A binary variable indicating whether customer k is in the participant group (taking a value of 1) or in the control group (taking a value of 0);

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[5] If there are T post-program months, there are T monthly dummy variables in the model, with the dummy variable Month$_{tt}$ the only one to take a value of 1 at time t. These are, in other words, monthly fixed effects.

ε_{kt} = The cluster -robust error t

errors account for heteroscedasticity and autocorrelation at the customer level.[6]

In this model, β_3 is the estimate of average daily energy savings due to the program. Program savings are the product of the average daily savings estimate and the total number of participant-days in the analysis.

3.2.3 Specification for Linear Fixed-Effects Regression

The simplest version of a linear fixed-effects regression (LFER) model, the One-Way LFER model, is one in which average daily consumption of kWh by customer k in bill t, denoted by ADC_{kt} , is a function of two variables: the binary variable $Treatment_k$, taking a value of 1 if household k is assigned to the treatment group, and 0 otherwise; and the binary variable $Post_t$, taking a value of 0 if the observation t is before the *program start date* and 1 if the observation is after the program start date.

Formally, the model specification is:

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

Three observations about this specification deserve comment. First, the coefficient α_{0k} captures *all* customer-specific effects on energy use that do not change over time, including those that are unobservable. Second, α_1 captures the average effect among control customers of being in the post treatment period. In other words, it captures the effects of exogenous factors, such as an economic recession, that affect control customers in the post treatment period but not in the pre-treatment period. Third, $\alpha_1 + \alpha_2$ captures the average effect among treatment customers of being in the post treatment period, and so for these households the effect directly attributable to the program is captured by the coefficient α_2.

3.3 Double Counting Analysis

Measurement of savings from behavioral programs needs to account for savings from other programs to ensure that there is not double counting of savings in evaluating portfolio performance.

The first step in this process is to cross-reference the account IDs for each treatment and control customer with other program participation in the study period. Rocky Mountain Power provided

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[6] For examples of academic applications of the approach to energy behavioral programs see:

Alcott, Hunt. "Social Norms and Energy Conservation", Working paper, Massachusetts Institute of Technology (MIT), Cambridge, MA, 2009.

Ayres, I., S. Raseman and A. Shih. "Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage", NBER Working Paper No. 15386, September 2009.

Costa, D.L. and M.E. Kahn. "Energy Conservation ″Nudges″ and Environmentalist Ideology: Evidence from a Randomized Residential Electricity Field Experiment", NBER Working Paper No. 15939, April 2010.

ADM with other program tracking data, and the datasets were cross-referenced by account number. This resulted in a total "other program kWh" per-group, per-wave, per-state.

It is important to normalize the effects on the treatment group households. The treatment and control groups are not precisely matched in customer count (and in the case of the Expansion wave, the treatment group is over 4 times the size of the control group). As such, if one were to directly compare the other-program-kWh of the treatment and control group, it would overestimate the double count (a treatment group of 30,000 customers is most assuredly going to show higher savings than a matched control group of 10,000 customers). By comparing this on a per-household basis, treatment and control groups of varying size could be normalized.

The final double count savings (calculated separately for each wave in each program year) is as follows:

$$Uplift = \left(\frac{OP\ kWh}{Hosehold_{Treatment}} - \frac{OP\ kWh}{Hosehold_{Control}} \right) \times \#\ Accounts_{Treatemt}$$

Where,

$$\frac{OP\ kWh}{Hosehold_{Treatment}} = Other\ program\ kWh\ per\ household\ in\ the\ treatment\ group$$

$$\frac{OP\ kWh}{Hosehold_{Control}} = Other\ program\ kWh\ per\ household\ in\ the\ control\ group$$

$$\#\ Accounts_{Treatemt} = Total\ accounts\ in\ the\ treatment\ group$$

Further discussion of the double counting analysis, as well detailed results, can be found in Appendix B. Double Counting Analysis.

3.4 Summary of Data Used

The data used in this study included billing data for treatment and control customers supplied by Rocky Mountain Power and treatment and control group assignment information provided by the program implementer, Oracle.

As part of the data cleaning, observations were removed as follows to create the sample used in the regression analyses.

- Observations with fewer than 10 days or more than 90 days in the billing cycle were removed because long and short bills can be an indication of an issue in the recording of energy use. In past evaluations, the inclusion range was 20-40 days. ADM broadened this range as abnormal billing reads may not be randomly distributed. In particular, long billing cycles are more common among rural populations.

- Observations outside of the evaluation period, 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 outsized impact on the regression results, biasing the estimate of savings.

3.5 Process Evaluation

ADM conducted a telephone survey of households in the treatment and control groups for the evaluation of the HER Program. The objectives of this surveying were to:

- Identify energy habits of treatment and control group households;
- Obtain feedback on program experience from treatment households;
- Develop metrics of knowledge gained as a result of program participation;
- Identify behaviors taken by treatment households to produce energy savings.

Surveys were conducted on weeknight evenings and during weekends to ensure a representative sample. The survey was administered in both English and Spanish.

3.5.1 Sample Size

The sample was comprised of 80 households for each treatment and control group wave. This sample was developed to meet 90% confidence and ±10% precision for binary questions. Table 7 summarizes the target and achieved sample sizes for the process evaluation surveys.

Table 7. Survey Sample and Completion Summary

Wave	Total Population	Sample Provided	Target	Achieved
Legacy Treatment	73,217	1,700	80	80
Legacy Control	23,358	1,700	80	80
Expansion Treatment	168,988	1,700	80	80
Expansion Control	40,375	1,700	80	80
Refill Treatment	35,988	1,700	80	80
Refill Control	17,094	1,700	80	80

4. Impact Evaluation Results

Table 8 summarizes the verified energy savings across all three waves. The results from the post-only regression modeling are used for reporting savings. Overall, verified net savings were 97,642 MWh over the two-year period.

Table 8. Overall Savings Summary

Variable	2016	2017	2016-2017
Number of Treatment Customers	278,193	254,911	
Number of Control Customers	80,827	74,523	
Savings as a Percent of Annual Use	1.46%	1.59%	1.52%
Verified Net Savings (MWh)	**48,022**	**49,620**	**97,642**

Table 9 shows savings by wave and year. Over the two-year period, 49.5% of final verified net savings were from the Legacy Wave, 44.1% from the Expansion Wave, and 6.4% from the Refill Wave.

Table 9. Savings by Wave and Year

Variable	Legacy		Expansion		Refill	
	2016	**2017**	**2016**	**2017**	**2016**	**2017**
Number of Treatment Customers	73,217	68,720	168,988	152,003	35,988	34,188
Number of Control Customers	23,358	21,929	40,375	36,378	17,094	16,216
Percent Savings	2.04%	1.97%	1.32%	1.53%	0.84%	1.10%
90% Confidence Interval	[1.76%, 2.32%]	[1.65%, 2.29%]	[1.06%, 1.58%]	[1.22%, 1.84%]	[0.65%, 1.03%]	[0.96%, 1.24%]
Average Daily Savings per Customer (kWh)	0.95	0.92	0.34	0.40	0.29	0.38
Standard Error	0.08	0.09	0.04	0.05	0.04	0.03
90% Confidence Interval	[0.82, 1.08]	[0.77, 1.07]	[0.27, 0.41]	[0.32, 0.48]	[0.22, 0.36]	[0.33, 0.43]
Verified Net Savings Before Double Count Adjustment (MWh)	25,394	22,999	21,200	21,991	1,573	4,692
90% Confidence Interval	[21,871, 28,905]	[19,363, 26,790]	[16,913, 25,030]	[17,629, 26,756]	[1,234, 1,959]	[4,126, 5,358]
Savings Double Count in Other Energy Efficiency Programs (MWh) [7]	-41	-42	-91	7	-13	-27
Final Verified Net Savings (MWh)	**25,353**	**22,957**	**21,109**	**21,998**	**1,560**	**4,665**

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[7] These amounts are used to adjust the realized savings to account for energy savings measure implemented through other residential energy efficiency programs. A negative value indicates less savings from these programs for the treatment group as compared to the control group and thus savings are added back to account for the difference. A positive value means the opposite.

4.1 Model Output

The output from the post-only regression model, shown in Table 10, was used to report savings estimates for the program.

Table 10. Post-Only Regression Results

Variable	Legacy		Expansion		Refill	
	2016	*2017*	*2016*	*2017*	*2016*	*2017*
Number of Treatment Customers	73,217	68,720	168,988	152,003	35,988	34,188
Number of Control Customers	23,358	21,929	40,375	36,378	17,094	16,216
Percent Savings	2.04%	1.97%	1.32%	1.53%	0.84%	1.10%
Average Daily Savings per Customer (kWh)	0.95	0.92	0.34	0.40	0.29	0.38
Verified Net Savings Before Double Count Adjustment (MWh)	**25,394**	**22,999**	**21,200**	**21,991**	**1,573**	**4,692**

Savings rates as a percent of annual use differ among the three waves. Factors that contribute to this include the following.

- **Length of time in treatment group.** Waves 1-3 have received reports for five, three, and two years, respectively. Historically, there has been a documented effect in behavioral programs of longer treatment resulting increased savings as a percent of billed use.

- **Difference in pre-treatment energy use.** Higher users have historically demonstrated a high percentage of savings. This is due to there being more usage that could be considered discretionary, and as a result, high-use customers have the greater potential for savings both in absolute and relative terms.

As shown in Figure 4, savings for the Legacy wave peaked at 2.71% during 2014, and then declined from 2015 through 2017. For the Expansion wave, savings as a percent of billed use have trended upwards since program inception. For the Refill wave, savings increased from .84% during ramp up in 2016 to 1.10% during 2017.
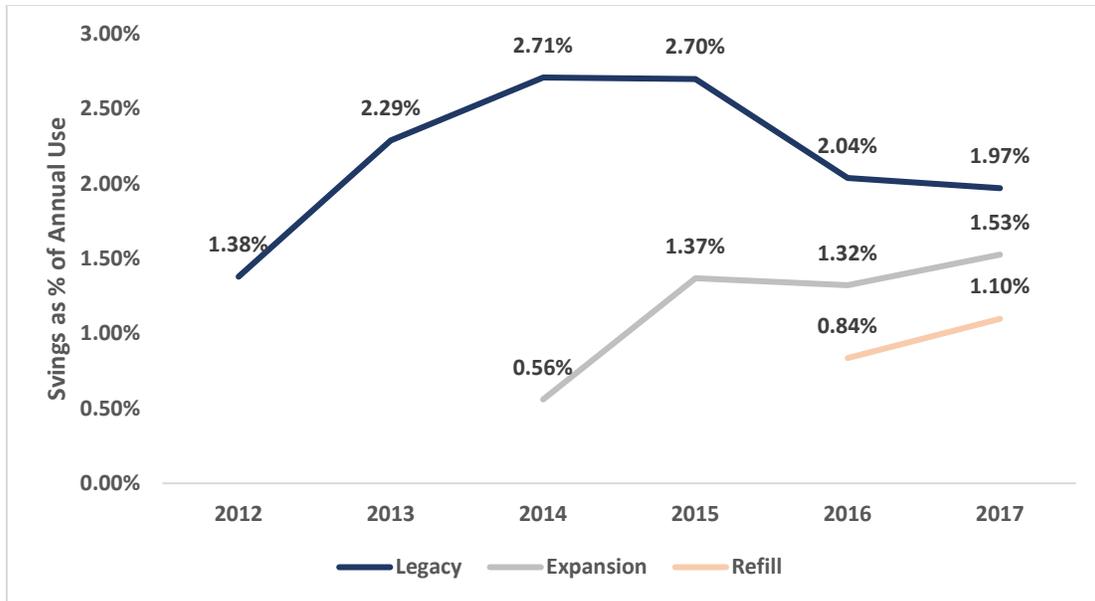
Figure 4. Longitudinal Savings as Percent of Billed Use by Wave and Program Year

4.2 Double Counting Findings

Savings estimates for the HER program must also take into account savings resulting from other programs. ADM examined program tracking data from Rocky Mountain Power's residential rebate programs, Home Energy Savings (HES) and Low Income Weatherization (LIW). Savings claimed by these programs were netted out of HER savings estimates to avoid double-counting. Savings from non-HER programs are measured and compared across treatment and control groups. Any differences between them are added or subtracted from initial estimates to treatment groups to account for the effect of these programs, resulting in final savings estimates which do not include savings from non-HER programs.

4.2.1 Double Counting from Down Stream Measures

The first double-counting analysis is for downstream measures. These programs track participation by customer, and program savings can be directly tied to treatment or control group accounts.

Table 11 shows that in 2016, energy savings were higher across all treatment groups when compared to the control groups: 0.57 kWh (Legacy), 0.54 kWh (Expansion), and 0.37 kWh (Refill) per household. The difference was subtracted from the verified HERs savings.

Table 11. Double Count Results for Down Stream Measures - 2016

Wave	Participants	Other-Program kWh Savings per-Account		Double-Count (kWh)[8]
		Treatment	Control	
Legacy	73,217	16.48	15.91	41,407
Expansion	168,988	14.85	14.31	91,427
Refill	35,988	17.70	17.33	13,299

Table 12 shows that in 2017 the expansion treatment group experienced less savings due to these programs as compared to the control group (0.04 kWh per household). The difference is added to the verified HER savings. However, in the Legacy and Refill treatment groups, energy savings were higher compared to the control group by 0.62 kWh and 0.78 kWh per household respectively, so this difference was subtracted from the verified HERs savings.

Table 12. Double Count Results for Down Stream Measures - 2017

Wave	Participants	Other-Program kWh Savings per-Account		Double-Count (kWh)[9]
		Treatment	Control	
Legacy	68,720	9.09	8.48	42,445
Expansion	152,003	7.57	7.61	-6,808
Refill	34,188	8.06	7.28	26,678

Additional details on the double count analysis are available in Appendix B. Double Counting Analysis.

4.2.2 Double Counting Analysis for Upstream Point-of-Sale Measures

For upstream point-of-sale lighting markdown program measures, the end-use customer is not tracked. As a result, the double counting analysis for this program cannot be tied to program data. To address a possibly unequal amount of lighting installation across treatment and control groups, ADM surveyed treatment and control group customers and asked about CFLs and LEDs purchase and installation quantities in 2017. The quantities of CFLs and LEDs installed are summarized in Figure 5. Across treatment and control groups, the total bulbs installed varied, but not to a statistically significant degree and thus no adjustment was applied. Within each wave, quantities installed were often higher for the control or treatment group but not to a statistically significant degree and no adjustment was applied.

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[8] These kWh values were added or subtracted from net verified program savings as appropriate to account for double counting of savings across programs. Positive values were subtracted; negative values were addded.
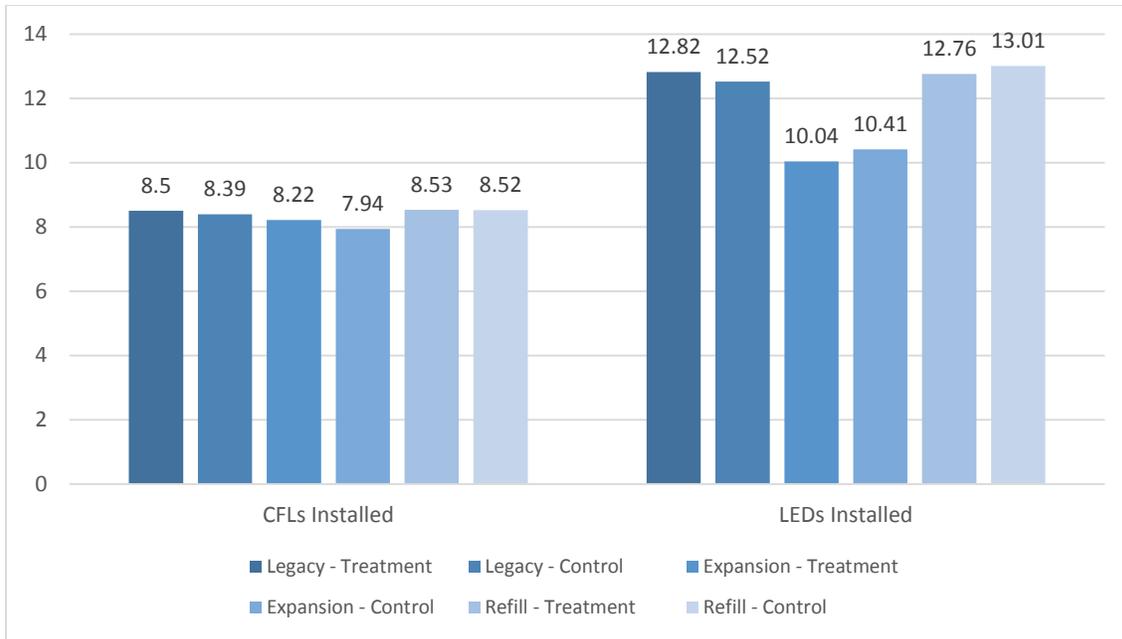
Figure 5. Quantities of CFLs and LEDs Installed

5. Process Evaluation Findings

ADM designed and administered a customer survey for the treatment and control groups in the Legacy, Expansion, and Refill waves. The information obtained through the surveys was used to address several process evaluation research objectives:

- To identify energy habits of treatment and control group households;

- To obtain feedback on program experience from treatment households;

- To develop metrics of knowledge gained as a result of program participation;

- To identify behaviors taken by treatment households to produce energy savings.

5.1 Self-Perception of Consumption and Efficiency

Respondents were first asked how they felt their energy usage compared to other homes of similar size. What is most telling in these responses is the increased self-awareness of the home energy report recipients. In all three waves, a significantly ($p<.05$) higher proportion of control group respondents stated that they do not know how their home's energy use compares to similar homes. Most notably, 23.8% of the Legacy control group respondents stated that they don't know how their usage would compare to their home in the area with similar energy use.

