2013–2014 Idaho Home Energy Savings Program Evaluation

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Glossary of Terms

Analysis of Covariance (ANCOVA)

An ANCOVA model is an Analysis of Variance (ANOVA) model with a continuous variable added. An ANCOVA model explains the variation in the independent variable, based on a series of characteristics (expressed as binary variables equaling either zero or one).

Evaluated Gross Savings

Evaluated gross savings represent the total program savings, based on the validated savings and installations, before adjusting for behavioral effects such as freeridership or spillover. They are most often calculated for a given measure 'i' as:

$$Evaluated\ Gross\ Savings_i = Verified\ Installations_i * Unit\ Consumption_i$$

Evaluated Net Savings

Evaluated net savings are the program savings net of what would have occurred in the program's absence. These savings are the observed impacts attributable to the program. Net savings are calculated as the product of evaluated gross savings and net-to-gross (NTG) ratio:

$$Net\ Savings = Evaluated\ Gross\ Savings * NTG$$

Freeridership

Freeridership in energy efficiency programs is participants who would have adopted the energy-efficient measure in the program's absence. This is often expressed as the freeridership rate, or the proportion of evaluated gross savings that can be classified as freeridership.

Gross Realization Rate

The ratio of evaluated gross savings and the savings reported (or claimed) by the program administrator.

In-Service Rate (ISR)

The ISR (also called the installation rate) is the proportion of incented measures actually installed.

Net-to-Gross (NTG)

The NTG ratio is the ratio of net savings to evaluated gross savings. Analytically, NTG is defined as:

$$NTG = (1 - Freeridership\ Rate) + Spillover\ Rate$$

P-Value

A p-value indicates the probability that a statistical finding might be due to chance. A p-value less than 0.10 indicates that, with 90% confidence, the finding was due to the intervention.

Spillover

Spillover is the adoption of an energy efficiency measure induced by the program's presence, but not directly funded by the program. As with freeridership, this is expressed as a fraction of evaluated gross savings (or the *spillover rate*).

T-Test

In regression analysis, a t-test is applied to determine whether the estimated coefficient differs significantly from zero. A t-test with a p-value less than 0.10 indicates that there is a 90% probability that the estimated coefficient is different from zero.

Trade Ally

For the purposes of the process evaluation, trade allies are respondents of the participant retailer/contractor survey. Trade allies include retailers and contractors who supply and install discounted compact florescent lamps (CFLs), appliances, HVAC, or insulation through the program.

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Executive Summary

Rocky Mountain Power first offered the Home Energy Savings (HES) program in Idaho in 2006. The program provides residential customers with incentives to facilitate their purchases of energy-efficient products and services through upstream (manufacturer) and downstream (customer) incentive mechanisms. During the 2013 and 2014 program years, Rocky Mountain Power's HES program reported gross electricity savings of 7,376,753 kWh. The largest of Rocky Mountain Power's Idaho residential programs, the HES program contributed 83% of the reported Idaho residential portfolio savings and 25% of Idaho's total energy efficiency portfolio savings in 2013 and 2014.[1]

During the evaluation period (2013-2014), the HES program included energy efficiency measures in six categories:

- ***Appliances:*** Rocky Mountain Power provided customer incentives for efficient clothes washers, dishwashers, refrigerators, freezers, room air conditioners, portable evaporative coolers, light fixtures, and high-efficiency electric storage water heaters.
- ***Heating, ventilation, and air conditioning (HVAC):*** Rocky Mountain Power provided customer incentives for high-efficiency heating and cooling equipment (including central A/C and evaporative coolers) and services, ground source heat pumps, and heat pump water heaters.
- ***Energy Efficiency Kits:*** In 2014, Rocky Mountain Power introduced low-cost (or for some configurations, no cost) mailed kits containing various combinations and quantities of CFLs, LEDs, faucet aerators, and high-efficiency showerheads.
- ***Lighting:*** Rocky Mountain Power provided upstream incentives for manufacturers to reduce retail prices on CFLs and LEDs.
- ***Manufactured Homes***: Rocky Mountain Power began offering incentives for manufactured homes to receive duct sealing in 2014.
- ***Weatherization:*** Rocky Mountain Power provided customer incentives for attic, wall, and floor insulation as well as for high-efficiency windows.

Rocky Mountain Power contracted with Cadmus to conduct impact and process evaluations of the Idaho HES program for program years 2013 and 2014. For the impact evaluation, Cadmus assessed energy impacts and program cost-effectiveness. For the process evaluation, Cadmus assessed program delivery and efficacy, bottlenecks, barriers, best practices, and opportunities for improvements. This document presents the results of Cadmus' impact and process evaluations.

[1] Residential portfolio and total portfolio savings (at the customer site) sourced from the 2013 and 2014 Rocky Mountain Power Idaho annual reports.

Key Findings

Cadmus' impact evaluation addressed over 99% of the HES program savings. Cadmus collected primary data on the top savings measures, performed billing analyses for insulation and HVAC measures, and completed engineering reviews using secondary data for the remaining measures.

Key Impact Evaluation Findings

Key evaluation findings include the following (summarized in Table 1):

- ***Appliances:*** Overall, Cadmus estimated a gross realization rate of 133% of reported savings for the appliance measure category. Incented appliances showed an overall weighted average installation rate of 99.6%. Gross savings realization rates ranged from 100% for dishwashers, freezers, and other measures that did not receive engineering reviews to 287% for clothes washers, which did receive an engineering review. Clothes washers realized a high evaluated gross savings mainly because of differences in the baselines between reported and evaluated savings (current practice baseline compared to the federal standard baseline). Appliance measures had a savings-weighted net-to-gross (NTG) of 71%.
- ***HVAC****:* Overall, the HVAC measure category realized 82% of reported gross savings. Evaluated gross savings realization rates ranged from 70% for ductless heat pumps to 115% for heat pump conversions through engineering analysis. HVAC measures had a savings-weighted NTG of 96%.
- ***Energy Efficiency Kits:*** Energy efficiency kit measures (such as lighting and water saving devices) were evaluated separately, but when combined at the kit level, these measures realized 79% of reported savings. Installation rates varied from 49% for kitchen faucet aerators to 88% for LEDs, and 20% of survey respondents who received water-saving measures (aerators and showerheads) reported having a water heater that was not electric (i.e., gas or propane), meaning savings could not be claimed for 20% of water-saving measures. Kits had a weighted NTG of 90%, derived from self-response surveys.
- ***Lighting:*** Incented CFL and LED bulbs realized 70% and 86% installation rates, respectively, based on installation, storage, and removal practices reported through telephone surveys. The evaluation estimated lower savings variables for LEDs than expected (in-service rates [ISRs], hours-of use, and delta watts), and the program realized only 72% of reported savings for LEDs, while realizing 92% for CFLs. The HES lighting component realized 91% of reported savings and had a weighted NTG of 55% (which falls within the typical range for upstream lighting NTG).
- ***Lighting Leakage:*** Through intercept surveys conducted with customers purchasing light bulbs at five participating retail stores, Cadmus found that lighting leakage rates averaged roughly 2.5 percentage points higher than the 0% leakage predicted by the Retail Sales Allocation Tool (RSAT)[2], with a confidence level of 90% and precision of ±2.0%. This indicates the RSAT is

[2] The RSAT is a tool used to determine the best stores for cost-effectively offering discounted energy-efficient light bulbs. More information can be found in the section Lighting Leakage Study and Appendix F. Lighting Retailer Allocation Review.

performing well as a predictor of bulb leakage because the RSAT scores are within the range of Cadmus' estimates of leakage rates from the intercept survey responses. For example, Cadmus calculated a 23.1% leakage rate from a surveyed store outside of Rocky Mountain Power's territory, which indicates nearly one-quarter of the bulbs purchased at such stores were probably installed within Rocky Mountain Power's territory. Cadmus did not apply leakage rates to evaluated savings estimates.

- ***Manufactured Homes:*** Cadmus estimated a 96% gross realization rate for the duct sealing offered to manufactured home customers.[3] Cadmus evaluated the duct sealing measure using a billing analysis that produced a net realization rate and therefore did not apply a net adjustment (NTG = 100%).
- ***Weatherization:*** Overall, Cadmus estimated a 102% net realization rate for the weatherization measure category,[4] consisting of attic, wall, and floor insulation as well as windows, and an NTG of 99%. Cadmus evaluated the insulation measures using a billing analysis that produced a net realization rate and therefore did not apply a net adjustment (NTG = 100%) to these weatherization measures, resulting in the high NTG ratio for the entire measure category.

Table 1. 2013 and 2014 HES Program Savings*

Measure Category	Evaluated Units**	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Precision (at 90% Confidence)	Evaluated Net Savings (kWh)	NTG
Appliances	31,108	846,584	1,127,959	133%	±7%	800,851	71%
HVAC	83	208,804	171,989	82%	±4%	164,816	96%
Kits	7,512	3,180,964	2,504,094	79%	±14%	2,253,684	90%
Lighting	148,090	2,659,816	2,431,109	91%	±3%	1,325,361	55%
Manufactured Homes	14	45,738	43,700	96%	±16%	43,700	100%
Weatherization	337,500	434,847	441,416	102%	±40%	438,191	99%
Total	**524,307**	**7,376,753**	**6,720,267**	**91%**	**±6%**	**5,026,604**	**75%**

*Totals in tables may not add exactly due to rounding.

**Cadmus counted each square foot of incented insulation or windows as one unit.

Table 2 and Table 3 show impact evaluation findings by program year. The change in the lighting and overall realization rates is mainly caused by the addition of the energy efficiency kits in 2014 and the drop in the gross realization rate for CFLs from 102% in 2013 to 74% in 2014

[3] Billing analysis for duct sealing consisted of comparing a participant group to a nonparticipant group, which produced realization rates that are not truly gross.

[4] Billing analysis for insulation consisted of comparing a participant group to a nonparticipant group, which produced realization rates that are not truly gross.

Cadmus applied NTG ratios to each measure consistently across the program years; however, measure-category NTG ratios changed slightly between years because the program added energy efficiency kits (which contributed 65% of reported savings to the program in 2014) as well as shifts in participation and savings within each measure category across the two years.