In general, members of the treatment waves are also more likely to describe themselves as relatively intensive energy users compared to control group respondents. This difference in self-perception is most notable among the Legacy respondents, among whom 33.8% consider themselves use at least somewhat more energy than their neighbors, compared to 11.3% of control group respondents. The fact that such a dramatic difference in self-perception is observed in all waves speaks to the efficacy of the home energy report in providing increased self-awareness about household energy use.
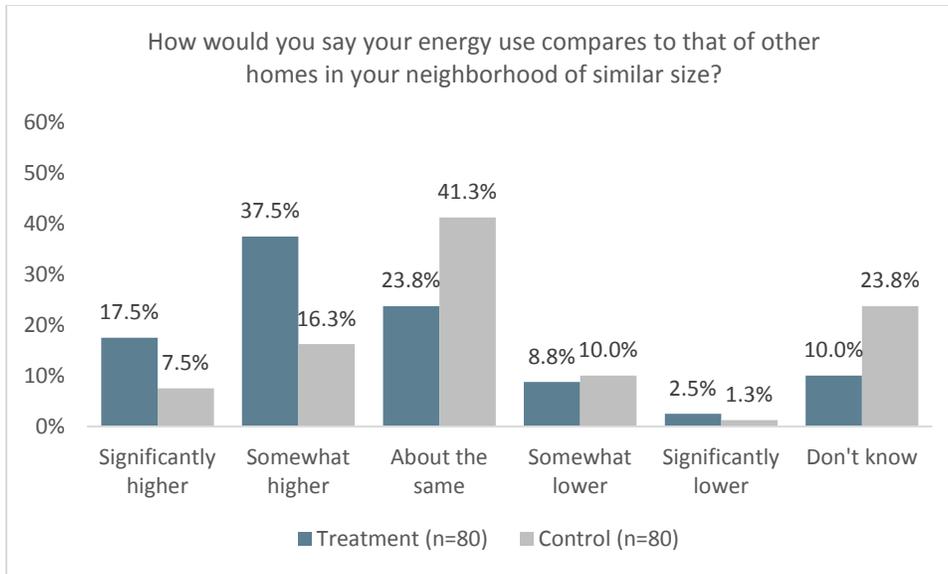
Figure 6. Self-Perception of Usage Compared to Similar Homes – Legacy
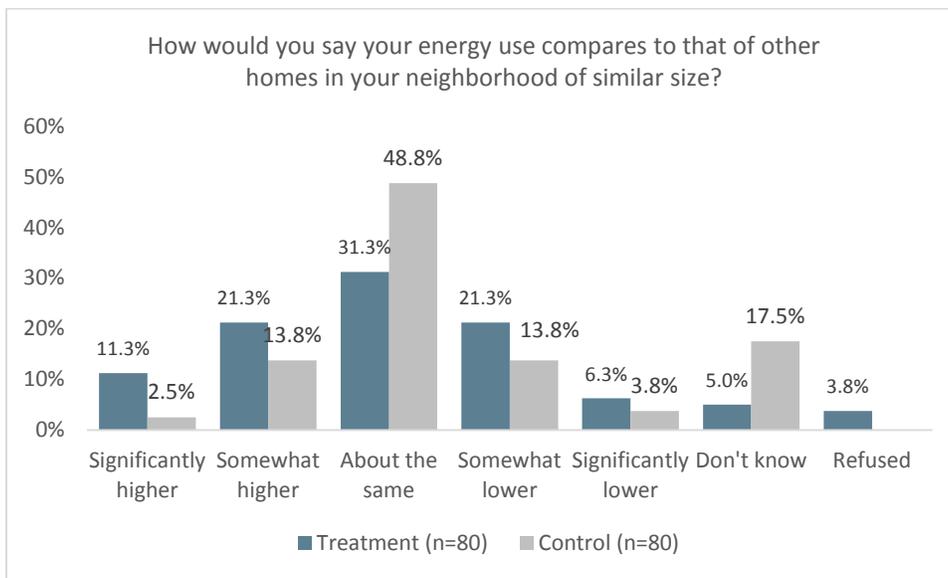
Figure 7. Self-Perception of Usage Compared to Similar Homes – Expansion

How would you say your energy use compares to that of other homes in your neighborhood of similar size?
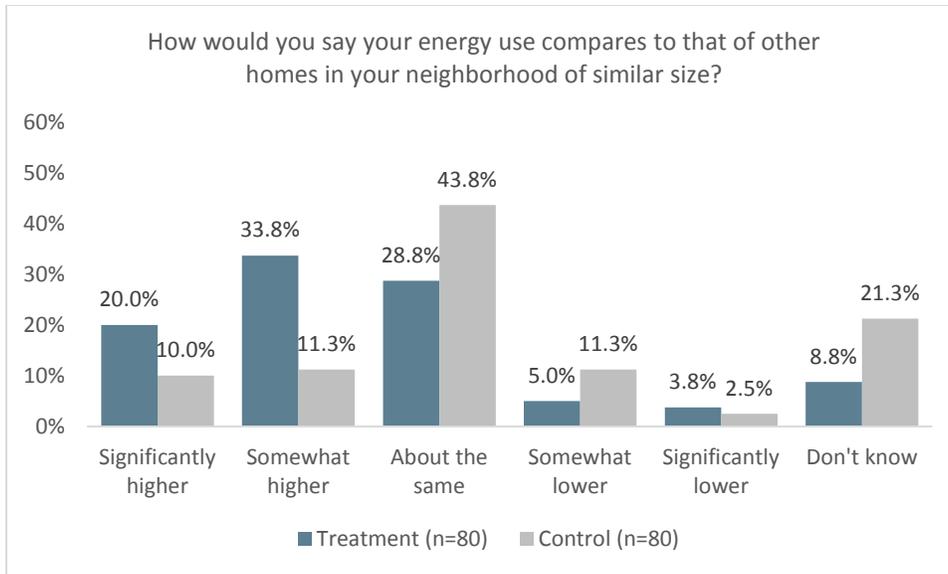
Figure 8. Self-Perception of Usage Compared to Similar Homes – Refill

Respondents were asked to identify how efficient they perceive their household to be in terms of energy use. The responses pertaining to self-assessment of home energy efficiency are summarized for the Legacy wave in Figure 9, for the Expansion wave in Figure 10, and for the Refill wave in Figure 11.
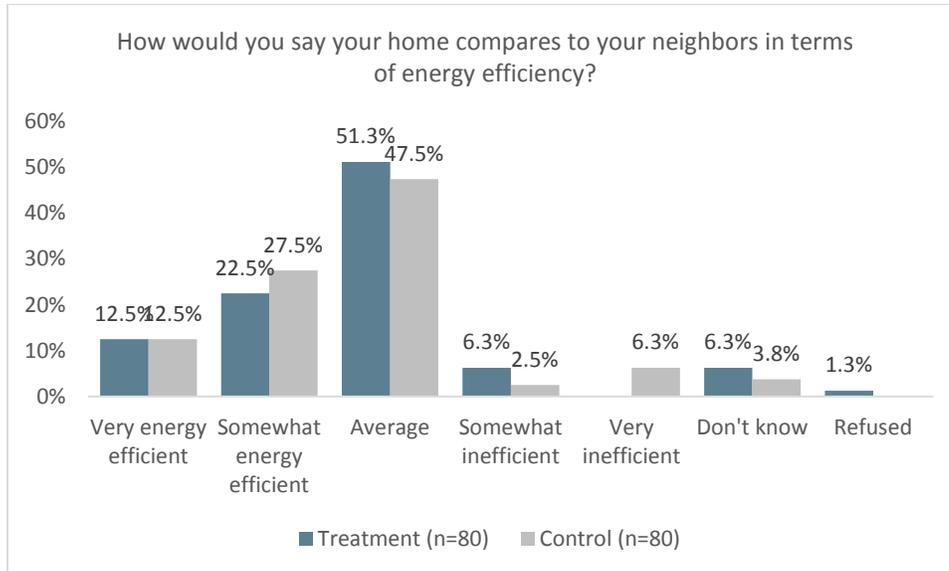
Figure 9. Self-Assessment of Home Efficiency – Legacy
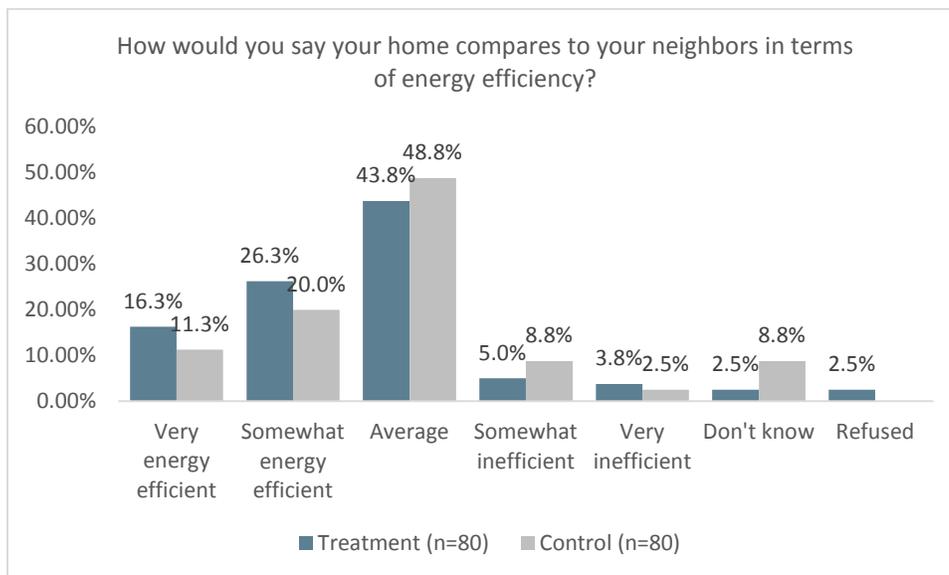
Figure 10. Self-Assessment of Home Efficiency – Expansion
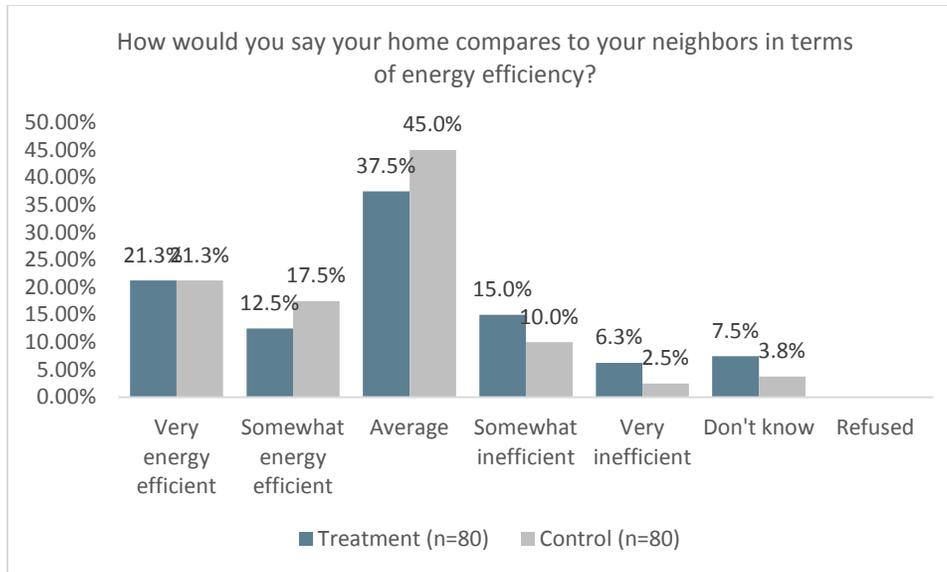
Figure 11. Self-Assessment of Home Efficiency – Refill

5.2 Response to Energy Efficiency Messaging

Respondents were asked if they were aware of energy efficiency programs offered by Rocky Mountain Power. If they stated that they were aware of such programs, they were then read descriptions of specific programs and asked if they could recall the specific program described.

Responses to the questions about energy efficiency programs are summarized in Table 13. Regarding non-specific program awareness, the Refill wave treatment group had a statistically significant lower awareness rate (53.8%) than the Legacy (70%) or Expansion (72.5%) treatment groups.[9] Within the Legacy wave, the treatment group reported a statistically significant higher (70%) awareness rate than the control group (53.8%).

Table 13. Recollection of Energy Efficiency Programs

	Legacy		*Expansion*		*Refill*	
	Treatment.	*Control*	*Treatment*	*Control*	*Treatment*	*Control*
Any Program (non-specific)	70.0%	53.8%	72.5%	61.3%	53.8%	65.0%
wattSmart Homes	58.8%	43.8%	61.3%	57.5%	47.5%	51.3%
Low Income Weatherization	27.5%	25.0%	28.8%	25.0%	21.3%	27.5%
AC Cool-Keeper	50.0%	32.5%	38.8%	30.0%	31.3%	41.3%
wattSmart Business	25.0%	16.3%	27.5%	21.3%	17.5%	21.3%
Irrigation Load Control	6.3%	6.3%	6.3%	5.0%	6.3%	10.0%

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[9] Each value is presented as a percent of total respondents. For example, although only those that indicated awareness of wattSmart programs were asked if they could identify wattSmart Homes, the percent displayed for wattSmart Homes is "percent of all survey respondents that recall the program", rather than "percent of those that are aware of wattSmart that can recall wattSmart Homes specifically".

5.3 Energy Conservation Behaviors Adopted

Respondents were asked to identify behaviors they had undertaken or improvements they had made to their home in the last 12 months that would reduce their electricity usage. Figure 12 summarizes common behaviors taken by survey respondents. All listed behaviors were pre-set categories in the survey except for open-ended mentions of efficient light bulbs, insulation, and new furnaces. ADM found these to be common answers in the "other", catchall category.
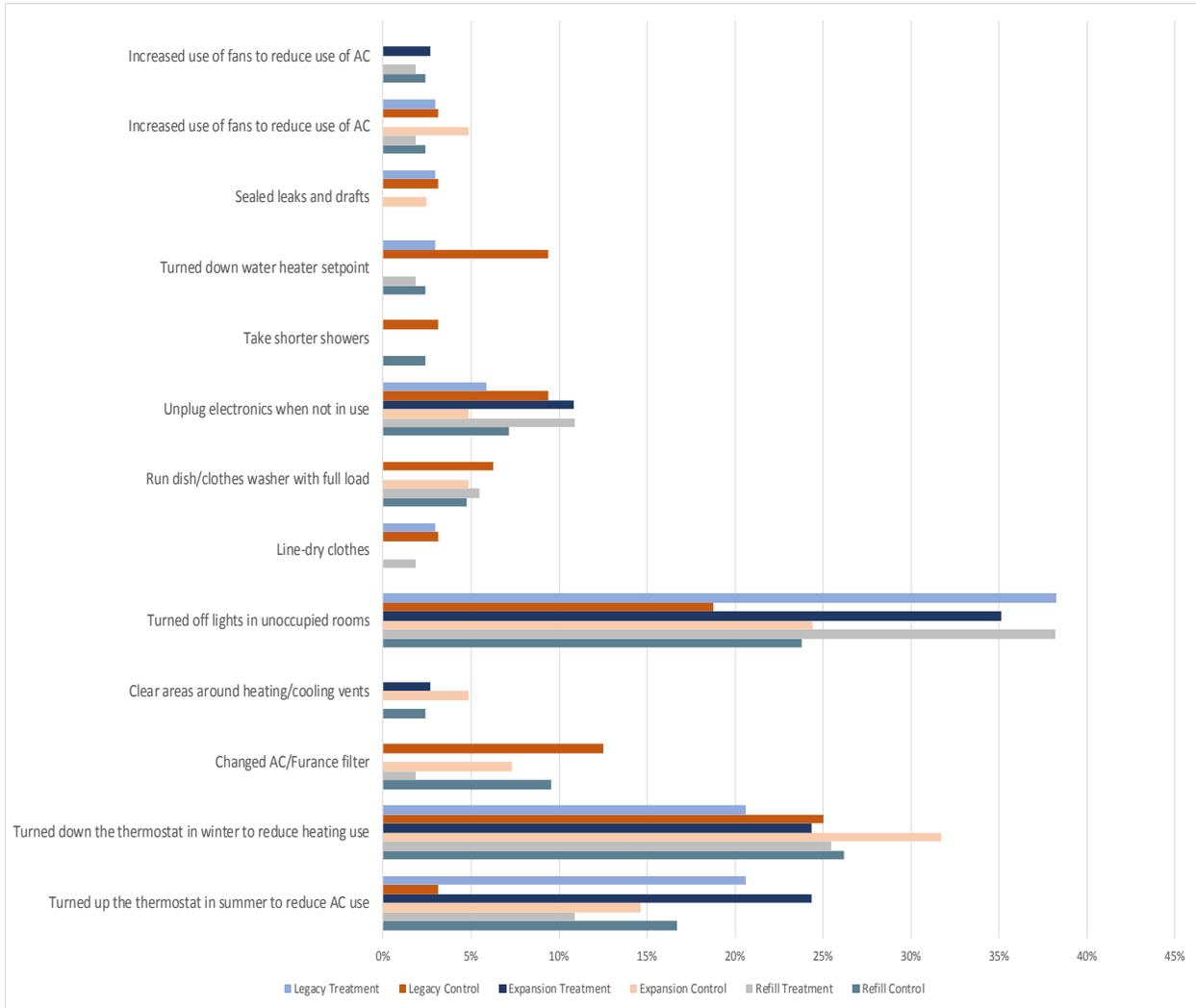
Figure 12. Common Behaviors Cited by Survey Respondents

Respondents were asked to rate how knowledgeable they were about ways to save energy in their homes. The rating was done with a scale of "1 to 5" where "1" means "Not at all knowledgeable" and "5" means "Very knowledgeable". The responses about self-assessed knowledge of how to save energy in a home are summarized in Figure 13.
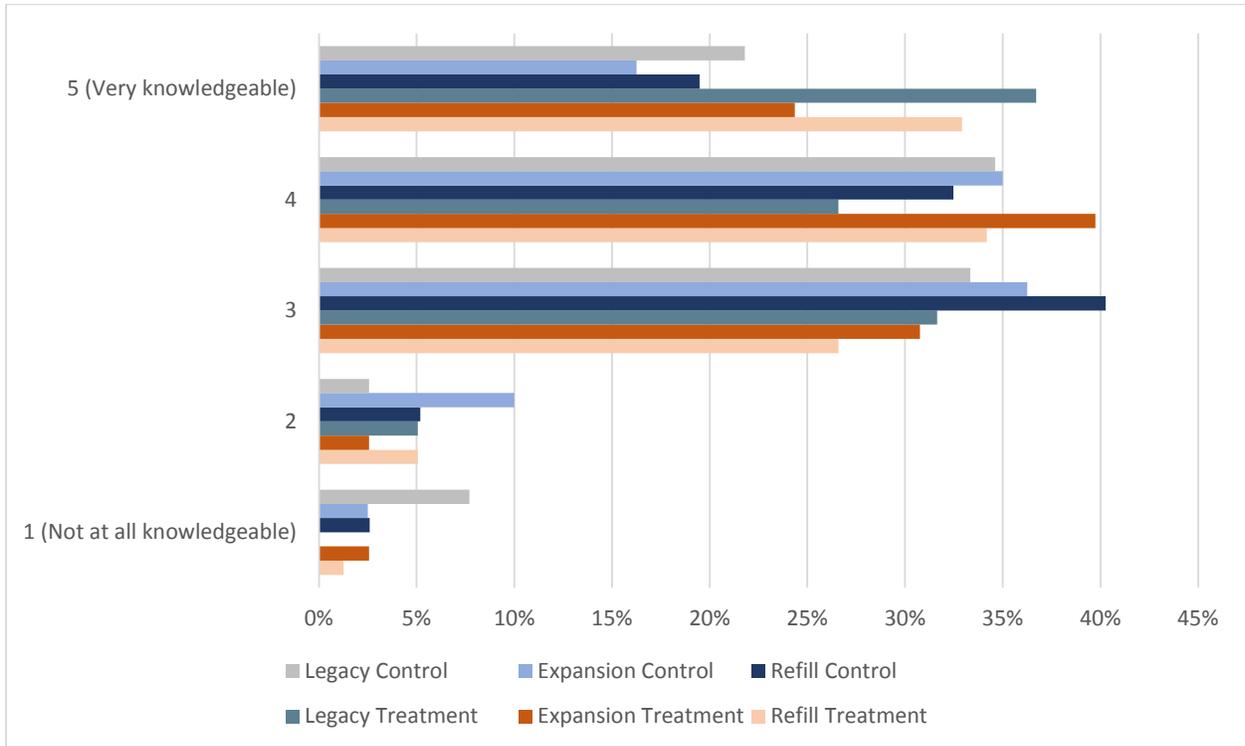
Figure 13. Self-Assessment of Knowledge of Energy Efficiency

Respondents were asked to rate the efforts of their households to save electricity in their houses. The rating was done with a scale of "1 to 5", with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can". The responses about households'efforts to save energy in their homes are summarized in Figure 14.
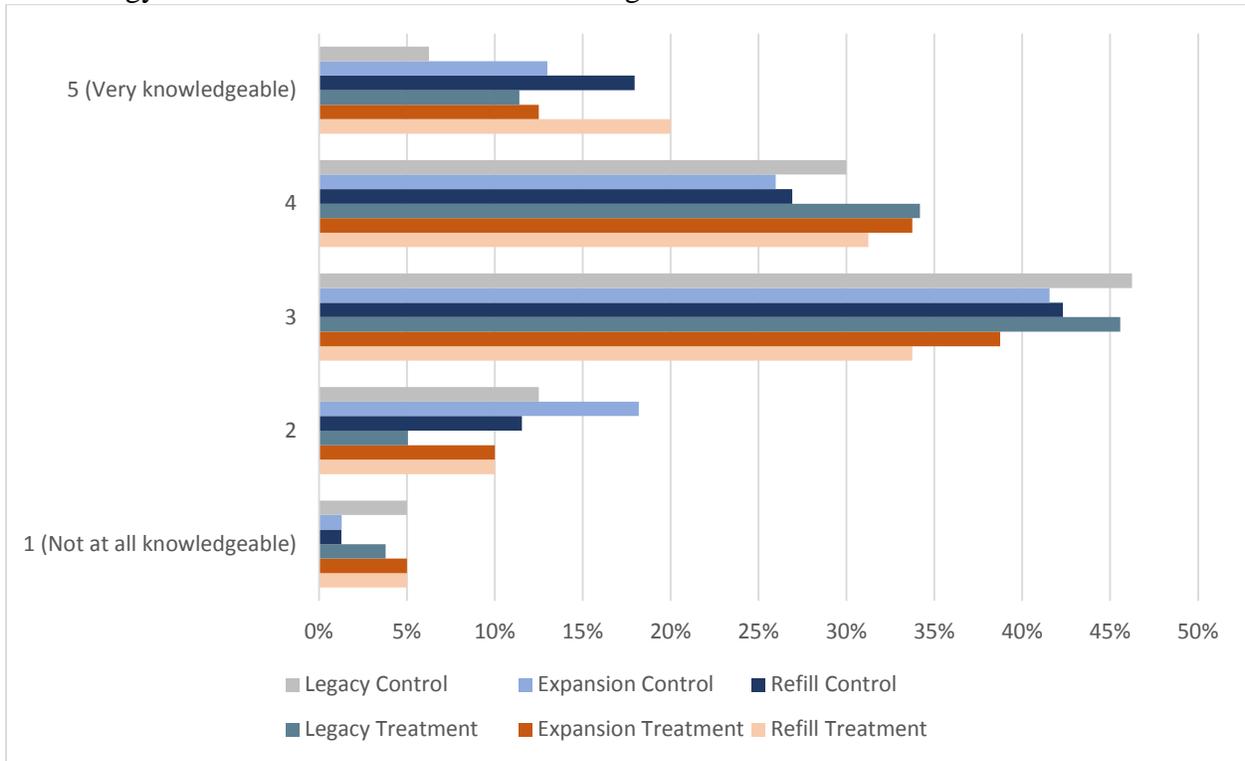
Figure 14. Self-Assessment of Household Efforts to Save Electricity