Table 2. 2013 HES Program Savings*

Measure Category	Evaluated Units**	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Evaluated Net Savings (kWh)	NTG
Appliances	12,905	377,302	535,148	142%	379,955	71%
HVAC	33	86,827	71,791	83%	66,872	93%
Kits***	0	0	0	N/A	0	N/A
Lighting	93,581	1,672,771	1,700,971	102%	929,657	55%
Manufactured Homes***	0	0	0	N/A	0	N/A
Weatherization	289,547	375,567	381,353	102%	380,059	100%
Total	**396,066**	**2,512,467**	**2,689,263**	**107%**	**1,756,543**	**65%**

*Totals in tables may not add exactly due to rounding.

**Cadmus counted each square foot of incented insulation or windows as one unit.

***Kits and Manufactured Homes measure categories did not have participation in 2013.

Table 3. 2014 HES Program Savings*

Measure Category	Evaluated Units**	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Evaluated Net Savings (kWh)	NTG
Appliances	18,203	469,282	592,812	126%	420,896	71%
HVAC	50	121,977	100,198	82%	97,944	98%
Kits	7,512	3,180,964	2,504,094	79%	2,253,684	90%
Lighting	54,509	987,045	730,138	74%	395,704	54%
Manufactured Homes	14	45,738	43,700	96%	43,700	100%
Weatherization	47,953	59,280	60,063	101%	58,132	97%
Total	**128,241**	**4,864,286**	**4,031,004**	**83%**	**3,270,061**	**81%**

*Totals in tables may not add exactly due to rounding.

**Cadmus counted each square foot of incented insulation or windows as one unit.

Key Process Evaluation Findings

Key process evaluation findings include the following:

- Retailers (43%) were the most commonly cited sources of program awareness for non-lighting participants. The general population most commonly mentioned bill inserts (53%) and word-of-mouth (12%) as ways they learned about wattsmart offerings. Energy efficiency kit participants learned about the program through bill inserts (58%) and the website (23%).

- Non-lighting participants expressed satisfaction with the program, with 97% reporting satisfaction with the program overall. In addition, non-lighting customers expressed high satisfaction levels with the measures they installed, their contractor, and the incentive amounts they received.
- Non-lighting participants indicated participating because they wanted to try new technology, save energy, and reduce costs. Energy efficiency kit participants said that price and energy efficiency motivated them to order a kit.
- General population survey respondents expressed increasing satisfaction levels with LEDs. Product satisfaction levels were consistently higher for LED purchasers than for CFL purchasers.
- The introduction of energy efficiency kits proved successful, as the program distributed 7,500 kits in 2014 and customers reported high levels of satisfaction with the program, the kit contents, and the ease of ordering a kit. However, the program experienced low installation rates for water measures.

Cost-Effectiveness Results

As shown in Table 4, the program proved cost-effective (including non-energy benefits) across the 2013–2014 evaluation period from all test perspectives, except for the Ratepayer Impact Measure (RIM) test. The program proved cost-effective from the Total Resource Cost Test (TRC) perspective, with a benefit-cost ratio of 2.61.

Table 4. 2013–2014 Evaluated Net HES Program Cost-Effectiveness Summary (Including Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit-Cost Ratio
PacifiCorp Total Resource Cost Test (PTRC) (TRC + 10% Conservation Adder)	$0.045	$1,869,230	$5,360,906	$3,491,676	2.87
Total Resource Cost (TRC) No Adder	$0.045	$1,869,230	$4,873,551	$3,004,321	2.61
Utility Cost Test (UCT)	$0.041	$1,688,276	$3,189,940	$1,501,664	1.89
Ratepayer Impact Measure (RIM) Test		$5,977,445	$3,189,940	($2,787,505)	0.53
Participant Cost Test (PCT)		$1,699,587	$8,671,378	$6,971,791	5.10
Life Cycle Revenue Impacts ($/kWh)					$0.000057179
Discounted Participant Payback (years)					1.52

The RIM test measures program impacts on customer rates. Most energy efficiency programs do not pass the RIM test because, although energy efficiency programs reduce energy delivery costs, they also reduce energy sales. As a result, the average rate per unit of energy may increase. A RIM benefit-cost ratio greater than 1.0 indicates that rates, as well as costs, will go down as a result of the program.

Typically, this only happens for demand response programs or programs that are targeted to the highest marginal cost hours (when marginal costs are greater than rates).

Table 5 shows the HES program proved cost-effective (excluding non-energy benefits) across the 2013–2014 evaluation period from all test perspectives except the RIM test. The program proved cost-effective from the TRC perspective, with a benefit-cost ratio of 1.71.

Table 5. 2013–2014 Evaluated Net HES Program Cost-Effectiveness Summary (Excluding Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit-Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.045	$1,869,230	$3,508,934	$1,639,704	1.88
TRC No Adder	$0.045	$1,869,230	$3,189,940	$1,320,710	1.71
UCT	$0.041	$1,688,276	$3,189,940	$1,501,664	1.89
RIM		$5,977,445	$3,189,940	($2,787,505)	0.53
PCT		$1,699,587	$6,490,287	$4,790,700	3.82
Lifecycle Revenue Impacts ($/kWh)					$0.000057179
Discounted Participant Payback (years)					1.75

Summary and Recommendations

From impact and process evaluation interviews, surveys, and other analyses, Cadmus drew the following conclusions and recommendations (this report's Conclusions and Recommendations section provides a more complete discussion of the findings):

- **Measure Categorization:** For some measures (such as light fixtures), measure categories were assigned in the program administrator's tracking database by delivery channels rather than end uses. Cadmus also found inconsistent use of measure categories between the participant tracking database and annual report cost-effectiveness assumptions.
  - ***Recommendation:*** Assign measure categories by end use to ensure the most appropriate cost-effectiveness results.
- **Clothes Washers Reported Savings:** Cadmus estimated clothes washer energy savings using the same approach described in the ENERGY STAR calculator from April 2013 (which incorporates the federal standard baseline). Reported savings were consistent with the RTF values, which had been calculated using a current practice baseline, not a federal standard baseline, thus the reported savings tended to decrease savings because the current practice baseline was more efficient than the federal standard. These findings led to the high realization rate of 288%.
  - ***Recommendation:*** Use the federal standard baseline when calculating reported clothes washer energy savings.

- **Upstream Lighting Database:** Cadmus experienced difficulty mapping the program administrator's lighting tracking database to the price scheduling database (for example, inconsistent use of SKUs and model numbers). Data tracking, however, did improve significantly between 2013 and 2014.
  - ***Recommendation:*** Track all data in a consistent manner throughout each two-year program evaluation period.
- **Lighting Cross-Sector Sales**: Cadmus estimated that 3.9% of efficient bulbs purchased at retail stores ultimately would be installed in commercial applications. Bulbs installed in commercial spaces produce higher first-year savings than bulbs installed in a residential space because commercial locations typically have higher daily hours of use (HOU) than residential locations. Currently, Rocky Mountain Power does not account for cross-sector sales from the upstream lighting incentives.
  - ***Recommendation:*** Consider accounting for commercial installation of upstream bulbs in the reported savings.
- **Nonparticipant Spillover:** Nonparticipant spillover results in energy savings caused by, but not rebated through, a utility's demand-side management activities. Through responses to the general population survey, Cadmus estimated nonparticipant spillover as 5% of HES program savings. Because the estimation of nonparticipant spillover savings is relatively new in the industry, and because such savings have not been assessed in previous program evaluations for Rocky Mountain Power, Cadmus did not apply this adjustment.
  - ***Recommendation:*** Consider allowing nonparticipant spillover analysis to be an integral component of NTG estimations for all programs.
- **Lighting Leakage:** The RSAT allocation score is performing well in Idaho. Through intercept surveys conducted with customers purchasing light bulbs at five participating retail stores, Cadmus found that lighting leakage rates averaged roughly 2.5 points higher than predicted by the RSAT, with a confidence level of 90% and precision of ±2.0%, which indicates the RSAT is performing well as a predictor of bulb leakage.
  - ***Recommendation:*** Rocky Mountain Power should continue applying the RSAT to determine which stores in its territory should be included as participating stores in the program.
- **Customer Outreach:** Bill inserts and retailers constituted the most commonly cited sources of program awareness for non-lighting participants. For the general population of customers, bill inserts and the program website were influential sources of awareness of wattsmart and energy efficiency kits.
  - ***Recommendation:*** Continue to pursue a multi-touch marketing strategy using a mix of bill inserts and retailer and contractor training, and expanding on online platforms, especially for the energy efficiency kits. Given the large percentage of customers who learned of wattsmart offerings through bill inserts, examine the proportion of customers who elect to receive online bills and ensure these online channels advertise the programs. Convey

messages that motivate customers to participate, such as recommendations for long-lasting products, saving energy, replacing equipment, and reducing costs.

- **Satisfaction with Program Experience:** Cadmus was not able to verify the efficacy of the program administrator's efforts to reach out to non-registered contractors who worked with customers seeking a rebate. (The program accepts applications only from trade allies registered with the program.)The program's efforts to lessen contractors' confusion about tariff changes appeared to be supported by customers' reported satisfaction.
  - ***Recommendation:*** Analyze the success of efforts to enroll non-registered contractors who worked with rebate participants within 90 days to determine if the additional outreach reduced the number of rejected applications because the contractor was not qualified. Continue regular training sessions with trade allies (e.g., distributors, retailers, sales associates, contractors), updating them on tariff changes and, where appropriate, supporting them with sales and marketing training.
- **Energy Efficiency Kits:** The kit rollout in 2014 proved successful, with over 7,500 kits distributed. Participants generally expressed satisfaction with the ordering process and the equipment in the kit; however, installation of the water-saving measures was limited. Many participants stored extra faucet aerators or showerheads because the measure did not fit, they had trouble installing the equipment, they already had the equipment, or they did not have a shower.
  - ***Recommendation:*** To reduce unnecessary program cost, consider allowing customers to opt out of the water-saving measures if they do not have a shower or if they already have efficient showerheads or faucet aerators.

Introduction

Program Description

Rocky Mountain Power contracted with CLEAResult to administer the Home Energy Savings (HES) Program during 2013 and 2014 program years and provide prescriptive incentives to residential customers who purchased qualifying, high-efficiency appliances, heating, ventilation, and air conditioning (HVAC), and weatherization measures.[5] The HES program also included an upstream lighting component, which provided high-efficiency lighting options by offering incentives for eligible CFLs and LEDs at the manufacturer level. In 2014, the program introduced low- and no-cost energy efficiency kits and incentives for installing duct sealing in manufactured homes.