5.4   Engagement with Home Energy Report

Respondents were asked to identify how much time they spend reading their home energy report. Responses are summarized in Figure 15.
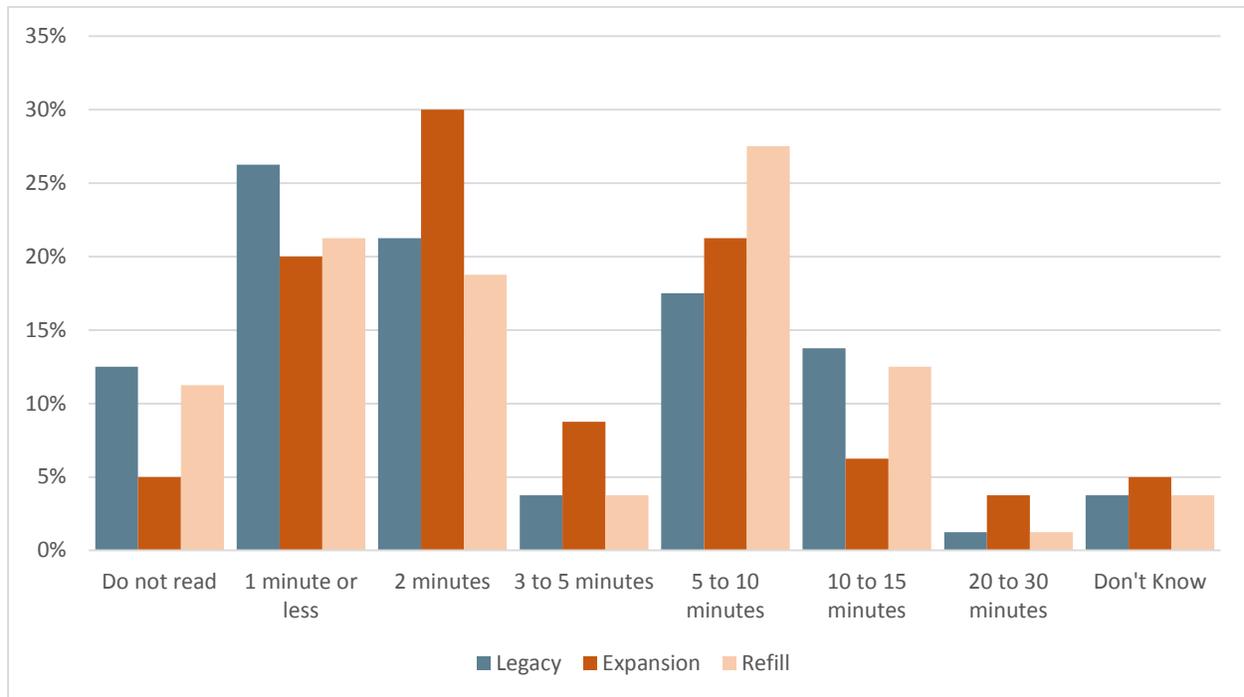
Figure 15. Time Spent Reading Home Energy Report

The longer a treatment group is in the program, the less time they report reading the report. The respondents in the Legacy wave most frequently answered one minute or less (26.25%), while the Expansion wave mentioned two minutes with the highest frequency (30%). Refill wave was the most likely to spend a significantly higher time, with five to ten minutes mentioned the most frequently (27.50%)

Respondents were asked to identify how often they would like to receive reports, relative to their current delivery schedule. These results are summarized below in Figure 16.
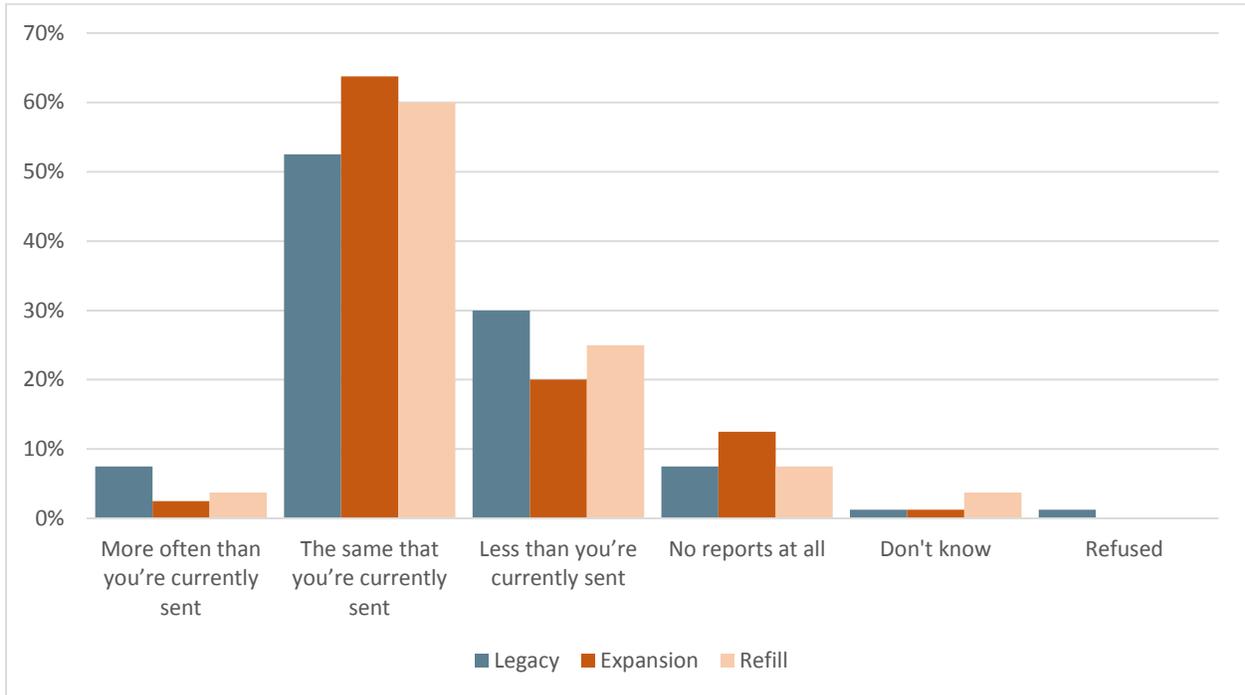
Figure 16. Desired Frequency of Report Delivery

Overall, the majority of respondents (59%) would like to keep the same delivery schedule for home energy reports (reports are mailed quarterly). Nine percent of respondents stated that they would not like to receive any further reports. Of those that stated they would not like to see any further reports, 36% indicated that they do not read their report at all.

ADM concludes that the current delivery schedule is adequate.

5.5 Customer Satisfaction Level

Respondents were asked to rate their satisfaction with Rocky Mountain Power on a scale of 1 to 10, where "0" means "extremely dissatisfied" and "10" means "extremely satisfied."

Responses regarding satisfaction with Rocky Mountain Power are summarized in Figure 17. The Refill wave was more likely to indicate satisfaction with the program overall and the Legacy wave rated Rocky Mountain Power highest (7.9 out of 10), on average, both across all treatment groups and within a wave. There is no statistically significant causal relationship between satisfaction and program treatment.
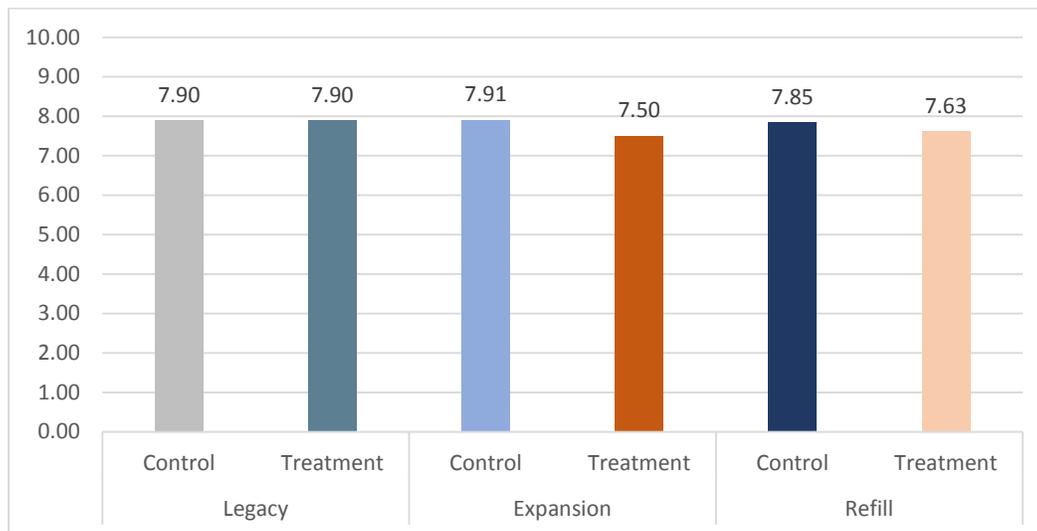
Figure 17. Satisfaction with Rocky Mountain Power

Respondents were asked to rate their satisfaction with various home energy report characteristics on a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied". Responses for various characteristics are summarized in Figure 18.
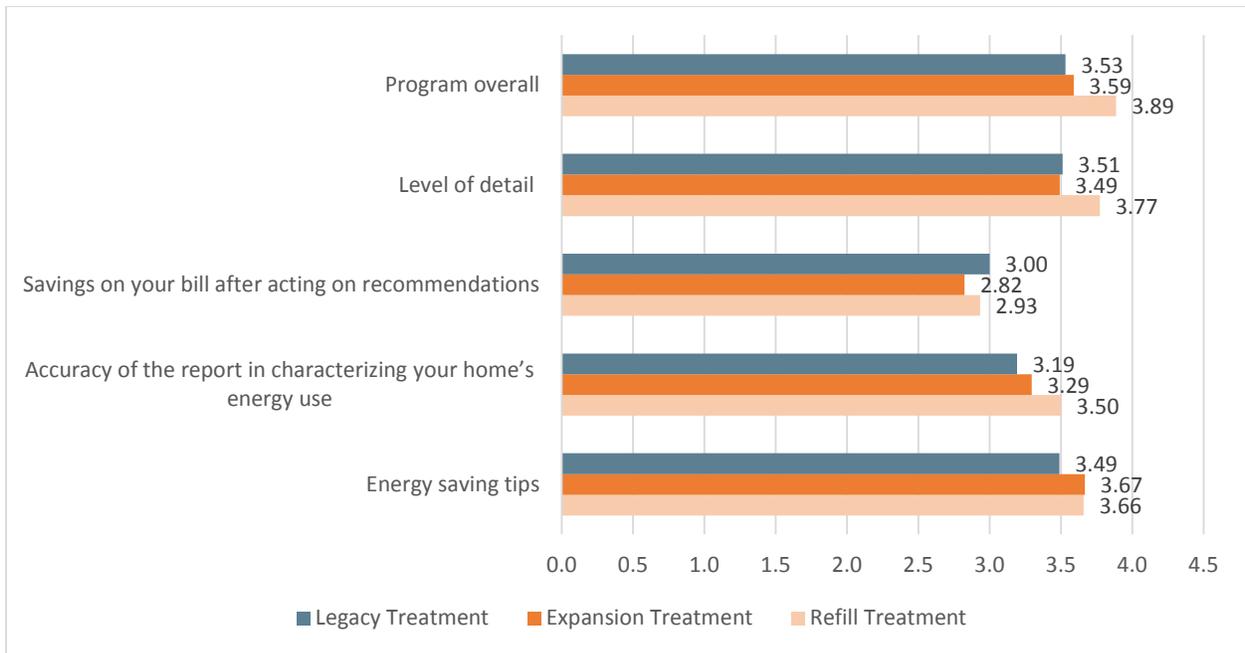
Figure 18. Satisfaction with Program Elements

6. Effective Measure Life and Lifetime Savings

This section discusses methods used in determining measure life as well as program lifetime savings.

6.1 Methodology

The lifetime savings were calculated based on the convergence of savings based on the degradation and attrition rates. The formula for this is:

$$Lifetime\ MWh = 1st\ yr\ MWh + \sum_{t=2}^{\infty} 1st\ yr\ MWh \times (1 - \theta)^{t-1} \times (1 - \lambda)^{t-1}$$

Where,

$t = Year\ t$

$\theta = Savings\ degradation\ rate$

$\lambda = Program\ attrition\ rate$

This series converges at:

$$Lifetime\ MWh = \frac{1st\ yr\ MWh}{\theta + \lambda - (\theta \times \lambda)}$$

Effective Useful Life is the median length of time (in years) that an energy efficiency measure is functional. Effective Useful Life (EUL) is calculated as:

   Lifetime MWH / First-year MWh

The calculation of this requires first-year savings, attrition rate and degradation rate, which are discussed in the following section.

6.2 Inputs

6.2.1 Realized Savings

Table 14 displays final realized MWh savings after adjusting for double counting.

Table 14. Realized Savings by Wave and by Year (MWh)

Wave	2016	2017	Total
Legacy	25,353	22,957	48,310
Expansion	21,109	21,998	43,107
Refill	1,560	4,665	6,225
Total	**48,022**	**49,620**	**97,642**

6.2.2 Attrition Rates

Attrition rates, discussed in section 3.1 Decay, are summarized below in Table 15:

Table 15. Program Attrition by Wave

Wave	Attrition Rate
Legacy	6.14%
Expansion	10.05%
Refill	5.00%

Attrition observed in each wave was used in calculating EUL. The result was a separate EUL for each of the three waves.

6.2.3 Saving Degradation Rate

Unlike attrition, the degradation rate (or savings decay) is intrinsically not observable during the program. Accordingly, secondary materials were used to select an appropriate savings degradation rate.

To determine an appropriate rate, ADM reviewed studies and reports of persistence in similar HER programs.

- In 2016 Navigant conducted a degradation rate and persistence study of a two-year ComEd HER program.[10] The group estimated degradation to be 24%, noting that groups that received reports for longer periods of time showed more savings persistence than those that received reports for a relatively short period of time.

- A meta-analysis conducted by Cadmus[11] (2014) examined five studies conducted by Alcott and Rogers, NMR Group/Tetra Tech/Allcot, Integral Analytics, and DNV-GL. Each study focused on RCT HER programs that were discontinued after two years of treatment. The groups which no longer received reports were then compared with groups which still continued to receive reports, as well as control groups. The result varied between 11% and 32% degradation, but the average degradation rate was approximately 20% per year. The results of this analysis prompted the Statewide Evaluation Team for Pennsylvania to use a 20% degradation rate to estimate potential savings and cost-effectiveness.12

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[10] Navigant. 2016. ComEd Home Energy Report Program Decay Rate and Persistence Study – Year Two. http://ilsagfiles.org/SAG_files/Evaluation_Documents/Draft%20Reports%20for%20Comment/ComEd_EPY7/ComEd_HER_Year_Two_Persistence_and_Decay_Study_2016-07-20_Draft.pdf

[11] Khawaja, M. Sami, Ph.D. and James Stewart, Ph.D. Long-Run Savings and Cost-Effectiveness of Home Energy Report Programs. Cadmus Group, Inc. November 2014. http://www.cadmusgroup.com/wp-content/uploads/2014/11/Cadmus_Home_Energy_Reports_Winter2014.pdf

[12] Statewide Evaluation Team (SWE). 2015. Residential Behavioral Program Persistence Study. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_Res_Behavioral_Program-Persistence_Study.pdf

After reviewing related literature, ADM determined that a 20% degradation rate is appropriate in determining an EUL for the Rocky Mountain Power HER program Evaluation.

6.3 Results

The Home Energy Report lifetime savings for 2016 and 2017 are presented in Table 16 and Table 17.

Table 16. Lifetime Savings and Effective Useful Life (EUL) - 2016

Factors in Calculation	Legacy	Expansion	Refill
Degradation Rate	20%	20%	20%
Attrition Rate	6.14%	10.05%	5.00%
First-year MWh	25,353	21,109	1,560
Effective Useful Life	4.01	3.57	5.28
Lifetime MWh	**101,764**	**75,280**	**8,235**

Table 17. Lifetime Savings and Effective Useful Life (EUL) - 2017

Factors in Calculation	Legacy	Expansion	Refill
Degradation Rate	20%	20%	20%
Attrition Rate	6.14%	10.05%	5.00%
First-year MWh	22,957	21,998	4,665
EUL	4.01	3.57	5.28
Lifetime MWh	**92,146**	**78,450**	**24,640**

The resulting Legacy, Expansion and Refill wave EULs are 4.01, 3.57 and 5.28 years, respectively, inversely representative to attrition rates.

7. Key Findings and Recommendations

Key findings and recommendations from the impact and process evaluation are presented here.

7.1 Key Findings

7.1.1 Impact Evaluation Findings

- **Expansion and Refill savings increased from 2016 to 2017; however Legacy savings decreased over the same period.** Savings in the Expansion wave grew from 1.32% in 2016 to 1.53% in 2017. Refill savings also grew from .84% in 2016 to 1.10% in 2017 while Legacy savings decreased from 2.04% to 1.97%. This type of fluctuation is common.

7.1.2 Process Evaluation Findings

- **Refill respondents indicated higher satisfaction with the program than the Legacy or Expansion waves.** Refill respondents rated their satisfaction with the program at 3.89 out of 5.00, compared to 3.59 and 3.53 for the Expansion and Legacy waves, respectively.

- **Longer program tenure is correlated with a shorter time spent reading the reports.** An inverse linear relationship was reported between program tenure and time spent reading the report, as determined by the most common answer per treatment wave.

- **Satisfaction with Rocky Mountain Power does not differ across waves or between Treatment and Control groups.** There was no statistically significant difference in utility satisfaction found between a wave's treatment and control respondents or across all treatment groups.

- **Participants in the Refill wave have notably lower income, fewer home occupants, and a lower homeownership rate than prior program waves.** Statistically significant demographic indicators were identified for the Refill wave when compared to the Legacy and Expansion Waves in this respect.

7.2 Recommendations

- **Where possible, tailor program recommendations to demographics.** The Refill wave skews younger, with a lower homeownership rate and with 20% of respondents indicating an income less than $25,000 per year. Program materials sent to this wave should have messaging focused on tips more appropriate for renters and lower income households (e.g., focusing information on low-cost or no-cost efficiency options, rather than on higher -cost appliances).

- **Consider cross-referencing treatment customers with known low income screening tools (such as LIHEAP registration) to spur outreach for Rocky Mountain Power low income programs.** These groups are to some extent pre-engaged with wattSmart via the home energy report and could be targeted for appropriate income-qualified programs.

8. Cost Effectiveness

This section presents the cost-effectiveness findings for the HER program using the realized savings for program years 2016 and 2017 for the state of Utah. Various cost-effectiveness tests of the Program were calculated: Utility Cost (UTC) test, PacifiCorp Total Resource Cost (PTRC) test, Total Resource Cost (TRC) test, Ratepayer Impact Measure (RIM) test, and the Participant Cost Test (PCT). Each scenario is analyzed using modeled assumptions provided by PacifiCorp.

The scenarios used the following assumptions:

- **Avoided Costs:** Calculated using PacifiCorp's 2015 IRP east residential whole house 31% decrement along with the Utah single family heat pump load shape.

- **Modeling Inputs:** Program-level savings were as provided by Rocky Mountain Power (per Table 19 below).

- **Energy Rates:** Used rates provided by PacifiCorp for the 2016 and 2017 Annual Report.

- **Line Loss Factors:** Residential line loss factor used throughout the analysis.

- **Measure Life:** The analysis used a 1-year measure life to be consistent with the 2017 annual reporting process.

The inputs for the cost-effectiveness testing are shown in Table 18.

Table 18. Utility Inputs for Cost-Effectiveness Tests

Parameter	2016	2017	2016-2017
Discount Rate for all B/C Tests	6.66%	6.66%	6.66%
Inflation Rate for all B/C Tests	1.90%	1.90%	1.90%
Line Loss Factor – Energy (%)	9.32%	9.32%	9.32%
Residential Energy Rate ($/kWh)	$0.1111	$0.1117	-
Gross Customer Costs	$0	$0	$0
Program Costs	$88,289	$1,332	$89,621
Utility Administrative	$42,322	$44,867	$87,188
Program Delivery	$2,627,845	$2,973,933	$5,601,778
Incentive Costs	$0	$0	$0

Table 19. Program Savings for the HER by Program Year

Program Year	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
2016	49,244,502	98%	48,021,639	100%	48,021,639	1
2017	50,562,602	98%	49,620,000	100%	49,620,000	1
2016-2017	99,807,104	98%	**97,641,639**	**100%**	97,641,639	**1**

Table 20 provides the cost/benefit ratios calculated through the cost-effectiveness testing for the combination of program year 2016 and 2017, as well as for 2016 and 2017 separately.