The HES program offered these measures for part or all of the 2013–2014 evaluation period:

- Appliances:
  - Clothes washer
  - Dishwasher
  - Electric water heater
  - Freezer
  - Light fixture
  - Portable evaporative cooler
  - Refrigerator
  - Room air conditioner
- HVAC:
  - Central air conditioners
  - Ductless and ducted heat pump
  - Evaporative cooler
  - Gas furnaces with an electronically commutated motor (ECM)
  - Ground source heat pump conversion
  - Heat pump conversion
  - Heat pump water heater
- Low- and no-cost energy efficiency kits:
  - wattsmart Starter Kits (CFLs, LEDs, aerators, high-efficiency showerheads)
- Lighting:
  - CFLs
  - LEDs
- Manufactured homes:
  - Duct sealing
- Weatherization:
  - Insulation (attic, floor, and wall)
  - Windows

[5] Before the 2013–2014 program year, the Home Energy Savings (HES) Program was administered by Portland Energy Conservation, Inc. (PECI), which CLEAResult acquired in 2014.

Program Participation

During the 2013–2014 HES program years, Rocky Mountain Power provided prescriptive incentives to over 1,300 residential customers, energy efficiency kits to over 7,500 customers, and provided upstream discounts for over 148,000 products. Table 6 shows participation and savings by measures and measure categories for this period.

Table 6. HES Program Reported Quantity and Savings by Measure, 2013–2014*

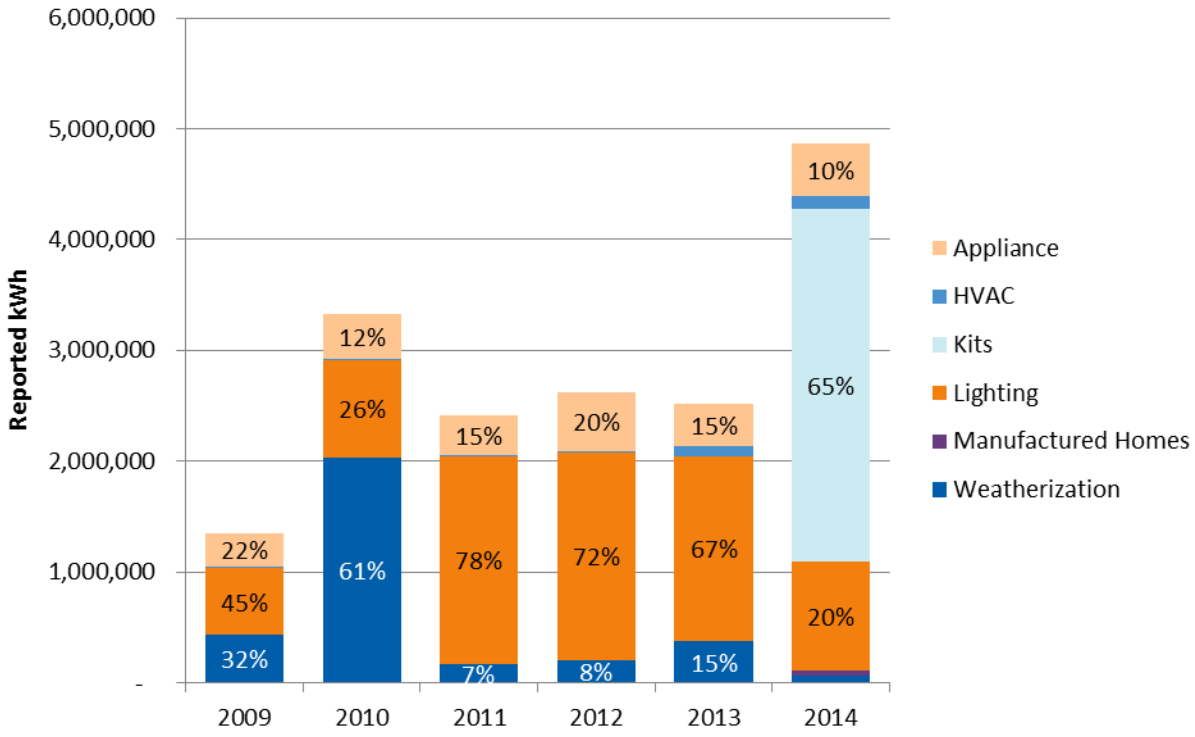
Measure Category	Measure Name	Reported Participants	Reported Quantity	Quantity Type	Reported kWh Savings
Appliance	Clothes Washer	776	778	Units	102,102
	Dishwasher	329	329	Units	14,055
	Electric Water Heater	29	30	Units	3,946
	Portable Evaporative Cooler	1	1	Units	210
	Freezer	1	1	Units	94
	Light Fixture	1,699	29,841	Units	717,078
	Refrigerator	87	87	Units	7,500
	Room Air Conditioner	39	41	Units	1,599
HVAC	Central Air Conditioner Equipment	4	4	Units	383
	Ductless Heat Pump	37	37	Units	129,500
	Evaporative Cooler	12	12	Units	4,652
	Gas Furnace	15	15	Units	7,920
	Ground Source Heat Pump Conversion	1	1	Project	12,525
	Heat Pump	7	7	Units	39,087
	Heat Pump System Conversion	2	2	Project	10,332
	Heat Pump Water Heater	5	5	Units	4,405
Kits	wattsmart Starter Kits	7,512	7,512	Kits	3,180,964
Lighting*	CFL Bulb	14,747	147,468	Units	2,640,593
	LED Bulb	622	622	Units	19,223
Manufactured Homes	Duct Sealing	14	14	Project	45,738
Weatherization	Attic Insulation	67	317,952	Square Feet	395,510
	Floor Insulation	4	4,796	Square Feet	11,415
	Wall Insulation	6	9,222	Square Feet	12,562
	Windows	44	5,530	Square Feet	15,360
Total					**7,376,753**

Source: Rocky Mountain Power 2013 and 2014 annual reports and 2013-2014 non-lighting and lighting databases provided by the program administrator.

* Rocky Mountain Power estimated participation for upstream products in its annual reports.

Historically, lighting savings have comprised a large majority of HES program savings. The 2013 program year was no exception; upstream lighting measures contributed 67% of HES annual reported gross program savings, as shown in Figure 1. In 2014, however, reported savings from CFL and LED bulbs decreased by roughly 41% from 2013 levels because the total number of program bulbs dropped by 42%. In 2014, the program launched energy efficiency kits, which contributed 65% of total 2014 HES savings, the largest of all measure categories.

Figure 1. Reported Gross kWh Savings by Measure Category from 2009–2014*



* Percentages may not add to 100% due to rounding

Data Collection and Evaluation Activities

Rocky Mountain Power contracted with Cadmus to conduct impact and process evaluations of the Idaho HES program for program years 2013 and 2014. For the impact evaluation, Cadmus assessed energy impacts and program cost-effectiveness. For the process evaluation, Cadmus assessed program delivery and efficacy, bottlenecks, barriers, best practices, and opportunities for improvements.

Table 7 lists the evaluation activities that supported these evaluations. Appendix A provides survey and data collection instruments used.

Table 7. Evaluation Activities

Activities	Impact		Process
	Gross Savings	Net-to-Gross	
Program Staff and Program Administrator Interviews			X
Participant Non-Lighting Surveys	X	X	X
Participant Kit Surveys	X	X	X
General Population Surveys	X	X*	X
Weatherization and HVAC Billing Analysis	X	X	
Engineering Reviews	X		
Demand Elasticity Modeling		X	
Intercept Surveys	X**	X***	X
Logic Model Review			X

* This activity provided an estimate of nonparticipant spillover savings that was not applied to the program savings.

** This activity provided an estimate of cross-sector lighting sales that was not applied to the program savings.

*** This activity provided a conservative spillover estimate that was not applied to the program savings.

Sample Design and Data Collection Methods

Cadmus developed samples, designed to achieve precision of ±10% with 90% statistical confidence for each surveyed population (sample sizes assumed a 0.5 coefficient of variation [CV]).[6] For small population sizes, Cadmus applied a finite population adjustment factor; this reduced the necessary completion target to achieve precision of ±10% with 90% statistical confidence.

Table 8 shows the final sample disposition for various data collection activities. For nearly all data collection (except administrator and management staff interviews), Cadmus drew samples using simple or stratified random sampling.[7]

Table 8. Sample Disposition for Various HES Program Data Collection Activities in Idaho

Data Collection Activity	Population	Sampling Frame	Target Completes	Achieved Completes
Program Staff Interview	N/A	N/A	1	1
Program Administrator Interviews	N/A	N/A	1	1
Non-Lighting Participant Surveys	1,359*	1,220	146	110**
Participant Kit Surveys	7,058	6,128	130	130
General Population Surveys	59,974***	10,000	250	250
Intercept Surveys+	50 stores	50 stores	600 surveys	42 surveys

* Non-lighting population represents all unique participants by account number.

6 The CV equals the ratio of standard deviation (a measure of the dispersion of data points in a data series) to the series mean.

7 Simple random samples are drawn from an entire population, whereas stratified random samples are drawn randomly from subpopulations (strata) and are then weighted to extrapolate to the population.

** Because of the small population of HVAC and weatherization participants, Cadmus was unable to attain the target number of completed surveys. All efforts were made to attain the target without placing undue burden on customers; up to five attempts were made to reach each participant.

*** The lighting population derived from Rocky Mountain Power's average 2014 residential customers in Idaho. Customer data provided by Rocky Mountain Power.

+ The target goal of 600 survey completes was made prior to learning the actual number of stores in the territory and upon discussions with Rocky Mountain Power, it was agreed to get as many completes as reasonably feasible. Cadmus collected as much data in stores as possible within the available resources and met the confidence and precision targets within achieved completes.

Non-Lighting Participant Telephone Surveys

Cadmus surveyed 110 non-lighting participants, gathering measure- and measure-category-level information on installations, freeridership, spillover, program awareness and satisfaction, and demographics.

In developing the survey targets by measure category, Cadmus used the measure mix from the 2013-2014 non-lighting database and randomly selected participants and measures within each measure category. Table 9 provides the population of non-lighting participants, targets, and achieved numbers of surveys.

Table 9. Non-Lighting Participant Survey Sample

Measure Category	Population	Targeted	Achieved
Appliances	1,195	68	68
HVAC	80	37	27
Weatherization	104	41	15
Total	**1,379***	**146**	**110**

*The total population differs from total population in Table 8 because some participants participated in multiple measure categories.

Participant Kit Surveys

Cadmus surveyed 130 customers who received energy efficiency kits in 2014 and gathered measure-level information on installations, freeridership, spillover, program awareness and satisfaction, and demographics.