Table 20. Cost/Benefit Ratios for the HER by Program Year

Program Year	UCT	PTRC	TRC	RIM	PCT
2016	0.95	1.04	0.95	0.32	n/a
2017	0.89	0.98	0.89	0.31	n/a
2016-2017	**0.92**	**1.01**	**0.92**	**0.31**	**n/a**

Table 21 provides cost-effectiveness results for the combination of program year 2016 and 2017, followed by the results for 2016 in Table 22 and for 2017 in Table 23.

Table 21. HER Program Level Cost-Effectiveness Results – PY 2016 and 2017

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Utility Cost Test (UCT)	$0.0620	$5,778,587	$5,309,665	-$468,922	0.92
Total Resource Cost Test (PTRC) with Conservation Adder	$0.0620	$5,778,587	$5,840,631	$62,044	1.01
Total Resource Cost Test (TRC) No Adder	$0.0620	$5,778,587	$5,309,665	-$468,922	0.92
Rate Impact Test (RIM)		$16,863,022	$5,309,665	-$11,553,358	0.31
Participant Cost Test (PCT)		$0	$11,084,435	$11,084,435	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.00022440
Discounted Participant Payback (years)					n/a

Table 22. HER Program Level Cost-Effectiveness Results – PY 2016

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Utility Cost Test (UCT)	$0.0602	$2,758,456	$2,620,214	-$138,242	0.95
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0602	$2,758,456	$2,882,235	$123,779	1.04
Total Resource Cost Test (TRC) No Adder	$0.0602	$2,758,456	$2,620,214	-$138,242	0.95
Rate Impact Test (RIM)		$8,195,029	$2,620,214	-$5,574,815	0.32
Participant Cost Test (PCT)		$0	$5,436,573	$5,436,573	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.00021655
Discounted Participant Payback (years)					n/a

Table 23. HER Program Level Cost-Effectiveness Results – PY 2017

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Utility Cost Test (UCT)	$0.0638	$3,020,132	$2,689,451	-$330,681	0.89
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0638	$3,020,132	$2,958,396	-$61,736	0.98
Total Resource Cost Test (TRC) No Adder	$0.0638	$3,020,132	$2,689,451	-$330,681	0.89
Rate Impact Test (RIM)		$8,667,995	$2,689,451	-$5,978,544	0.31
Participant Cost Test (PCT)		$0	$5,647,863	$5,647,863	n/a
Lifecycle Revenue Impacts ($/kWh)					$0.00023224
Discounted Participant Payback (years)					n/a

9. Appendix A. Regression Output

This appendix provides tables reporting the results of the various regression analyses.

Table 24. 2016-17 PO Parameter Estimates, Legacy Wave

Variable	2016		2017	
	Coefficient	*t-statistic*	*Coefficient*	*t-statistic*
(Intercept)	3.55	21.96	4.02	23.49
treatment	-0.95	-30.93	-0.92	-26.26
avgPre.kWh	0.16	9.64	0.13	7.66
avgPreSummer.kWh	-0.08	-10.67	-0.07	-9.14
avgPreWinter.kWh	0.81	103.43	0.80	95.98
factor(month)2	0.39	1.72	-0.11	-0.46
factor(month)3	0.45	2.02	0.20	0.85
factor(month)4	0.35	1.53	0.33	1.37
factor(month)5	-1.13	-4.99	-0.81	-3.38
factor(month)6	0.79	3.50	1.15	4.70
factor(month)7	3.73	16.42	5.22	21.51
factor(month)8	1.87	8.23	3.00	12.46
factor(month)9	-1.19	-5.21	-0.27	-1.10
factor(month)10	0.02	0.08	0.50	2.06
factor(month)11	1.27	5.58	1.51	5.46
factor(month)12	-0.09	-0.40	-28.73	-2.00
avgPre.kWh:factor(month)2	0.39	16.80	0.31	12.15
avgPre.kWh:factor(month)3	0.77	33.31	0.77	31.13
avgPre.kWh:factor(month)4	1.06	45.05	0.95	37.61
avgPre.kWh:factor(month)5	0.94	39.86	0.81	32.41
avgPre.kWh:factor(month)6	-0.07	-2.92	-0.10	-3.98
avgPre.kWh:factor(month)7	-0.35	-14.88	-0.29	-11.43
avgPre.kWh:factor(month)8	0.44	18.43	0.15	5.84
avgPre.kWh:factor(month)9	1.11	46.85	1.07	42.33
avgPre.kWh:factor(month)10	1.12	47.40	0.93	36.68
avgPre.kWh:factor(month)11	0.62	26.12	0.67	22.72
avgPre.kWh:factor(month)12	-0.10	-4.34		
avgPreSummer.kWh:factor(month)2	-0.13	-13.37	-0.11	-10.00
avgPreSummer.kWh:factor(month)3	-0.22	-22.10	-0.22	-20.57
avgPreSummer.kWh:factor(month)4	-0.25	-24.54	-0.21	-19.68
avgPreSummer.kWh:factor(month)5	-0.02	-2.06	0.05	4.42
avgPreSummer.kWh:factor(month)6	0.77	76.98	0.78	71.43
avgPreSummer.kWh:factor(month)7	1.06	104.97	1.02	94.77
avgPreSummer.kWh:factor(month)8	0.60	59.28	0.72	67.16
avgPreSummer.kWh:factor(month)9	0.02	2.14	0.00	0.39
avgPreSummer.kWh:factor(month)10	-0.20	-19.92	-0.20	-18.07
avgPreSummer.kWh:factor(month)11	-0.10	-10.25	-0.13	-10.55
avgPreSummer.kWh:factor(month)12	0.11	10.85		
avgPreWinter.kWh:factor(month)2	-0.35	-31.51	-0.29	-24.63
avgPreWinter.kWh:factor(month)3	-0.73	-67.12	-0.73	-62.34
avgPreWinter.kWh:factor(month)4	-1.03	-92.40	-0.95	-80.12
avgPreWinter.kWh:factor(month)5	-1.11	-99.82	-1.05	-88.47
avgPreWinter.kWh:factor(month)6	-0.82	-73.21	-0.78	-64.95
avgPreWinter.kWh:factor(month)7	-0.72	-64.70	-0.73	-61.03
avgPreWinter.kWh:factor(month)8	-1.03	-92.37	-0.90	-76.07
avgPreWinter.kWh:factor(month)9	-1.24	-110.86	-1.16	-97.08
avgPreWinter.kWh:factor(month)10	-1.15	-102.21	-0.97	-80.95

avgPreWinter.kWh:factor(month)11	-0.72	-63.99	-0.77	-55.08
avgPreWinter.kWh:factor(month)12	-0.02	-1.73		

Table 25. 2016-17. PPR Parameter Estimates, Legacy Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
(Intercept)	5.60	46.69	5.84	45.97
treatment	-0.97	-31.13	-0.94	-26.57
factor(month)2	1.99	12.05	0.76	4.29
factor(month)3	2.36	13.91	1.84	10.11
factor(month)4	2.56	14.14	2.81	14.58
factor(month)5	2.83	16.21	3.50	18.98
factor(month)6	3.45	20.23	3.49	19.03
factor(month)7	5.07	29.26	6.54	35.43
factor(month)8	3.28	18.92	4.50	24.63
factor(month)9	2.45	14.17	3.00	16.36
factor(month)10	2.93	15.94	3.86	19.73
factor(month)11	4.11	23.34	4.53	20.46
factor(month)12	1.90	11.00	-42.34	-2.93
avgPre.kWh	0.84	371.81	0.82	342.99
factor(month)2:avgPre.kWh	-0.12	-35.50	-0.10	-28.29
factor(month)3:avgPre.kWh	-0.17	-45.46	-0.16	-40.86
factor(month)4:avgPre.kWh	-0.19	-44.27	-0.19	-42.69
factor(month)5:avgPre.kWh	-0.19	-49.53	-0.18	-43.98
factor(month)6:avgPre.kWh	-0.08	-24.50	-0.06	-18.31
factor(month)7:avgPre.kWh	-0.02	-6.28	-0.01	-1.68
factor(month)8:avgPre.kWh	-0.12	-40.85	-0.12	-38.29
factor(month)9:avgPre.kWh	-0.20	-58.09	-0.17	-46.72
factor(month)10:avgPre.kWh	-0.25	-59.56	-0.27	-61.09
factor(month)11:avgPre.kWh	-0.26	-71.97	-0.28	-59.86
factor(month)12:avgPre.kWh	-0.09	-28.85		

Table 26. 2016-17. LFER Parameter Estimates, Legacy Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
post_dummy	-5.41	-122.45	-5.98	-124.51
post_dummy:treatment	-0.90	-17.76	-0.87	-15.71

Table 27. 2016-17 PO Parameter Estimates, Expansion Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
(Intercept)	2.49	43.67	3.35	51.06
treatment	-0.34	-26.21	-0.40	-24.94
avgPre.kWh	0.14	13.37	0.08	6.95
avgPreSummer.kWh	0.00	0.89	0.02	4.30
avgPreWinter.kWh	0.77	156.16	0.77	136.01
factor(month)2	-0.15	-1.94	-0.28	-3.03
factor(month)3	-0.16	-2.03	-0.45	-4.90
factor(month)4	-0.25	-3.19	-0.26	-2.84
factor(month)5	-0.72	-8.95	-1.07	-11.60
factor(month)6	1.02	12.80	1.27	13.77
factor(month)7	3.94	49.12	5.25	56.95
factor(month)8	2.34	29.08	3.00	32.54
factor(month)9	-0.39	-4.82	0.59	6.33
factor(month)10	0.41	5.05	0.30	3.21
factor(month)11	0.88	10.82	0.82	7.85
factor(month)12	0.74	9.15	-20.69	-2.39
avgPre.kWh:factor(month)2	0.37	25.35	0.40	24.26
avgPre.kWh:factor(month)3	0.91	63.59	0.82	49.27
avgPre.kWh:factor(month)4	1.11	76.72	1.06	63.24
avgPre.kWh:factor(month)5	1.04	71.36	0.94	56.32
avgPre.kWh:factor(month)6	0.06	4.20	0.04	2.38
avgPre.kWh:factor(month)7	-0.60	-40.98	-0.63	-37.24
avgPre.kWh:factor(month)8	-0.17	-11.38	-0.15	-8.98
avgPre.kWh:factor(month)9	0.73	49.98	0.61	36.07
avgPre.kWh:factor(month)10	1.10	74.77	1.06	62.58
avgPre.kWh:factor(month)11	0.92	62.38	0.97	51.35
avgPre.kWh:factor(month)12	0.17	11.61		
avgPreSummer.kWh:factor(month)2	-0.11	-19.34	-0.14	-20.21
avgPreSummer.kWh:factor(month)3	-0.27	-46.00	-0.23	-33.82
avgPreSummer.kWh:factor(month)4	-0.28	-46.80	-0.27	-39.52
avgPreSummer.kWh:factor(month)5	-0.09	-14.61	-0.01	-2.10
avgPreSummer.kWh:factor(month)6	0.75	126.47	0.75	110.03
avgPreSummer.kWh:factor(month)7	1.23	207.28	1.24	181.47
avgPreSummer.kWh:factor(month)8	0.91	152.85	0.90	131.43
avgPreSummer.kWh:factor(month)9	0.19	31.32	0.21	30.06
avgPreSummer.kWh:factor(month)10	-0.22	-36.07	-0.27	-39.08
avgPreSummer.kWh:factor(month)11	-0.23	-38.56	-0.27	-34.81
avgPreSummer.kWh:factor(month)12	-0.01	-1.58		
avgPreWinter.kWh:factor(month)2	-0.33	-46.60	-0.34	-42.41
avgPreWinter.kWh:factor(month)3	-0.78	-111.26	-0.74	-91.41
avgPreWinter.kWh:factor(month)4	-1.00	-142.87	-0.96	-118.43
avgPreWinter.kWh:factor(month)5	-1.11	-157.11	-1.06	-130.85
avgPreWinter.kWh:factor(month)6	-0.86	-121.19	-0.84	-102.35
avgPreWinter.kWh:factor(month)7	-0.61	-86.76	-0.58	-70.89
avgPreWinter.kWh:factor(month)8	-0.75	-105.57	-0.75	-92.06
avgPreWinter.kWh:factor(month)9	-1.04	-145.62	-0.92	-112.45

avgPreWinter.kWh:factor(month)10	-1.09	-152.33	-0.99	-119.96
avgPreWinter.kWh:factor(month)11	-0.83	-116.60	-0.87	-94.58
avgPreWinter.kWh:factor(month)12	-0.15	-21.45		

Table 28. 2016-17. PPR Parameter Estimates, Expansion Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
(Intercept)	5.70	133.36	6.38	129.92
treatment	-0.35	-26.21	-0.40	-24.98
factor(month)2	-0.48	-8.07	-0.63	-9.10
factor(month)3	-0.35	-5.64	-0.30	-4.25
factor(month)4	-0.52	-8.10	-0.48	-6.50
factor(month)5	-0.74	-11.65	-0.95	-13.09
factor(month)6	0.21	3.40	0.06	0.87
factor(month)7	0.33	5.15	1.56	21.34
factor(month)8	0.13	1.97	1.99	27.26
factor(month)9	0.13	2.05	-0.21	-2.83
factor(month)10	0.93	13.71	0.10	1.30
factor(month)11	1.13	17.28	0.89	10.21
factor(month)12	1.84	30.34	-23.05	-2.64
avgPre.kWh	0.79	554.67	0.76	470.61
factor(month)2:avgPre.kWh	-0.02	-7.91	-0.03	-11.04
factor(month)3:avgPre.kWh	-0.07	-28.31	-0.09	-34.00
factor(month)4:avgPre.kWh	-0.07	-25.12	-0.08	-25.48
factor(month)5:avgPre.kWh	-0.07	-28.24	-0.03	-10.93
factor(month)6:avgPre.kWh	0.11	50.87	0.12	51.97
factor(month)7:avgPre.kWh	0.07	37.87	0.09	43.40
factor(month)8:avgPre.kWh	0.14	69.76	0.10	45.29
factor(month)9:avgPre.kWh	-0.09	-38.94	-0.02	-8.89
factor(month)10:avgPre.kWh	-0.16	-56.07	-0.14	-42.22
factor(month)11:avgPre.kWh	-0.15	-60.30	-0.15	-44.45
factor(month)12:avgPre.kWh	-0.10	-51.12		

Table 29. 2016-17 LFER Parameter Estimates, Expansion Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
post_dummy	-0.28	-13.59	0.02	0.90
post_dummy:treatment	-0.35	-15.44	-0.41	-15.87

Table 30. 2016-17 *PO Parameter Estimates, Refill Wave*

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
(Intercept)	-1.23	-11.13	0.22	1.77
treatment	-0.29	-6.85	-0.38	-13.07
avgPre.kWh	1.12	78.44	0.36	21.69
avgPreSummer.kWh	0.15	24.06	-0.07	-9.98
avgPreWinter.kWh	-0.35	-53.45	0.77	100.86
factor(month)2			0.38	2.16
factor(month)3			0.84	4.83
factor(month)4			0.84	4.89
factor(month)5			0.12	0.68
factor(month)6			0.06	0.34
factor(month)7			4.25	24.49
factor(month)8			3.81	21.23
factor(month)9			2.94	15.84
factor(month)10	1.38	9.29	1.29	7.37
factor(month)11	2.65	17.11	1.71	9.16
factor(month)12	0.40	2.56	0.38	1.68
avgPre.kWh:factor(month)2			0.30	12.74
avgPre.kWh:factor(month)3			0.67	28.54
avgPre.kWh:factor(month)4			0.90	39.25
avgPre.kWh:factor(month)5			0.67	28.42
avgPre.kWh:factor(month)6			-0.08	-3.31
avgPre.kWh:factor(month)7			-0.47	-20.22
avgPre.kWh:factor(month)8			-0.14	-5.91
avgPre.kWh:factor(month)9			0.64	25.46
avgPre.kWh:factor(month)10	0.25	12.62	0.84	35.76
avgPre.kWh:factor(month)11	-0.09	-4.43	0.68	26.75
avgPre.kWh:factor(month)12	-0.56	-26.57	0.64	20.85
avgPreSummer.kWh:factor(month)2			-0.11	-10.82
avgPreSummer.kWh:factor(month)3			-0.20	-19.62
avgPreSummer.kWh:factor(month)4			-0.21	-21.10
avgPreSummer.kWh:factor(month)5			0.09	8.91
avgPreSummer.kWh:factor(month)6			0.79	72.62
avgPreSummer.kWh:factor(month)7			1.17	114.74
avgPreSummer.kWh:factor(month)8			0.91	85.59
avgPreSummer.kWh:factor(month)9			0.24	21.79
avgPreSummer.kWh:factor(month)10	-0.38	-43.03	-0.17	-16.18
avgPreSummer.kWh:factor(month)11	-0.36	-39.60	-0.15	-13.32
avgPreSummer.kWh:factor(month)12	-0.23	-24.53	-0.14	-10.12
avgPreWinter.kWh:factor(month)2			-0.29	-26.60
avgPreWinter.kWh:factor(month)3			-0.66	-62.52
avgPreWinter.kWh:factor(month)4			-0.94	-89.83
avgPreWinter.kWh:factor(month)5			-1.01	-93.39
avgPreWinter.kWh:factor(month)6			-0.84	-73.93
avgPreWinter.kWh:factor(month)7			-0.74	-69.98
avgPreWinter.kWh:factor(month)8			-0.85	-77.79
avgPreWinter.kWh:factor(month)9			-1.05	-92.01
avgPreWinter.kWh:factor(month)10	0.02	2.31	-0.96	-89.43

avgPreWinter.kWh:factor(month)11	0.39	41.15	-0.76	-65.42
avgPreWinter.kWh:factor(month)12	0.95	98.59	-0.57	-41.88

Table 31. 2016-17. PPR Parameter Estimates, Refill Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
(Intercept)	4.50	39.97	4.89	50.21
treatment	-0.29	-5.89	-0.37	-11.88
factor(month)2			-0.60	-4.41
factor(month)3			-1.05	-7.51
factor(month)4			-0.78	-5.11
factor(month)5			0.11	0.78
factor(month)6			-0.48	-3.13
factor(month)7			0.28	1.89
factor(month)8			1.90	12.52
factor(month)9			2.11	12.90
factor(month)10	1.23	8.03	2.10	13.03
factor(month)11	2.29	15.49	2.51	16.58
factor(month)12	1.06	7.26	3.37	17.28
avgPre.kWh	0.80	275.99	0.86	379.30
factor(month)2:avgPre.kWh			-0.01	-3.63
factor(month)3:avgPre.kWh			0.01	1.62
factor(month)4:avgPre.kWh			-0.02	-4.30
factor(month)5:avgPre.kWh			0.00	0.56
factor(month)6:avgPre.kWh			0.04	11.72
factor(month)7:avgPre.kWh			0.06	19.80
factor(month)8:avgPre.kWh			0.01	3.56
factor(month)9:avgPre.kWh			-0.05	-12.02
factor(month)10:avgPre.kWh	-0.08	-16.64	-0.19	-40.53
factor(month)11:avgPre.kWh	-0.07	-17.26	-0.17	-40.96
factor(month)12:avgPre.kWh	0.04	10.90	-0.15	-31.73

Table 32. 2016-17 LFER Parameter Estimates, Expansion Wave

Variable	2016		2017	
	Coefficient	t-statistic	Coefficient	t-statistic
post_dummy	-4.06	-70.86	-0.61	-13.33
post_dummy:treatment	-0.27	-3.92	-0.37	-6.64

10. Appendix B. Double Counting Analysis

To avoid double-counting of savings, program savings from other energy efficiency programs due to HER participation must be counted toward either the HER program or the other energy efficiency programs but not both. The double-counted savings, positive or negative, are subtracted from the net savings estimates from the regression analysis to get total verified savings.

Customer ID and address fields were used to identify HER treatment and control participants who had also enrolled in the Home Energy Savings (HES) and Low Income Weatherization (LIW) programs. HES and LIW program savings were categorized as: Appliances, Building Shell, Energy Kits, HVAC, Lighting, and Water Heating.

Table 33 and Table 34 detail the 2016 other program savings. In 2016, HVAC aggregated savings were highest for all waves. By wave, the Expansion Treatment reported the most savings (2,509,067 kWh).