Cadmus targeted samples to achieve statistically significant measure-level results for each kit item offered. Cadmus stratified the sample into two groups: participants who received LEDs and participants who received CFLs (all kit types contained only one type of lighting). Cadmus then randomly selected participants for the survey. Table 10 lists the population of kit participants, targets, and achieved numbers of surveys.

Table 10. Participant Kit Survey Sample

Lighting Type	Population	Targeted	Achieved
CFL	6,536	70	70
LED	522	60	60
Total	**7,058**	**130**	**130**

General Population Surveys

The general population survey collected information on HES program awareness and key lighting metrics from a random group of customers in Idaho. Cadmus drew the lighting survey sample from a random list of 10,000 Idaho residential customers, provided by Rocky Mountain Power, and achieved 250 completed responses.

Intercept Surveys

Cadmus conducted intercept surveys at stores in Idaho to determine how many light bulbs being purchased within Rocky Mountain Power's territory were being installed outside of the territory (leakage), with the primary purpose to evaluate the accuracy of the Retail Sales Allocation Tool (RSAT).

Cadmus targeted 20 stores in Idaho—15 stores within Rocky Mountain Power service territory and five stores outside its territory. However, Cadmus had difficulty achieving the target number of surveys per store (Table 11) due to limited customer traffic in the stores. Nevertheless, the surveys produced sufficient results about leakage to achieve the intended precision of ±10% with 90% statistical confidence.

Table 11. Intercept Store and Survey Samples in Idaho

Store Location	RSAT Score	Target Stores	Accessed Stores*	Target Surveys**	Achieved Surveys
Within Rocky Mountain Power	Greater or equal to 96%	8	5	450	36
	Less than 96%	7	0		
Outside of Rocky Mountain Power	N/A	5	1	150	6
Total		**20**	**6**	**600**	**42**

*Includes three stores (two within Rocky Mountain Power territory, one outside) in which Cadmus achieved access to the store but was unable to administer surveys.

**The survey target was set prior to knowledge of the actual number of stores in and out of the territory, but was not officially reduced.

Impact Evaluation

This chapter provides the impact evaluation findings for the HES program resulting from Cadmus' data analysis, which used these methods:

- Participant surveys
- General population surveys
- Intercept surveys
- Billing analysis
- Engineering reviews
- Elasticity modeling

This report presents two evaluated saving values: gross savings and net savings. Reported gross savings are electricity savings (kWh) that Rocky Mountain Power reported in the 2013 and 2014 Rocky Mountain Power Energy Efficiency and Peak Reduction Annual Reports (annual reports).[8] To determine gross savings, Cadmus applied step 1 through step 3. To determine evaluated net savings, Cadmus applied the fourth step. These steps are described in more detail following Table 12.

Table 12. Impact Steps to Determine Evaluated Net Savings

Savings Estimate	Step	Action
Evaluated Gross Savings	1	Tracking Database Review: validate accuracy of data in the participant database
	2	Verification: Adjust gross savings with the actual installation rate
	3	Unit Energy Savings: Validate saving calculations (i.e., billing analysis and engineering reviews)
Evaluated Net Savings	4	Attribution: Apply net-to-gross adjustments

The first three steps determined evaluated gross savings:

- **Step one** (verify participant database) included a review of the program tracking database to ensure participants and reported savings matched 2013 and 2014 annual reports.
- **Step two** (adjust gross savings with the actual installation rate) determined the number of program measures installed and remaining installed through telephone surveys.
- **Step three** (estimate gross unit energy savings [UES]) included reviews of measure saving assumptions, equations, and inputs (e.g., engineering reviews for lighting and appliances, billing analysis for weatherization and HVAC measures).

[8] Rocky Mountain Power Idaho Annual Reports: 2013–2014. Available online:

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2014/2013-Idaho-Annual-Report-FINAL.pdf

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2015/ID_2014-Annual-Report-FINAL-Report_042815.pdf

The **fourth step** (applying net adjustments) determined evaluated net savings. Cadmus calculated the net saving adjustments using results from customer self-response and demand elasticity modeling. Table 13 lists the methods for each gross and net savings step, by measure, in the 2013–2014 HES program.