Table 33. 2016 Other Program Savings (kWh) by Wave and Treatment Status

Measurement Type	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Appliances	27,309	82,955	35,554	158,144	17,959	34,434
Building Shell	33,709	110,840	45,593	184,797	27,152	81,000
Energy Kits	8,776	22,078	10,435	43,167	4,330	7,244
HVAC	283,327	946,474	473,678	2,084,931	216,590	427,679
Lighting	15,644	39,739	12,368	35,347	30,285	86,777
Water Heating	2,967	4,540	-	2,681	-	-
Total	**371,733**	**1,206,626**	**577,628**	**2,509,067**	296,316	637,133

By participation, HVAC had the most treatment and control customers across all waves as detailed in Table 34.

Table 34. 2016 Other Program Participants by Wave and Treatment Status

Measurement Type	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Appliances	203	631	270	1,181	131	243
Building Shell	89	328	157	632	81	177
Energy Kits	31	113	52	251	24	38
HVAC	346	1,135	589	2,447	272	530
Lighting	15	30	14	75	12	38
Water Heating	2	3	-	2		

Table 35 details the double count calculations for 2016.

Table 35. 2016 PO Regression Double Count Calculation

Wave		Total kWh Double Count	Number of Accounts	Average kWh Double Count	MWh
Legacy	Control	371,733	23,358	15.91	41.41
	Treatment	1,206,626	73,217	16.48	
Expansion	Control	577,628	40,375	14.31	91.43
	Treatment	2,509,067	168,988	14.85	
Refill	Control	296,316	17,094	17.33	13.30
	Treatment	637,133	35,988	17.70	

Table 36 and Table 37 detail the 2017 other program savings. The 2017 data were aggregated by program type and parent program (HES or LIW). In 2017, HVAC (HES) aggregated savings were highest for all waves. By wave, the Expansion Treatment reported the most savings (1,150,387 kWh).

Table 36. 2017 Other Program Savings (kWh) by Wave and Treatment Status

Measurement Type	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Appliances (HES)	6,379	16,538	7,045	31,015	3,653	5,381
Building Shell (HES)	12,767	42,549	17,304	76,145	4,873	19,644
Energy Kits (HES)	32,110	104,214	49,666	183,943	18,445	44,780
HVAC (HES)	132,689	453,038	190,459	822,882	88,027	192,137
Water Heating (HES)	-	2,788	-	3,484	-	-
Appliances (LIW)	-	879	3,516	6,153	879	4,395
HVAC (LIW)	1,046	1,569	3,138	12,029	1,046	3,661
Lighting (LIW)	899	3,397	5,817	14,737	1,084	5,471
Total	**185,888**	**624,973**	**276,945**	**1,150,387**	**118,006**	**275,469**

By participation, HVAC (HES) had the most treatment and control customers across all waves, as shown in Table 37.

Table 37. 2017 Other Program Participants by Wave and Treatment Status

Measurement Type	Legacy Wave		Expansion Wave		Refill Wave	
	Control	Treatment	Control	Treatment	Control	Treatment
Appliances (HES)	52	129	56	242	28	39
Building Shell (HES)	40	148	57	298	22	67
Energy Kits (HES)	121	352	213	845	71	158
HVAC (HES)	293	974	467	2071	191	486
Water Heating (HES)	-	3	-	2	-	-
Appliances (LIW)	-	4	5	7	1	7
HVAC (LIW)	2	3	6	23	2	-
Lighting (LIW)	2	10	13	33	3	13

Table 38 details the 2017 double-count calculations.

Table 38. 2017 PO Regression Double-Count Calculation

Wave		Total kWh Double Count	Number of Accounts	Average kWh Double Count	MWh
Legacy	Control	185,888	21,929	8.48	42.45
	Treatment	624,973	68,720	9.09	
Expansion	Control	276,945	36,378	7.61	-6.81
	Treatment	1,150,387	152,003	7.57	
Refill	Control	118,006	16,216	7.28	26.68
	Treatment	**275,469**	34,188	8.06	

11. Appendix C. Survey Instruments

This appendix provides the survey instruments used to collect information for the process evaluation from households in the treatment and control groups for the three waves.

Treatment Group Survey

Glossary of Terms:

[PROGRAM]: Program name ("Home Energy Reports")

[UTILITY_LONG]: Utility's full name (Utah is "Rocky Mountain Power", Utah is "Rocky Mountain Power")

[UTILITY_SHORT]: Utility's shortened name (if there is applicable abbreviation. Else = UTILITY_LONG)

[LOCATION]: Premise address for the contacted household

"Hello, my name is [name] with [Survey_Company], calling on behalf of [UTILITY_LONG]. We are conducting a survey of [UTILITY_LONG] customers to collect consumer feedback about the effectiveness energy efficiency programs and messaging. We are not selling anything. The survey will take 10-12 minutes, and the responses are kept strictly confidential.

May we ask you some questions about your experience with [UTILITY_LONG] energy efficiency programs and messaging?

    1. Yes
    2. No [THANK AND TERMINATE SURVEY]
    98. DON'T KNOW [THANK AND TERMINATE SURVEY]
    99. REFUSED [THANK AND TERMINATE SURVEY]

  1. **Am I reaching you on a cell phone?**

    1. Yes
    2. No

[DISPLAY Q2 IF Q1 = 1]

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

    1. Yes [CONTINUE SURVEY]
    2. No [RESCHEDULE]

  3. **We have your address listed as [LOCATION]. Is that correct?**

    1. Yes
    2. No [THANK AND TERMINATE SURVEY]
    98. DON'T KNOW [THANK AND TERMINATE SURVEY]
    99. REFUSED [THANK AND TERMINATE SURVEY]

4. **Are you the person in the household who reads communications from [UTILITY_LONG]? This would include the electric bill, notifications about your account, and other information.**

    1. Yes [SKIP TO Q6]
    2. No [DISPLAY Q5]
    98. DON'T KNOW [DISPLAY Q5
    99. REFUSED [THANK AND TERMINATE SURVEY]

5. **Can I speak to the person in your household that handles the communications you receive from [UTILITY_ LONG]?**

    1. Yes
    2. No [THANK AND TERMINATE SURVEY]
    98. DON'T KNOW [THANK AND TERMINATE SURVEY]
    99. REFUSED [THANK AND TERMINATE SURVEY]

6. **Do you recall seeing reports from [UTILITY_ LONG] in the mail or through email that describe your home's electricity use? This report includes graphs that show your electricity use and compares your use to your neighbors. This is different from your electric bill, and does not include your natural gas use.**

    1. Yes
    2. No [THANK AND TERMINATE SURVEY]
    98. DON'T KNOW [THANK AND TERMINATE SURVEY]
    99. REFUSED [THANK AND TERMINATE SURVEY]

7. **How helpful was the home energy report for understanding your household's electricity use? Was it… [READ. MARK ONE]**

    1. Very helpful
    2. Somewhat helpful
    3. Slightly helpful
    4. Not at all helpful
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

8. **How would you say your energy use compares to other homes of similar size in your neighborhood? Is your usage… [READ. MARK ONE]**

    1. Significantly higher
    2. Somewhat higher
    3. About the same
    4. Somewhat lower
    5. Significantly lower
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

9. **How would you say your home compares to your neighbors in terms of energy efficiency? Is your home… [READ. MARK ONE]**

   1. Very energy efficient
   2. Somewhat energy efficient
   3. Average
   4. Somewhat inefficient
   5. Very inefficient
   98. DON'T KNOW [DON'T READ]
   99. REFUSED [DON'T READ]

10. **Have you heard of wattSmart energy efficiency programs offered by [UTILITY_LONG]? These programs offer financial incentives for energy efficiency improvements made by residential and commercial customers**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

[DISPLAY Q11-Q15 IF Q10=1]

"I'm going to describe the energy efficiency programs offered by [UTILITY_LONG]. After I describe each one, please state whether you have heard of the program prior to this call". [READ EACH DESCRIPTION. MARK ONE ANSWER FOR EACH]

11. **[IF UTILITY_LONG= "Rocky Mountain Power", "wattSmart Homes", IF UTILITY_LONG= "Rocky Mountain Power", "Home Energy Savings"]: this program offers cash incentives for home energy efficiency improvements, including efficient lighting, appliances, heating, and cooling, as well as for home insulation.**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

12. **Low Income Weatherization. This program provides free-of-charge weatherization services to qualifying low-income customers**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

13. **AC Cool-Keeper. This program provides incentives for homes and businesses to have a control device connected to your central air conditioner, reducing its use during hot summer peak days.**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

14. **wattSmart Business. This program provides rebates to businesses for installing efficient equipment in their buildings.**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

15. **Irrigation Load Control. This program provides rebates to agricultural customers to curtail the use of their irrigation systems during hot summer peak hours.**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

"I now have a couple questions about any light bulb purchases you may have done for your home in the last year"

16. **How many CFL light bulbs have been purchased for your household in 2017? [IF NEEDED: "These are the bulbs with a spiral shape"]**

   1. [CFL_PURCHASE_QUANTITY]
   98. DON'T KNOW
   99. REFUSED

17. **Of the [CFL_ PURCHASE _QUANTITY] CFLs you've purchased in 2017, how many of them have been installed?**

   1. [CFL_INSTALL_QUANTITY]
   98. DON'T KNOW
   99. REFUSED

18. **How many LED light bulbs have been purchased for your household in 2017? [IF NEEDED: "These are more expensive energy efficient light bulbs that usually look like a regular light bulb"]**

    1. [LED_PURCHASE_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q19 IF [LED_PURCHASE_QUANTITY] > 0]

19. **Of the [LED_ PURCHASE _QUANTITY] LEDs purchased in 2017, how many of them have been installed?**

    1. [LED _INSTALL_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

20. **In 2017, did you purchase any energy efficient equipment or make energy efficiency upgrades to your home that would reduce your electricity usage?**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q21 IF Q20 = 1]

21. **What purchases or upgrades did you make in 2017? Please only include purchase or upgrades that would reduce your electricity usage. [DO NOT READ. PROBE FOR MULTIPLE]**

    1. Replaced an air conditioner/HVAC unit (AC, heat pump, window unit)
    2. Tuned-up or serviced an air conditioner/HVAC unit
    3. Installed and/or replaced an evaporative cooler
    4. CFLs/compact fluorescent lighting
    5. LED bulbs
    6. Clothes washer
    7. Clothes dryer
    8. Dishwasher
    9. Furnace fan
    10. Other fans (whole-house, attic fan, box fans, ceiling fans)
    11. Refrigerator
    12. Freezer
    13. Pool equipment – heaters, pumps, variable speed drives or controls
    14. Programmable thermostat
    15. Smart thermostat / Wi-Fi thermostat / NEST / Ecobee
    16. Water heater – storage tank, tankless, heat pump water heater
    17. Windows – double pane, triple pane, low-e windows, storm windows
    18. Solar screens
    19. Efficient electronics
    20. Insulation (attic insulation, wall insulation, floor insulation)
    21. Solar panels / solar PV
    22. Other _____
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q22 IF Q21 < 98]

22. **How important was the information from your Home Energy Report from [UTILITY_LONG] in your decision to make those energy efficient purchases or upgrades? [READ. MARK ONE]**

    1. Very important
    2. Somewhat important
    3. Slightly important
    4. Not important at all
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

23. **In the last two years, have you made any changes in your energy use habits that would conserve electricity in your home?**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q24 IF Q0=1]

24. **What actions or changes have you made? [DO NOT READ. PROBE FOR MULTIPLE]**

    1. Turned up the thermostat in summer to reduce AC use
    2. Turned down the thermostat in winter to reduce heating use
    3. Changed AC filter
    4. Changed furnace filter
    5. Clear areas around heating/cooling vents
    6. Turned off lights in unoccupied rooms
    7. Line-dry clothes
    8. Run clothes washer with full load
    9. Run dishwasher with full load
    10. Used cold water setting on clothes washer
    11. Used cold water setting on dishwasher
    12. Unplug electronics when not in use
    13. Turn off computers overnight
    14. Take shorter showers
    15. Turned down water heater setpoint
    16. Sealed leaks and drafts
    17. Cleaned refrigerator coils
    18. Increased refrigerator/freezer temperature
    19. Used heat blocking materials on windows / shaded windows during hot daytime
    20. Increased use of fans to reduce use of AC
    21. Shifted use off-peak (e.g., avoided use of laundry/electronics/ during peak time)
    22. Other _____
    98. DON'T KNOW
    99. REFUSED

25. **How important was the information from your Home Energy Report in your decision to take these actions to conserve energy? [READ. MARK ONE]**

    1. Very important
    2. Somewhat important
    3. Slightly important
    4. Not important at all
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

26. **Overall, on a scale of "1 to 5" where "1" means "Not at all knowledgeable" and "5" means "Very knowledgeable," how knowledgeable are you about ways to save energy in your home?**

    1. [SCORE]
    98. DON'T KNOW
    99. REFUSED

27. **How would you rate your household's efforts to save electricity in your home? Using a scale of 1 to 5, with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can" to lower your monthly energy bill in your home.**

    1. [SCORE]
    98. DON'T KNOW [SKIP TO Q29]
    99. REFUSED [SKIP TO Q29]

28. **What motivated you to save electricity in your home? [DO NOT READ. MARK ALL INDICATED]**

    1. Reduce electricity costs / reduce electric bill
    2. Conservation / good for environment
    3. Make my usage more similar to my neighbors
    4. Other _____[RECORD VERBATIM]
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

29. **How much time would you say you typically spend reading the Home Energy Report?… [READ. MARK ONE].**

    1. [RECORD VERBATIM]
    98. DON'T KNOW
    99. REFUSED

30. **How many reports would you like to receive per year? Would you say… [READ. MARK ONE]**

      1. More often than you're currently sent;
      2. The same that you're currently sent; or
      3. Less than you're currently sent
      4. No reports at all
      98. DON'T KNOW
      99. REFUSED

31. **On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with the following Home Energy Report items? Please note that if you do not feel you are able to provide a score, you may say "I don't know". [RANDOMIZE 31i-31iv. 31v ALWAYS SECOND TO LAST. 31Error! Reference source not found. ALWAYS LAST] [ALLOW FOR 98 CODE FOR "DON'T KNOW" AND 99 CODE FOR "REFUSED"]**

      i. The energy saving tips provided in your report

      ii. The accuracy of the report in characterizing your home's energy use

      iii. The savings on your bill after acting on recommendations in the report

      iv. The level of detail in the report

      v. The program overall

[DISPLAY Q32 IF ANY IN Q31 <3]

32. **You indicated some dissatisfaction with Home Energy Reports. Why were you dissatisfied?**

      1. (VERBATIM)
      98. DON'T KNOW
      99. REFUSED

Company Satisfaction

The next questions relate to your <u>overall experience</u> as a customer of **[UTLITY_LONG].**

33. **Now, thinking about your experiences with [UTILITY_LONG] as your electric utility, how satisfied would you say you are with [UTILITY_LONG]?**

Please use a scale from 0 to 10 where "0" means "extremely dissatisfied" and "10" means "extremely satisfied." You can use any number between zero and ten.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

34. **Why did you give [UTILITY_LONG] a [INSERT Q33 RATING] on overall satisfaction?**

> *Please be specific.*

_____

DEMOGRAPHIC

"I now have a couple of questions about your household. These are anonymous and will be used solely for the purpose of combining different customers' responses. If you do not want to answer any of these, let me know. It is okay to not answer any of these questions."

35. **Do you own or rent the home in which you live?**

    1. Own
    2. Rent
    98. DON'T KNOW
    99. REFUSED

36. **Which of the following brackets contains your age? [READ. MARK ONE. MARK APPLICABLE ANSWER IF CUSTOMER INTERRUPTS AND STATES EXACT AGE]**

    1. 18-24
    2. 25-34
    3. 35-44
    4. 45-54
    5. 55-64
    6. 65 or over
    98. DON'T KNOW
    99. REFUSED

37. **How many people live in your household full time?**

    1. [#OCCUPANTS]
    98. DON'T KNOW
    99. REFUSED

38. **I'm going to read off a list of income ranges, please indicate which range your total pre-tax household income falls. This is the total annual income of your household:**

    1.   Less than $25,000
    2. $25,000 - $49,999
    3. $50,000 – $74,999
    4. $75,000 - $99,999
    5. $100,000-$149,999
    6. $150,000 or above
    98.   DON'T KNOW
    99.   REFUSED

39. **What's the highest level of education you've completed? (DON'T READ)**

    1.   Up to 8th grade
    2.   Some high school
    3.   High school or GED equivalent
    4.   Some college
    5.   Associate's degree
    6.   Bachelor's college degree
    7.   Graduate degree/professional degree/JD/MD
    98.   DON'T KNOW
    99.   REFUSED
    100.

40. **[INTERVIEWER: RECORD RESPONDENT'S GENDER. DO NOT ASK]**

    1. Male
    2. Female
    3. Don't know

Control Group Survey

Glossary of Terms:

[UTILITY_LONG]: Utility's full name ("Rocky Mountain Power", "Rocky Mountain Power")

[UTILITY_SHORT]: Utility's shortened name (if there is applicable abbreviation. Else = UTILITY_LONG)

[LOCATION]: Premise address for the contacted household

"Hello, my name is [name] with [Survey_Company], calling on behalf of [UTILITY_LONG]. We are conducting a survey of [UTILITY_LONG] customers to collect information on household energy use habits. We are not selling anything. The survey will take 5-7 minutes, and the responses are kept strictly confidential.

May we ask you some questions about your household energy use?

> 1. Yes
> 2. No [THANK AND TERMINATE SURVEY]
> 98. DON'T KNOW [THANK AND TERMINATE SURVEY]
> 99. REFUSED [THANK AND TERMINATE SURVEY]

1. Am I reaching you on a cell phone?

> 1. Yes
> 2. No

[DISPLAY Q2 IF Q1 = 1]

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

> 1. Yes [CONTINUE SURVEY]
> 2. No [RESCHEDULE]

3. **We have your address listed as [LOCATION]. Is that correct?**

> 1. Yes
> 2. No [THANK AND TERMINATE SURVEY]
> 98. DON'T KNOW [THANK AND TERMINATE SURVEY]
> 99. REFUSED [THANK AND TERMINATE SURVEY]

4. **How would you say your energy use compares to other homes of similar size in your neighborhood? Is your usage… [READ. MARK ONE]**

> 1. Significantly higher
> 2. Somewhat higher
> 3. About the same
> 4. Somewhat lower
> 5. Significantly lower
> 98. DON'T KNOW [DON'T READ]
> 99. REFUSED [DON'T READ]

5. **How would you say your home compares to your neighbors in terms of energy efficiency? Is your home… [READ. MARK ONE]**

   1. Very energy efficient
   2. Somewhat energy efficient
   3. Average
   4. Somewhat inefficient
   5. Very inefficient
   98. DON'T KNOW [DON'T READ]
   99. REFUSED [DON'T READ]

6. **Have you heard of wattSmart energy efficiency programs offered by [UTILITY_LONG]? These programs offer financial incentives for energy efficiency improvements made by residential and commercial customers**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

[DISPLAY Q11-Q15 IF Q10=1]

"I'm going to describe the energy efficiency programs offered by [UTILITY_LONG]. After I describe each one, please state whether you have heard of the program prior to this call". [READ EACH DESCRIPTION. MARK ONE ANSWER FOR EACH]

7. **[IF UTILITY_LONG= "Rocky Mountain Power", "wattSmart Homes", IF UTILITY_LONG= "Rocky Mountain Power", "Home Energy Savings"]: this program offers cash incentives for home energy efficiency improvements, including efficient lighting, appliances, heating, and cooling, as well as for home insulation.**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

8. **Low Income Weatherization. This program provides free-of-charge weatherization services to qualifying low-income customers**

   1. Yes
   2. No
   98. DON'T KNOW
   99. REFUSED

9. **AC Cool-Keeper. This program provides incentives for homes and businesses to have a control device connected to your central air conditioner, reducing its use during hot summer peak days.**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

10. **wattSmart Business. This program provides rebates to businesses for installing efficient equipment in their buildings.**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

11. **Irrigation Load Control. This program provides rebates to agricultural customers to curtail the use of their irrigation systems during hot summer peak hours.**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

"I now have a couple questions about any light bulb purchases you may have done for your home in the last year"

12. **How many CFL light bulbs have been purchased for your household in the last year? [IF NEEDED: "These are the bulbs with a spiral shape"]**

    1. [CFL_PURCHASE_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

13. **Of the [CFL_ PURCHASE _QUANTITY] CFLs you've purchased in the last year, how many of them have been installed?**

    1. [CFL_INSTALL_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

14. **How many LED light bulbs have been purchased for your household in the last year? [IF NEEDED: "These are more expensive energy efficient light bulbs that usually look like a regular light bulb"]**

    1. [LED_PURCHASE_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q19 IF [LED_PURCHASE_QUANTITY] > 0]

15. **Of the [LED_ PURCHASE _QUANTITY] LEDs purchased in the last year, how many of them have been installed?**

    1. [LED _INSTALL_QUANTITY]
    98. DON'T KNOW
    99. REFUSED

16. **In 2017, did you purchase any energy efficient equipment or make energy efficiency upgrades to your home that would reduce your electricity usage?**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

[DISPLAY Q21 IF Q16 = 1]

17. **What other purchases or upgrades did you make in 2017? Please only include purchase or upgrades that would reduce your electricity usage. [DO NOT READ. PROBE FOR MULTIPLE]**

    1. Replaced an air conditioner/HVAC unit (AC, heat pump, window unit)
    2. Tuned-up or serviced an air conditioner/HVAC unit
    3. Installed and/or replaced an evaporative cooler
    4. CFLs/compact fluorescent lighting
    5. LED bulbs
    6. Clothes washer
    7. Clothes dryer
    8. Dishwasher
    9. Furnace fan
    10. Other fans (whole-house, attic fan, box fans, ceiling fans)
    11. Refrigerator
    12. Freezer
    13. Pool equipment – heaters, pumps, variable speed drives or controls
    14. Programmable thermostat
    15. Smart thermostat / Wi-Fi thermostat / NEST / Ecobee
    16. Water heater – storage tank, tankless, heat pump water heater
    17. Windows – double pane, triple pane, low-e windows, storm windows
    18. Solar screens
    19. Efficient electronics
    20. Insulation (attic insulation, wall insulation, floor insulation)
    21. Solar panels / solar PV
    22. Other _____
    98. DON'T KNOW
    99. REFUSED

18. **In the last two years, have you made any changes in your energy use habits that would conserve energy in your home?**

    1. Yes
    2. No
    98. DON'T KNOW
    99. REFUSED

19. **What actions or changes have you made? [DO NOT READ. PROBE FOR MULTIPLE]**

     1. Turned up the thermostat in summer to reduce AC use
     2. Turned down the thermostat in winter to reduce heating use
     3. Changed AC filter
     4. Changed furnace filter
     5. Clear areas around heating/cooling vents
     6. Turned off lights in unoccupied rooms
     7. Line-dry clothes
     8. Run clothes washer with full load
     9. Run dishwasher with full load
     10. Used cold water setting on clothes washer
     11. Used cold water setting on dishwasher
     12. Unplug electronics when not in use
     13. Turn off computers overnight
     14. Take shorter showers
     15. Turned down water heater setpoint
     16. Sealed leaks and drafts
     17. Cleaned refrigerator coils
     18. Increased refrigerator/freezer temperature
     19. Used heat blocking materials on windows / shaded windows during hot daytime
     20. Increased use of fans to reduce use of AC
     21. Shifted use off-peak (e.g., avoided use of laundry/electronics/ during peak time)
     22. Other _____
     98. DON'T KNOW
     99. REFUSED

20. **Overall, on a scale of "1 to 5" where "1" means "Not at all knowledgeable" and "5" means "Very knowledgeable," how knowledgeable are you about ways to save energy in your home?**

     1. [SCORE]
     98. DON'T KNOW
     99. REFUSED

21. **How would you rate your household's efforts to save electricity in your home? Using a scale of 1 to 5, with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can" to lower your monthly energy bill in your home.**

     1. [SCORE]
     98. DON'T KNOW [SKIP TO Q33]
     99. REFUSED [SKIP TO Q33]

[DISPLAY Q28 IF Q27 ≥ 3]

22. **What motivated you to save electricity in your home? [DO NOT READ. MARK ALL INDICATED]**

    1. Reduce electricity costs / reduce electric bill
    2. Conservation / good for environment
    3. Make my usage more similar to my neighbors
    4. Other _____[RECORD VERBATIM]
    98. DON'T KNOW [DON'T READ]
    99. REFUSED [DON'T READ]

Company Satisfaction

The next questions relate to your <u>overall experience</u> as a customer of **[UTLITY_LONG].**

23. **Now, thinking about your experiences with [UTILITY_LONG] as your electric utility, how satisfied would you say you are with [UTILITY_LONG]?**

Please use a scale from 0 to 10 where "0" means "extremely dissatisfied" and "10" means "extremely satisfied." You can use any number between zero and ten.

Extremely dissatisfied										Extremely satisfied
0	1	2	3	4	5	6	7	8	9	10

24. **Why did you give [UTILITY_LONG] a [INSERT Q23 RATING] on overall satisfaction?**

    Please be specific.

DEMOGRAPHIC

I now have a couple of questions about your household. These are anonymous and will be used solely for the purpose of combining different customers' responses. If you do not want to answer any of these, let me know. It is okay to not answer any of these questions."

25. **Do you own or rent the home in which you live?**

    1. Own
    2. Rent
    98. DON'T KNOW
    99. REFUSED

26. **Which of the following brackets contains your age? [READ. MARK ONE. MARK APPLICABLE ANSWER IF CUSTOMER INTERRUPTS AND STATES EXACT AGE]**

   1. 18-24
   2. 25-34
   3. 35-44
   4. 45-56
   5. 55-64
   6. 65 or over
   98. DON'T KNOW
   99. REFUSED

27. **How many people live in your household full time?**

   1. [#OCCUPANTS]
   98. DON'T KNOW
   99. REFUSED

28. **I'm going to read off a list of income ranges, please indicate which range your total pre-tax household income falls. This is the total annual income of your household:**

   1.   Less than $25,000
   2. $25,000 - $49,999
   3. $50,000 – $74,999
   4. $75,000 - $99,999
   5. $100,000-$149,999
   6. $150,000 or above
   98.   DON'T KNOW
   99.   REFUSED

29. **What's the highest level of education you've completed? (DON'T READ)**

   1.   Up to 8th grade
   2.   Some high school
   3.   High school or GED equivalent
   4.   Some college
   5.   Associate's degree
   6.   Bachelor's college degree
   7.   Graduate degree/professional degree/JD/MD
   98.   DON'T KNOW
   99.   REFUSED

30. **[INTERVIEWER: RECORD RESPONDENT'S GENDER. DO NOT ASK]**

   1. Male
   2. Female
   3. Don't know

12. Appendix D. Survey Tabulations

This appendix provides tabulations of the responses from the surveys of treatment and control group customers.

12.1 Treatment Group Survey Tabulations

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
7. How helpful was the home energy report for understanding your household's electricity use? Was it… [READ. MARK ONE]	Very helpful	15	19%	16	20%	13	16%	44	18%
	Somewhat helpful	26	33%	27	34%	30	38%	83	35%
	Slightly helpful	14	18%	13	16%	15	19%	42	18%
	Not at all helpful	22	28%	22	28%	21	26%	65	27%
	Don't know	3	4%	1	1%	1	1%	5	2%
	Refused	0	0%	1	1%	0	0%	1	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
8. How would you say your energy use compares to other homes of similar size in your neighborhood? Is your usage… [READ. MARK ONE]	Significantly higher	14	18%	9	11%	16	20%	39	16%
	Somewhat higher	30	38%	17	21%	27	34%	74	31%
	About the same	19	24%	25	31%	23	29%	67	28%
	Somewhat lower	7	9%	17	21%	4	5%	28	12%
	Significantly lower	2	3%	5	6%	3	4%	10	4%
	Don't know	8	10%	4	5%	7	9%	19	8%
	Refused	0	0%	3	4%	0	0%	3	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
9. How would you say your home compares to your neighbors in terms of energy efficiency? Is your home… [READ. MARK ONE]	Very energy efficient	10	13%	13	16%	17	21%	40	17%
	Somewhat energy efficient	18	23%	21	26%	10	13%	49	20%
	Average	41	51%	35	44%	30	38%	106	44%
	Somewhat inefficient	5	6%	4	5%	12	15%	21	9%
	Very inefficient	0	0%	3	4%	5	6%	8	3%
	Don't know	5	6%	2	3%	6	8%	13	5%
	Refused	1	1%	2	3%	0	0%	3	1%
	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
10. Have you heard of WattSmart energy efficiency programs offered by [UTILITY_LONG]? These programs offer financial incentives for energy efficiency improvements made by residential and commercial customers	Yes	56	70%	58	73%	43	54%	157	65%
	No	24	30%	20	25%	32	40%	76	32%
	Don't know	0	0%	1	1%	5	6%	6	3%
	Refused	0	0%	1	1%	0	0%	1	0%
	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 56)	Count	Percent (n = 58)	Count	Percent (n = 43)	Count	Percent (n = 157)
11. Have you heard of WattSmart energy efficiency programs offered by Rocky Mountain Power?	Yes	47	84%	49	84%	38	88%	134	85%
	No	6	11%	9	16%	5	12%	20	13%
	Don't know	3	5%	0	0%	0	0%	3	2%
	Refused	0	0%	0	0%	0	0%	0	0%

12. Low Income Weatherization. This program provides free-of-charge weatherization services to qualifying low-income customers	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 56)	Count	Percent (n = 58)	Count	Percent (n = 43)	Count	Percent (n = 157)
	Yes	22	39%	23	40%	17	40%	62	39%
	No	34	61%	34	59%	25	58%	93	59%
	Don't know	0	0%	1	2%	1	2%	2	1%
	Refused	0	0%	0	0%	0	0%	0	0%

13. AC Cool-Keeper. This program provides incentives for homes and businesses to have a control device connected to your central air conditioner, reducing its use during hot summer peak days.	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 56)	Count	Percent (n = 58)	Count	Percent (n = 43)	Count	Percent (n = 157)
	Yes	40	71%	31	53%	25	58%	96	61%
	No	16	29%	24	41%	18	42%	58	37%
	Don't know	0	0%	3	5%	0	0%	3	2%
	Refused	0	0%	0	0%	0	0%	0	0%

14. WattSmart Business. This program provides rebates to businesses for installing efficient equipment in their buildings.	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 56)	Count	Percent (n = 58)	Count	Percent (n = 43)	Count	Percent (n = 157)
	Yes	20	36%	22	38%	14	33%	56	36%
	No	36	64%	34	59%	28	65%	98	62%
	Don't know	0	0%	2	3%	1	2%	3	2%
	Refused	0	0%	0	0%	0	0%	0	0%

15. Irrigation Load Control. This program provides rebates to agricultural customers to curtail the use of their irrigation systems during hot summer peak hours.	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 56)	Count	Percent (n = 58)	Count	Percent (n = 43)	Count	Percent (n = 157)
	Yes	5	9%	5	9%	5	12%	15	10%
	No	50	89%	51	88%	38	88%	139	89%
	Don't know	1	2%	2	3%	0	0%	3	2%
	Refused	0	0%	0	0%	0	0%	0	0%

16. How many CFLs have been purchased for your household in 2017?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 240)
	Mean value	66	4.12	70	6.10	63	4.62	199	4.75
	Don't know	14	18%	9	11%	17	21%	40	17%
	Refused	0	0%	1	1%	0	0%	1	0%
17. Of the [x] CFLs purchased, how many of them have been installed?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 30)	Count	Response (n = 42)	Count	Response (n = 35)	Count	Response (n = 107)
	Mean value	28	8.50	41	8.22	35	7.60	104	8.53
	Don't know	2		1		0		3	3%
	Refused	0		0		0		0	0%

18. How many LEDs have been purchased for your household in 2017?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 240)
	Mean value	68	10.24	69	10.04	62	8.24	199	10.81
	Don't know	12	15%	10	13%	18	23%	40	17%
	Refused	0	0%	1	1%	0	0%	1	0%
19. Of the [x] LEDs purchased, how many of them have been installed	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n =45)	Count	Response (n =52)	Count	Response (n = 44)	Count	Response (n = 141)
	Mean value	44	12.82	52	10.04	44	9.98	140	12.76
	Don't know	1	2%	0	0%	0	0%	1	1%
	Refused	0	0%	0	0%	0	0%	0	0%

20. In 2017, did you purchase any energy efficient equipment or make energy efficiency upgrades to your home that would reduce your electricity usage?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	Yes	30	38%	28	35%	21	26%	79	33%
	No	49	61%	52	65%	57	71%	158	66%
	Don't know	1	1%	0	0%	2	3%	3	1%
	Refused	0	0%	0	0%	0	0%	0	0%

		Legacy Wave		Expansion Wave		Refill Wave	
	Response	Count	Percent	Count	Percent	Count	Percent
21. What purchases or upgrades did you make in 2017? Please only include purchase or upgrades that would reduce your electricity usage. [DO NOT READ. PROBE FOR MULTIPLE]	Replaced an air conditioner/HVAC unit (AC, heat pump, window unit)	2	4%	6	11%	3	8%
	Tuned-up or serviced an air conditioner/HVAC unit	0	0%	1	2%	0	0%
	Installed and/or replaced an evaporative cooler	0	0%	1	2%	1	3%
	CFLs/compact fluorescent lighting	1	2%	3	5%	0	0%
	LED bulbs	5	11%	6	11%	4	11%
	Clothes washer	3	6%	3	5%	4	11%
	Clothes dryer	3	6%	5	9%	4	11%
	Dishwasher	1	2%	3	5%	3	8%
	Furnace fan	0	0%	2	4%	2	5%
	Other fans (whole-house, attic fan, box fans, ceiling fans)	0	0%	1	2%	0	0%
	Refrigerator	9	19%	6	11%	3	8%
	Freezer	0	0%	0	0%	0	0%
	Pool equipment – heaters, pumps, variable speed drives or controls	0	0%	0	0%	0	0%
	Programmable thermostat	2	4%	1	2%	0	0%
	Smart thermostat / Wi-Fi thermostat / NEST / Ecobee	2	4%	1	2%	0	0%
	Water heater – storage tank, tankless, heat pump water heater	3	6%	1	2%	2	5%
	Windows – double pane, triple pane, low-e windows, storm windows	2	4%	2	4%	0	0%
	Solar screens	1	2%	0	0%	1	3%
	Efficient electronics	1	2%	1	2%	0	0%
	Insulation (attic insulation, wall insulation, floor insulation)	2	4%	2	4%	3	8%
	Solar panels / solar PV	1	2%	0	0%	1	3%
	Other _____	6	13%	12	21%	5	14%
	Don't know	3	6%	0	0%	1	3%
	Refused	0	0%	0	0%	0	0%

22. How important was the information from your Home Energy Report from [UTILITY_LONG] in your decision to make those energy efficient purchases or upgrades?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 27)	Count	Percent (n = 28)	Count	Percent (n = 20)	Count	Percent (n = 75)
	Very important	6	22%	2	7%	5	25%	13	17%
	Somewhat important	6	22%	6	21%	7	35%	19	25%
	Slightly important	2	7%	3	11%	3	15%	8	11%
	Not important at all	13	48%	16	57%	5	25%	34	45%
	Don't know	0	0%	1	4%	0	0%	1	1%
	Refused	0	0%	0	0%	0	0%	0	0%
23. In the last two years, have you made any changes in your energy use habits that would conserve electricity in your home?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	Yes	31	39%	38	48%	39	49%	108	45%
	No	48	60%	40	50%	41	51%	129	54%
	Don't know	1	1%	2	3%	0	0%	3	1%
	Refused	0	0%	0	0%	0	0%	0	0%

Response	Legacy Wave		Expansion Wave		Refill Wave	
	Count	Percent	Count	Percent	Count	Percent
Turned up the thermostat in summer to reduce AC use	7	15%	9	17%	6	9%
Turned down the thermostat in winter to reduce heating use	7	15%	9	17%	14	21%
Changed AC filter	0	0%	0	0%	0	0%
Changed furnace filter	0	0%	0	0%	1	1%
Clear areas around heating/cooling vents	0	0%	1	2%	0	0%
Turned off lights in unoccupied rooms	13	27%	13	25%	21	31%
Line-dry clothes	1	2%	0	0%	1	1%
Run clothes washer with full load	0	0%	0	0%	1	1%
Run dishwasher with full load	0	0%	0	0%	2	3%
Used cold water setting on clothes washer	0	0%	0	0%	0	0%
Used cold water setting on dishwasher	0	0%	0	0%	0	0%
Unplug electronics when not in use	2	4%	3	6%	2	3%
Turn off computers overnight	0	0%	1	2%	4	6%
Take shorter showers	0	0%	0	0%	0	0%
Turned down water heater setpoint	1	2%	0	0%	1	1%
Sealed leaks and drafts	1	2%	0	0%	0	0%
Cleaned refrigerator coils	0	0%	0	0%	0	0%
Increased refrigerator/freezer temperature	1	2%	0	0%	0	0%
Used heat blocking materials on windows / shaded windows during hot daytime	1	2%	0	0%	1	1%
Increased use of fans to reduce use of AC	0	0%	1	2%	1	1%
Shifted use off-peak	0	0%	0	0%	0	0%
Other _____	13	27%	13	25%	13	19%
Don't know	1	2%	2	4%	0	0%
Refused	0	0%	1	2%	0	0%

24. What actions or changes have you made? [DO NOT READ. PROBE FOR MULTIPLE]

25. How important was the	Response	Legacy Wave	Expansion Wave	Refill Wave	All Waves

information from your Home Energy Report in your decision to take these actions to conserve energy?		Count	Percent (n = 79)	Count	Percent (n = 77)	Count	Percent (n = 80)	Count	Percent (n = 236)
	Very important	14	18%	10	13%	13	16%	37	16%
	Somewhat important	26	33%	31	40%	21	26%	78	33%
	Slightly important	8	10%	10	13%	22	28%	40	17%
	Not important at all	28	35%	25	32%	22	28%	75	32%
	Don't know	2	3%	1	1%	2	3%	5	2%
	Refused	1	1%	0	0%	0	0%	1	0%

		Legacy Wave		Expansion Wave		Refill Wave		All Waves	
26. Overall, on a scale of "1 to 5" where "1" means "Not at all knowledgeable" and "5" means "Very knowledgeable," how knowledgeable are you about ways to save energy in your home?	Response	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	1 (Not at all knowledgeable)	0	0%	2	3%	1	1%	3	1%
	2	4	5%	2	3%	4	5%	10	4%
	3	25	31%	24	30%	21	26%	70	29%
	4	21	26%	31	39%	27	34%	79	33%
	5 (Very knowledgeable)	29	36%	19	24%	26	33%	74	31%
	Don't know	0	0%	0	0%	1	1%	1	0%
	Refused	1	1%	2	3%	0	0%	3	1%

		Legacy Wave		Expansion Wave		Refill Wave		All Waves	
27. How would you rate your household's efforts to save electricity in your home? Using a scale of 1 to 5, with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can" to lower your monthly energy bill in your home.	Response	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	1 (Have not done much)	3	4%	4	5%	4	5%	11	5%
	2	4	5%	8	10%	8	10%	20	8%
	3	36	45%	31	39%	27	34%	94	39%
	4	27	34%	27	34%	25	31%	79	33%
	5 (Done almost everything you can)	9	11%	10	13%	16	20%	35	15%
	Don't know	0	0%	0	0%	0	0%	0	0%
	Refused	1	1%	0	0%	0	0%	1	0%

		Legacy Wave		Expansion Wave		Refill Wave		All Waves	
	Response	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
28. What motivated you to save electricity in your home? [DO NOT READ. MARK ALL INDICATED]	Reduce electricity costs / reduce electric bill	54	68%	54	72%	58	76%	173	72%
	Conservation / good for environment	15	19%	17	23%	13	17%	47	20%
	Make my usage more similar to my neighbors	2	3%	0	0%	1	1%	3	1%
	Other _____[RECORD VERBATIM]	5	6%	3	4%	1	1%	9	4%
	Don't know	2	3%	1	1%	3	4%	7	3%
	Refused	1	1%	0	0%	0	0%	1	<1%
		Legacy Wave		Expansion Wave		Refill Wave		All Waves	
	Response	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
30. How many reports would you like to receive per year? Would you say…	More often than you're currently sent	6	8%	2	3%	3	4%	11	5%
	The same that you're currently sent	42	53%	51	64%	48	60%	141	59%
	Less than you're currently sent	24	30%	16	20%	20	25%	60	25%
	No reports at all	6	8%	10	13%	6	8%	22	9%
	Don't know	1	1%	1	1%	3	4%	5	2%
	Refused	1	1%	0	0%	0	0%	1	<1%
		Legacy Wave		Expansion Wave		Refill Wave		All Waves	
	Response	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
31i. On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with i. The energy saving tips provided in your report	1 (Very Dissatisfied)	7	9%	4	5%	1	1%	12	5%
	2	6	8%	9	11%	9	11%	24	10%
	3	21	26%	17	21%	21	26%	59	25%
	4	18	23%	16	20%	20	25%	54	23%
	5 (Very Satisfied)	15	19%	21	26%	11	14%	47	20%
	98	11	14%	13	16%	18	23%	42	18%
	99	2	3%	0	0%	0	0%	2	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
31ii. On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with ii. The accuracy of the report in characterizing your home's energy use	1 (Very Dissatisfied)	14	18%	10	13%	7	9%	31	13%
	2	9	11%	7	9%	6	8%	22	9%
	3	14	18%	11	14%	23	29%	48	20%
	4	15	19%	19	24%	16	20%	50	21%
	5 (Very Satisfied)	14	18%	16	20%	10	13%	40	17%
	98	11	14%	17	21%	18	23%	46	19%
	99	3	4%	0	0%	0	0%	3	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
31iii. On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with iii. The savings on your bill after acting on recommendations in the report	1 (Very Dissatisfied)	12	15%	13	16%	8	10%	33	14%
	2	4	5%	11	14%	6	8%	21	9%
	3	27	34%	15	19%	32	40%	74	31%
	4	9	11%	13	16%	9	11%	31	13%
	5 (Very Satisfied)	10	13%	7	9%	3	4%	20	8%
	98	16	20%	21	26%	22	28%	59	25%
	99	2	3%	0	0%	0	0%	2	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
31iv. On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with iv. The level of detail in the report	1 (Very Dissatisfied)	10	13%	6	8%	4	5%	20	8%
	2	2	3%	8	10%	6	8%	16	7%
	3	22	28%	21	26%	15	19%	58	24%
	4	20	25%	19	24%	22	28%	61	25%
	5 (Very Satisfied)	15	19%	21	26%	18	23%	54	23%
	98	9	11%	5	6%	15	19%	29	12%
	99	2	3%	0	0%	0	0%	2	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
31v. On a scale of 1-5, where "1" is "very dissatisfied" and "5" is "very satisfied," how satisfied would you say you are with *v. The program overall*	1 (Very Dissatisfied)	8	10%	7	9%	4	5%	19	8%
	2	7	9%	4	5%	4	5%	15	6%
	3	22	28%	23	29%	21	26%	66	28%
	4	21	26%	20	25%	24	30%	65	27%
	5 (Very Satisfied)	18	23%	22	28%	17	21%	57	24%
	98	3	4%	4	5%	10	13%	17	7%
	99	1	1%	0	0%	0	0%	1	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
33. Now, thinking about your experiences with [UTILITY_LONG] as your electric utility, how satisfied would you say you are with [UTILITY_LONG]?	0 (Extremely dissatisfied)	2	3%	0	0%	1	1%	3	1%
	1	0	0%	0	0%	1	1%	1	0%
	2	1	1%	1	1%	3	4%	5	2%
	3	0	0%	2	3%	1	1%	3	1%
	4	1	1%	3	4%	2	3%	6	3%
	5	7	9%	9	11%	5	6%	21	9%
	6	3	4%	8	10%	3	4%	14	6%
	7	11	14%	8	10%	9	11%	28	12%
	8	22	28%	24	30%	26	33%	72	30%
	9	10	13%	11	14%	12	15%	33	14%
	10 (Extremely satisfied)	23	29%	14	18%	17	21%	54	23%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
35. Do you own or rent the home in which you live?	Own	73	91%	73	91%	68	85%	214	89%
	Rent	1	1%	4	5%	7	9%	12	5%
	Don't know	0	0%	0	0%	0	0%	0	0%
	Refused	6	8%	3	4%	5	6%	14	6%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
36. Which of the following brackets contains your age?	18-24	0	0%	0	0%	0	0%	0	0%
	25-34	2	3%	12	15%	9	11%	23	10%
	35-44	10	13%	18	23%	14	18%	42	18%
	45-56	14	18%	18	23%	17	21%	49	20%
	55-64	23	29%	13	16%	10	13%	46	19%
	65 or over	27	34%	17	21%	24	30%	68	28%
	Don't know	0	0%	0	0%	1	1%	1	0%
	Refused	4	5%	2	3%	5	6%	11	5%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
37. How many people live in your household full time?	1	3	4%	7	9%	8	10%	18	8%
	2	34	43%	26	33%	30	38%	90	38%
	3	8	10%	16	20%	10	13%	34	14%
	4	11	14%	11	14%	8	10%	30	13%
	5	8	10%	10	13%	7	9%	25	10%
	6	4	5%	4	5%	5	6%	13	5%
	7	0	0%	0	0%	2	3%	2	1%
	8	4	5%	0	0%	1	1%	5	2%
	9	3	4%	1	1%	1	1%	5	2%
	10	1	1%	1	1%	0	0%	2	1%
	Don't know	0	0%	2	3%	0	0%	2	1%
	Refused	4	5%	1	1%	8	10%	13	5%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
38. I'm going to read off a list of income ranges, please indicate which range your total pre-tax household income falls. This is the total annual income of your household:	Less than $25,000	4	5%	2	3%	6	8%	12	5%
	$25,000 - $49,999	11	14%	9	11%	12	15%	32	13%
	$50,000 – $74,999	12	15%	12	15%	19	24%	43	18%
	$75,000 - $99,999	12	15%	13	16%	10	13%	35	15%
	$100,000-$149,999	14	18%	13	16%	3	4%	30	13%
	$150,000 or above	7	9%	9	11%	4	5%	20	8%
	Don't know	1	1%	2	3%	1	1%	4	2%
	Refused	19	24%	20	25%	25	31%	64	27%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
39. What's the highest level of education you've completed? (DON'T READ)	Up to 8th grade	0	0%	1	1%	1	1%	2	1%
	Some high school	3	4%	2	3%	1	1%	6	3%
	High school or GED equivalent	12	15%	9	11%	19	24%	40	17%
	Some college	20	25%	19	24%	22	28%	61	25%
	Associate's degree	4	5%	6	8%	8	10%	18	8%
	Bachelor's college degree	23	29%	27	34%	12	15%	62	26%
	Graduate degree/professional degree/JD/MD	12	15%	13	16%	12	15%	37	15%
	Don't know	0	0%	1	1%	0	0%	1	0%
	Refused	6	8%	2	3%	5	6%	13	5%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
40. [INTERVIEWER: RECORD RESPONDENT'S GENDER. DO NOT ASK]	Male	42	53%	48	60%	43	54%	133	55%
	Female	37	46%	32	40%	36	45%	105	44%
	Don't know	1	1%	0	0%	1	1%	2	1%

12.2 Control Group Survey Tabulations

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
4. How would you say your energy use compares to other homes of similar size in your neighborhood? Is your usage… [READ. MARK ONE]	Significantly higher	6	8%	2	3%	8	10%	16	7%
	Somewhat higher	13	16%	11	14%	9	11%	33	14%
	About the same	33	41%	39	49%	35	44%	107	45%
	Somewhat lower	8	10%	11	14%	9	11%	28	12%
	Significantly lower	1	1%	3	4%	2	3%	6	3%
	Don't know	19	24%	14	18%	17	21%	50	21%
	Refused	0	0%	0	0%	0	0%	0	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
5. How would you say your home compares to your neighbors in terms of energy efficiency? Is your home… [READ. MARK ONE]	Very energy efficient	10	13%	9	11%	17	21%	36	15%
	Somewhat energy efficient	22	28%	16	20%	14	18%	52	22%
	Average	38	48%	39	49%	36	45%	113	47%
	Somewhat inefficient	2	3%	7	9%	8	10%	17	7%
	Very inefficient	5	6%	2	3%	2	3%	9	4%
	Don't know	3	4%	7	9%	3	4%	13	5%
	Refused	0	0%	0	0%	0	0%	0	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
6. Have you heard of WattSmart energy efficiency programs offered by [UTILITY_LONG]? These programs offer financial incentives for energy efficiency improvements made by residential and commercial customers	Yes	43	54%	49	61%	52	65%	144	60%
	No	37	46%	30	38%	27	34%	94	39%
	Don't know	0	0%	1	1%	1	1%	2	1%
	Refused	0	0%	0	0%	0	0%	0	0%

"I'm going to describe the energy efficiency programs offered by [UTILITY_LONG]. After I describe each one, please state whether you have heard of the program prior to this call". *7. [IF UTILITY_LONG= "Rocky Mountain Power", "WattSmart Homes", IF UTILITY_LONG= "Pacific Power", "Home Energy Savings"]: this program offers cash incentives for home energy efficiency improvements, including efficient lighting, appliances, heating, and cooling, as well as for home insulation.*	**Response**	*Legacy Wave*		*Expansion Wave*		*Refill Wave*		*All Waves*	
		Count	*Percent (n = 43)*	*Count*	*Percent (n = 49)*	*Count*	*Percent (n = 52)*	*Count*	*Percent (n = 144)*
	Yes	35	81%	46	94%	41	79%	122	85%
	No	8	19%	3	6%	9	17%	20	14%
	Don't know	0	0%	0	0%	2	4%	2	1%
	Refused	0	0%	0	0%	0	0%	0	0%

8. Low Income Weatherization. This program provides free-of-charge weatherization services to qualifying low-income customers	**Response**	*Legacy Wave*		*Expansion Wave*		*Refill Wave*		*All Waves*	
		Count	*Percent (n = 43)*	*Count*	*Percent (n = 49)*	*Count*	*Percent (n = 52)*	*Count*	*Percent (n = 144)*
	Yes	20	47%	20	41%	22	42%	62	43%
	No	22	51%	29	59%	29	56%	80	56%
	Don't know	1	2%	0	0%	1	2%	2	1%
	Refused	0	0%	0	0%	0	0%	0	0%

9. AC Cool-Keeper. This program provides incentives for homes and businesses to have a control device connected to your central air conditioner, reducing its use during hot summer peak days.	**Response**	*Legacy Wave*		*Expansion Wave*		*Refill Wave*		*All Waves*	
		Count	*Percent (n = 43)*	*Count*	*Percent (n = 49)*	*Count*	*Percent (n = 52)*	*Count*	*Percent (n = 144)*
	Yes	26	60%	24	49%	33	63%	83	58%
	No	17	40%	25	51%	19	37%	61	42%
	Don't know	0	0%	0	0%	0	0%	0	0%
	Refused	0	0%	0	0%	0	0%	0	0%

10. WattSmart Business. This program provides rebates to businesses for installing efficient equipment in their buildings.	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 43)	Count	Percent (n = 49)	Count	Percent (n = 52)	Count	Percent (n = 144)
	Yes	13	30%	17	35%	17	33%	47	33%
	No	28	65%	32	65%	35	67%	95	66%
	Don't know	2	5%	0	0%	0	0%	2	1%
	Refused	0	0%	0	0%	0	0%	0	0%
11. Irrigation Load Control. This program provides rebates to agricultural customers to curtail the use of their irrigation systems during hot summer peak hours.	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
	Yes	Count	Percent (n = 43)	Count	Percent (n = 49)	Count	Percent (n = 52)	Count	Percent (n = 144)
		5	12%	4	8%	8	15%	17	12%
	No	37	86%	45	92%	44	85%	126	88%
	Don't know	1	2%	0	0%	0	0%	1	1%
	Refused	0	0%	0	0%	0	0%	0	0%

12. How many CFLs have been purchased for your household in 2017?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 240)
	Mean value	68	5.81	68	4.46	72	4.03	208	4.97
	Don't know	12	15%	12	15%	8	10%	32	13%
	Refused	0	0%	0	0%	0	0%	0	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 31)	Count	Response (n = 37)	Count	Response (n = 29)	Count	Response (n = 97)
13. Of the [x] CFLs purchased, how many of them have been installed?	Mean value	31	8.39	36	7.94	29	8.52	96	8.09
	Don't know	0		1		0		1	1%
	Refused	0		0		0		0	0%
	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 80)	Count	Response (n = 240)
14. How many LEDs have been purchased for your household in 2017?	Mean value	69	10.49	72	8.06	74	13.80	215	9.55
	Don't know	11	14%	8	10%	6	8%	25	10%
	Refused	0	0%	0	0%	0	0%	0	0%
	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Response (n =50)	Count	Response (n = 46)	Count	Response (n = 55)	Count	Response (n = 151)
15. Of the [x] LEDs purchased, how many of them have been installed?	Mean value	50	12.52	46	10.41	55	13.01	151	10.89
	Don't know	0	0%	0	0%	0	0%	0	0%
	Refused	0	0%	0	0%	0	0%	0	0%

16. In 2017, did you purchase any energy efficient equipment or make energy efficiency upgrades to your home that would reduce your electricity usage?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	Yes	16	20%	22	28%	25	31%	63	26%
	No	62	78%	56	70%	53	66%	171	71%
	Don't know	2	3%	2	3%	2	3%	6	3%
	Refused	0	0%	0	0%	0	0%	0	0%

Response	Legacy Wave		Expansion Wave		Refill Wave	
	Count	Percent	Count	Percent	Count	Percent
Replaced an air conditioner/HVAC unit (AC, heat pump, window unit)	5	25%	3	8%	3	9%
Tuned-up or serviced an air conditioner/HVAC unit	0	0%	0	0%	1	3%
Installed and/or replaced an evaporative cooler	0	0%	0	0%	0	0%
CFLs/compact fluorescent lighting	0	0%	0	0%	1	3%
LED bulbs	3	15%	4	11%	2	6%
Clothes washer	2	10%	5	14%	1	3%
Clothes dryer	1	5%	2	6%	2	6%
Dishwasher	1	5%	1	3%	1	3%
Furnace fan	0	0%	2	6%	2	6%
Other fans (whole-house, attic fan, box fans, ceiling fans)	0	0%	1	3%	1	3%
Refrigerator	1	5%	1	3%	4	11%
Freezer	0	0%	2	6%	0	0%
Pool equipment – heaters, pumps, variable speed drives or controls	0	0%	0	0%	0	0%
Programmable thermostat	0	0%	0	0%	0	0%
Smart thermostat / Wi-Fi thermostat / NEST / Ecobee	2	10%	3	8%	1	3%
Water heater – storage tank, tankless, heat pump water heater	0	0%	3	8%	1	3%
Windows – double pane, triple pane, low-e windows, storm windows	0	0%	3	8%	1	3%
Solar screens	0	0%	0	0%	0	0%
Efficient electronics	1	5%	0	0%	1	3%
Insulation (attic insulation, wall insulation, floor insulation)	0	0%	0	0%	2	6%
Solar panels / solar PV	0	0%	0	0%	0	0%
Other _____	4	20%	5	14%	8	23%
Don't know	0	0%	1	3%	3	9%
Refused	0	0%	0	0%	0	0%

17. What purchases or upgrades did you make in 2017? Please only include purchase or upgrades that would reduce your electricity usage. [DO NOT READ. PROBE FOR MULTIPLE]

18. In the last two years, have you made any changes in your energy use habits that would conserve electricity in your home?	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
	Yes	25	31%	33	41%	35	44%	93	39%
	No	54	68%	45	56%	43	54%	142	59%
	Don't know	1	1%	2	3%	2	3%	5	2%
	Refused	0	0%	0	0%	0	0%	0	0%

Response	Legacy Wave		Expansion Wave		Refill Wave	
	Count	Percent	Count	Percent	Count	Percent
Turned up the thermostat in summer to reduce AC use	1	3%	6	12%	7	13%
Turned down the thermostat in winter to reduce heating use	8	21%	13	25%	11	20%
Changed AC filter	1	3%	1	2%	1	2%
Changed furnace filter	3	8%	2	4%	3	6%
Clear areas around heating/cooling vents	0	0%	2	4%	1	2%
Turned off lights in unoccupied rooms	6	16%	10	19%	10	19%
Line-dry clothes	1	3%	0	0%	0	0%
Run clothes washer with full load	1	3%	1	2%	1	2%
Run dishwasher with full load	1	3%	1	2%	1	2%
Used cold water setting on clothes washer	1	3%	0	0%	0	0%
Used cold water setting on dishwasher	0	0%	0	0%	0	0%
Unplug electronics when not in use	2	5%	1	2%	2	4%
Turn off computers overnight	1	3%	1	2%	1	2%
Take shorter showers	1	3%	0	0%	1	2%
Turned down water heater setpoint	3	8%	0	0%	1	2%
Sealed leaks and drafts	1	3%	1	2%	0	0%
Cleaned refrigerator coils	0	0%	0	0%	0	0%
Increased refrigerator/freezer temperature	0	0%	0	0%	0	0%
Used heat blocking materials on windows / shaded windows during hot daytime	1	3%	2	4%	1	2%
Increased use of fans to reduce use of AC	0	0%	0	0%	1	2%
Shifted use off-peak	0	0%	0	0%	0	0%
Other _____	6	16%	11	21%	10	19%
Don't know	0	0%	0	0%	2	4%
Refused	0	0%	0	0%	0	0%

19. What actions or changes have you made? [DO NOT READ. PROBE FOR MULTIPLE]

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
20. Overall, on a scale of "1 to 5" where "1" means "Not at all knowledgeable" and "5" means "Very knowledgeable," how knowledgeable are you about ways to save energy in your home?	1 (Not at all knowledgeable)	6	8%	2	3%	2	3%	10	4%
	2	2	3%	8	10%	4	5%	14	6%
	3	26	33%	29	36%	31	39%	86	36%
	4	27	34%	28	35%	25	31%	80	33%
	5 (Very knowledgeable)	17	21%	13	16%	15	19%	45	19%
	Don't know	1	1%	0	0%	3	4%	4	2%
	Refused	1	1%	0	0%	0	0%	1	0%
	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
21. How would you rate your household's efforts to save electricity in your home? Using a scale of 1 to 5, with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can" to lower your monthly energy bill in your home.	1 (have not done much)	4	5%	1	1%	1	1%	6	3%
	2	10	13%	14	18%	9	11%	33	14%
	3	37	46%	32	40%	33	41%	102	43%
	4	24	30%	20	25%	21	26%	65	27%
	5 (done almost everything you can)	5	6%	10	13%	14	18%	29	12%
	Don't know	0	0%	3	4%	2	3%	5	2%
	Refused	0	0%	0	0%	0	0%	0	0%

	Response	Legacy Wave		Expansion Wave		Refill Wave	
		Count	Percent	Count	Percent	Count	Percent
22. What motivated you to save electricity in your home? [DO NOT READ. MARK ALL INDICATED]	Reduce electricity costs / reduce electric bill	50	66%	53	75%	52	68%
	Conservation / good for environment	16	21%	13	18%	13	17%
	Make my usage more similar to my neighbors	0	0%	0	0%	2	3%
	Other _____[RECORD VERBATIM]	6	8%	3	4%	4	5%
	Don't know	4	5%	2	3%	4	5%
	Refused	0	0%	0	0%	1	1%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
23. Now, thinking about your experiences with [UTILITY_LONG] as your electric utility, how satisfied would you say you are with [UTILITY_LONG]?	0 (Extremely dissatisfied)	0	0%	0	0%	1	1%	1	0%
	1	0	0%	0	0%	0	0%	0	0%
	2	0	0%	0	0%	0	0%	0	0%
	3	3	4%	1	1%	1	1%	5	2%
	4	1	1%	0	0%	4	5%	5	2%
	5	5	6%	7	9%	3	4%	15	6%
	6	10	13%	6	8%	7	9%	23	10%
	7	9	11%	15	19%	14	18%	38	16%
	8	20	25%	23	29%	19	24%	62	26%
	9	9	11%	10	13%	8	10%	27	11%
	10 (Extremely satisfied)	23	29%	18	23%	23	29%	64	27%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
24. Do you own or rent the home in which you live?	Own	75	94%	68	85%	74	93%	217	90%
	Rent	2	3%	8	10%	4	5%	14	6%
	Don't know	0	0%	1	1%	0	0%	1	0%
	Refused	3	4%	3	4%	2	3%	8	3%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
25. Which of the following brackets contains your age?	18-24	0	0%	0	0%	1	1%	1	0%
	25-34	1	1%	4	5%	7	9%	12	5%
	35-44	13	16%	19	24%	25	31%	57	24%
	45-56	20	25%	23	29%	17	21%	60	25%
	55-64	12	15%	6	8%	9	11%	27	11%
	65 or over	28	35%	25	31%	18	23%	71	30%
	Don't know	0	0%	0	0%	0	0%	0	0%
	Refused	6	8%	3	4%	3	4%	12	5%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
26. How many people live in your household full time?	1	6	8%	12	15%	1	1%	19	8%
	2	23	29%	25	31%	20	25%	68	28%
	3	11	14%	10	13%	17	21%	38	16%
	4	12	15%	11	14%	14	18%	37	15%
	5	11	14%	10	13%	8	10%	29	12%
	6	5	6%	4	5%	12	15%	21	9%
	7	3	4%	4	5%	1	1%	8	3%
	8	2	3%	1	1%	1	1%	4	2%
	9	0	0%	0	0%	1	1%	1	0%
	10	0	0%	0	0%	0	0%	0	0%
	Don't know	2	3%	0	0%	2	3%	4	2%
	Refused	5	6%	3	4%	2	3%	10	4%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
27. I'm going to read off a list of income ranges, please indicate which range your total pre-tax household income falls. This is the total annual income of your household:	Less than $25,000	5	6%	4	5%	2	3%	11	5%
	$25,000 - $49,999	5	6%	16	20%	11	14%	32	13%
	$50,000 – $74,999	14	18%	12	15%	15	19%	41	17%
	$75,000 - $99,999	6	8%	10	13%	11	14%	27	11%
	$100,000-$149,999	12	15%	11	14%	9	11%	32	13%
	$150,000 or above	9	11%	7	9%	9	11%	25	10%
	Don't know	3	4%	2	3%	6	8%	11	5%
	Refused	26	33%	18	23%	17	21%	61	25%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
28. What's the highest level of education you've completed? (DON'T READ)	Up to 8th grade	0	0%	1	1%	1	1%	2	1%
	Some high school	2	3%	1	1%	2	3%	5	2%
	High school or GED equivalent	13	16%	18	23%	15	19%	46	19%
	Some college	17	21%	14	18%	19	24%	50	21%
	Associate's degree	10	13%	10	13%	8	10%	28	12%
	Bachelor's college degree	19	24%	17	21%	13	16%	49	20%
	Graduate degree/professional degree/JD/MD	12	15%	14	18%	18	23%	44	18%
	Don't know	2	3%	0	0%	1	1%	3	1%
	Refused	5	6%	5	6%	3	4%	13	5%

	Response	Legacy Wave		Expansion Wave		Refill Wave		All Waves	
		Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 80)	Count	Percent (n = 240)
29. [INTERVIEWER: RECORD RESPONDENT'S GENDER. DO NOT ASK]	Male	39	49%	41	51%	43	54%	123	51%
	Female	40	50%	38	48%	37	46%	115	48%
	Don't know	1	1%	1	1%	0	0%	2	1%

13. Appendix E. Demographics

This appendix provides figures summarizing the survey information on the demographics of the households in the treatment and control groups that were surveyed.
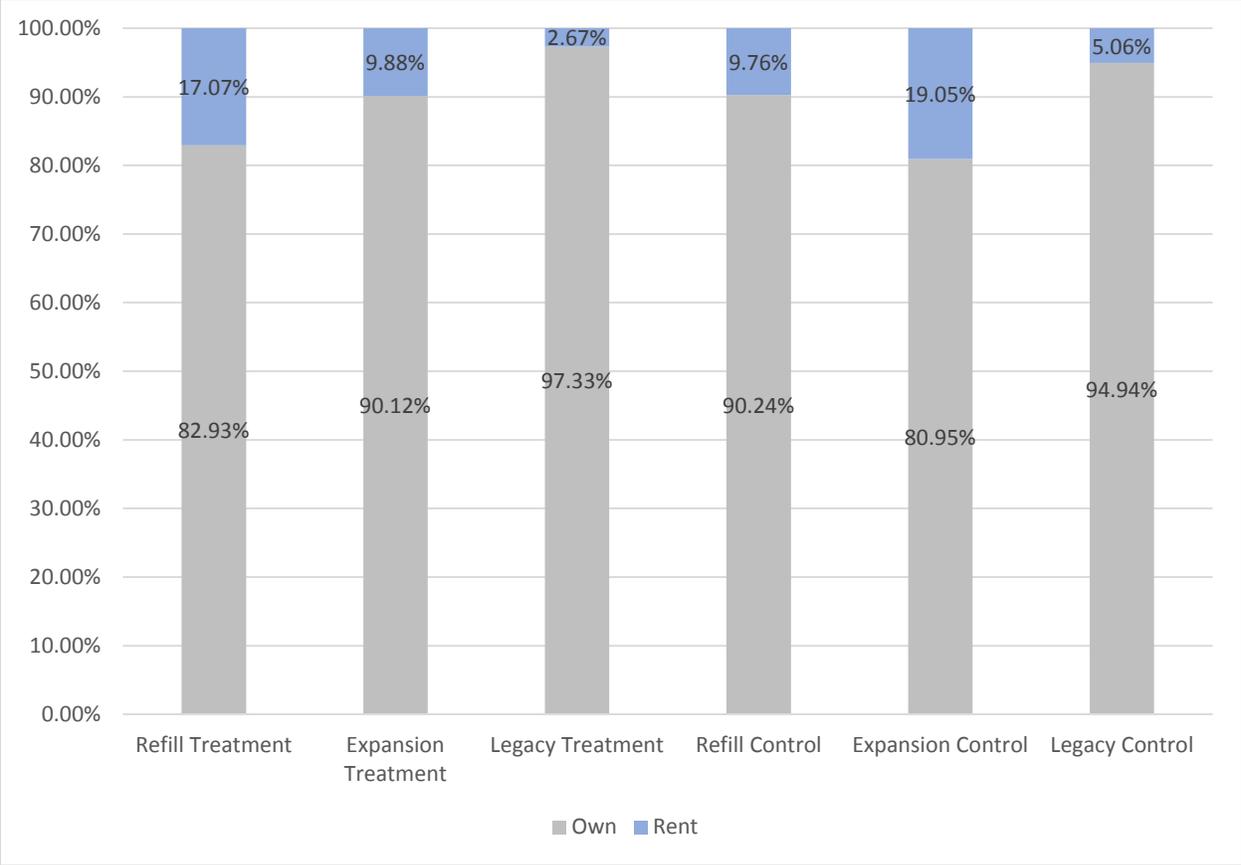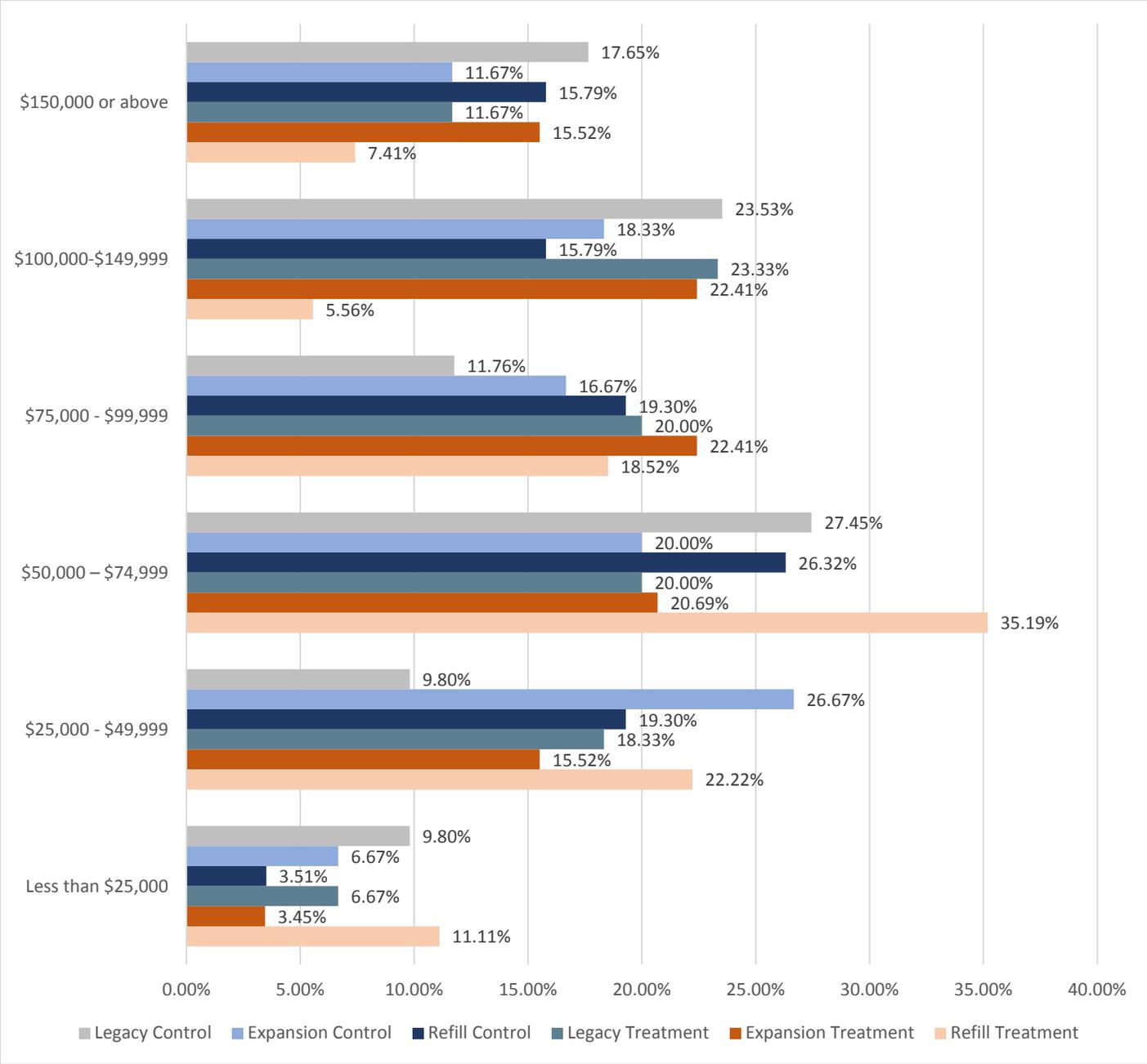

Figure 19. Own or Rent Home

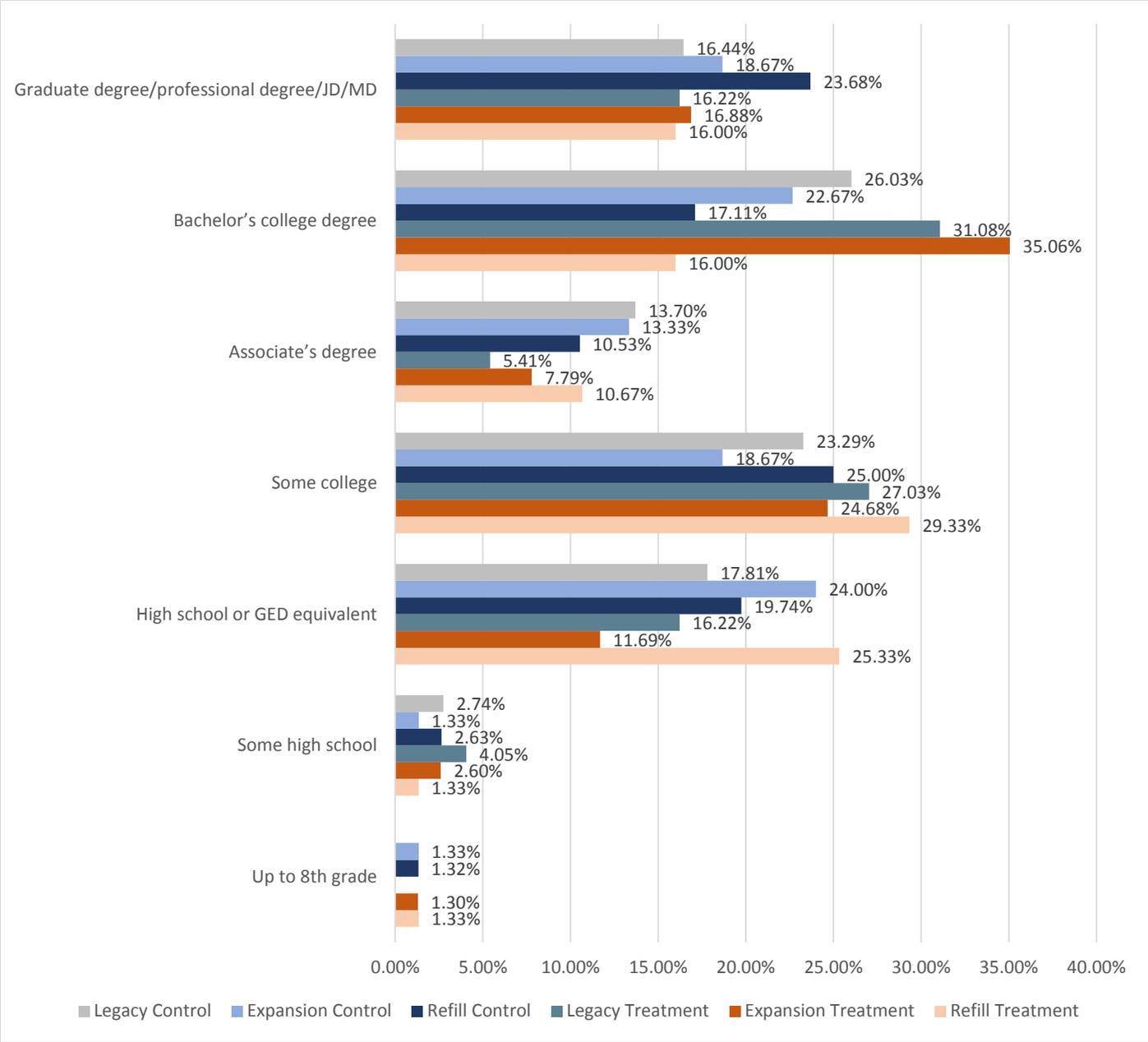*Figure 20. Pre-Tax Household Annual Income Range*

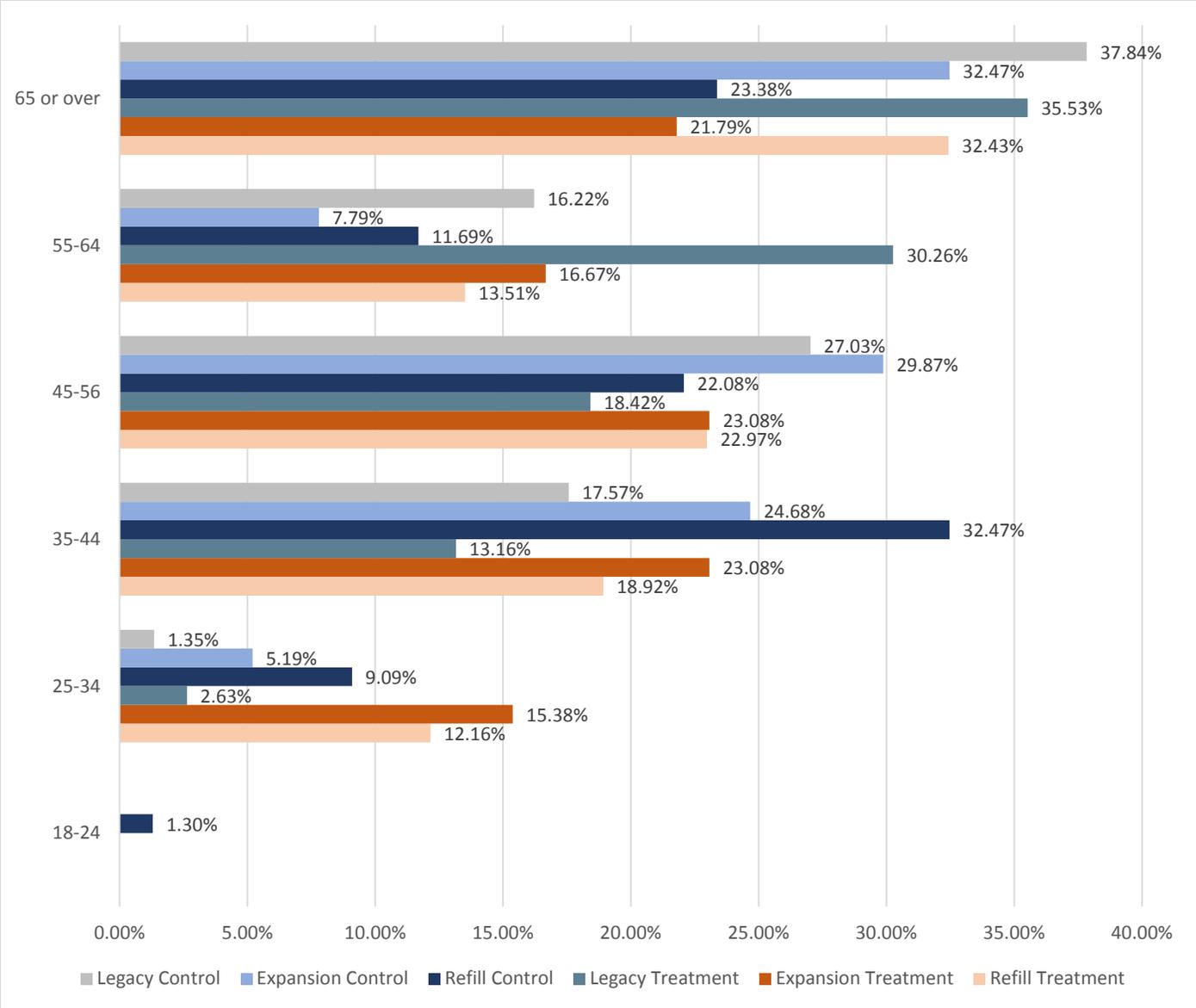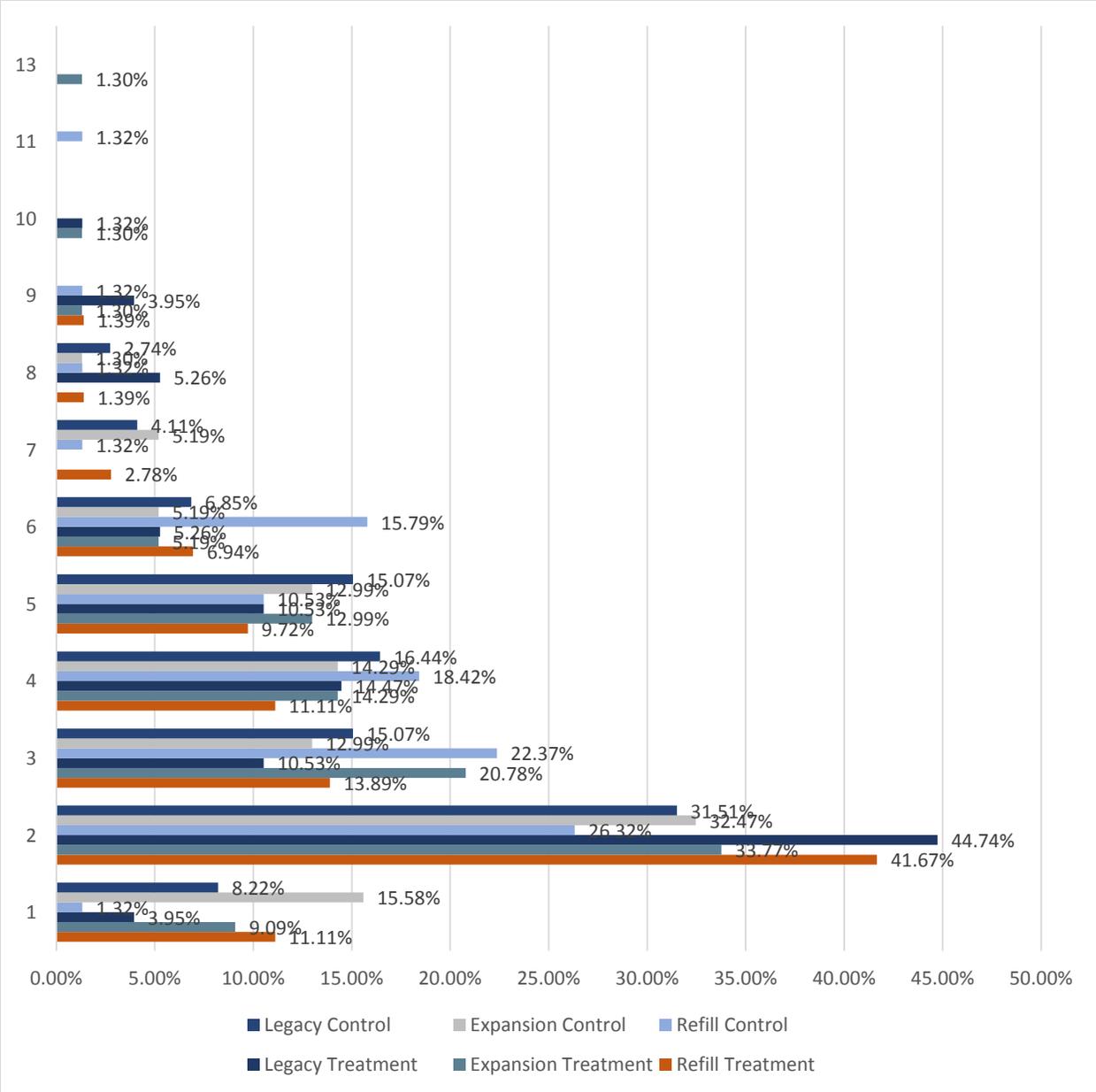*Figure 21. Highest Education Level of Respondent*

Figure 22: Age of Respondent

Figure 23: Number of People in Household Full-Time