Table 13. 2013–2014 HES Impact Methodology by Measure

<table>
<tr><th rowspan="2">Measure Category</th><th rowspan="2">Measure Name</th><th rowspan="2">% of Savings*</th><th colspan="3">Gross Method</th><th rowspan="2">Step 4: Attribution</th></tr>
<tr><th>Step 1: Database Review</th><th>Step 2: Verification</th><th>Step 3: Unit Energy Savings</th></tr>
<tr><td rowspan="8">Appliance</td><td>Dishwasher</td><td>0.2%</td><td rowspan="24">Non-Lighting Tracking Database Review</td><td rowspan="16">In-Service Rate: Non-Lighting Survey</td><td rowspan="6">Reported**</td><td rowspan="16">Self-Response: Non-Lighting Survey</td></tr>
<tr><td>Electric Water Heater</td><td>0.1%</td></tr>
<tr><td>Portable Evaporative Cooler</td><td>0.0%</td></tr>
<tr><td>Freezer</td><td>0.0%</td></tr>
<tr><td>Refrigerator</td><td>0.1%</td></tr>
<tr><td>Room Air Conditioner</td><td>0.0%</td></tr>
<tr><td>Clothes Washer</td><td>1.4%</td><td rowspan="5">Engineering Review</td></tr>
<tr><td>Light Fixture</td><td>9.7%</td></tr>
<tr><td rowspan="9">HVAC</td><td>Ductless Heat Pump</td><td>1.8%</td></tr>
<tr><td>Heat Pump</td><td>0.5%</td></tr>
<tr><td>Heat Pump System Conversion</td><td>0.1%</td></tr>
<tr><td>Evaporative Cooler</td><td>0.1%</td><td rowspan="9">Reported**</td></tr>
<tr><td>Gas Furnace</td><td>0.1%</td></tr>
<tr><td>Ground Source Heat Pump Conversion</td><td>0.2%</td></tr>
<tr><td>Heat Pump Water Heater</td><td>0.1%</td></tr>
<tr><td>Central Air Conditioner Equipment</td><td>0.0%</td></tr>
<tr><td>Manufactured Homes</td><td>Duct Sealing</td><td>0.6%</td><td colspan="3">Billing Analysis</td></tr>
<tr><td rowspan="4">Weatherization</td><td>Attic Insulation</td><td>5.4%</td></tr>
<tr><td>Floor Insulation</td><td>0.2%</td></tr>
<tr><td>Wall Insulation</td><td>0.2%</td></tr>
<tr><td>Windows</td><td>0.2%</td><td>In-Service Rate: Non-Lighting Survey</td><td>Reported**</td><td>Self-Response: Non-Lighting Survey</td></tr>
<tr><td>Kits</td><td>wattsmart Starter Kit</td><td>43.1%</td><td>Kit Tracking Database Review</td><td>In-Service Rate: Kit Participant Survey</td><td rowspan="2">Engineering Review</td><td>Self-Response: Kit Participant Survey</td></tr>
<tr><td rowspan="2">Lighting</td><td>CFL Bulb</td><td>35.8%</td><td rowspan="2">Upstream Lighting Tracking Database Review</td><td rowspan="2">In-Service Rate: General Population Survey</td><td rowspan="2">Demand Elasticity Modeling</td></tr>
<tr><td>LED Bulb</td><td>0.3%</td></tr>
</table>

* Sum of column may not add to 100% due to rounding. ** Measures with “reported” gross savings contributing less than 0.5% of total did not qualify for analysis.

Evaluated Gross Savings

To calculate gross savings for HES program measures, Cadmus reviewed the tracking database, verified measures, and conducted either engineering reviews or billing analyses of the measures that accounted for at least 99% of program savings. Table 14 presents the share of savings and gross savings evaluation method for measures representing 99% of program savings during the 2013–2014 period.

Table 14. Measure Selection for Step 3: Engineering and Billing Analysis

Measure Category	Measure	Percentage of Reported kWh Savings	Step 3: Evaluation Method
Appliances	Clothes Washer	1.4%	Engineering Review
	Light Fixture	9.7%	Engineering Review
HVAC	Ductless Heat Pump	1.8%	Engineering Review
	Heat Pump	0.5%	Engineering Review
	Heat Pump Conversion	0.1%	Engineering Review
Kits	wattsmart Starter Kit	43.1%	Engineering Review
Lighting	CFL Bulb	35.8%	Engineering Review
	LED Bulb	0.3%	Engineering Review
Manufactured Homes	Duct Sealing	0.6%	Billing Analysis
Weatherization	Attic, Floor, & Wall Insulation	5.7%	Billing Analysis
Sum % of Reported Savings Evaluated		**99%**	

Table 15 provides the gross savings evaluation results for evaluated quantities, gross savings, and realization rates by measure type.

Table 15. Reported and Evaluated Gross HES Program Savings for 2013–2014

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated Gross	
Appliance	Clothes Washer	778	102,102	293,062	287%
	Dishwasher	329	14,055	13,999	100%
	Electric Water Heater	30	3,946	3,930	100%
	Portable Evaporative Cooler	1	210	209	100%
	Freezer	1	94	94	100%
	Light Fixture	29,841	717,078	807,603	113%
	Refrigerator	87	7,500	7,470	100%
	Room Air Conditioner	41	1,599	1,593	100%
HVAC	Central Air Conditioner Equipment	4	383	383	100%
	Ductless Heat Pump	37	129,500	91,120	70%
	Evaporative Cooler	12	4,652	4,652	100%

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated Gross	
	Gas Furnace	15	7,920	7,920	100%
	Ground Source Heat Pump Conversion	1	12,525	12,525	100%
	Heat Pump	7	39,087	39,091	100%
	Heat Pump System Conversion	2	10,332	11,893	115%
	Heat Pump Water Heater	5	4,405	4,405	100%
Kits	wattsmart Starter Kits	7,512	3,180,964	2,504,094	79%
Lighting	CFL Bulbs	147,468	2,640,593	2,417,197	92%
	LED Bulbs	622	19,223	13,912	72%
Manufactured Homes	Duct Sealing	14	45,738	43,700	96%*
Weatherization**	Attic Insulation	317,952	395,510	401,705	102%
	Floor Insulation	4,796	11,415	11,594	102%
	Wall Insulation	9,222	12,562	12,759	102%
	Windows	5,530	15,360	15,359	100%
Total* **			**7,376,753**	**6,720,267**	**91%**

* Only eight of the 14 participants remained after billing analysis screening. Billing analysis could not be performed for Idaho. The billing analysis results from the Washington HES manufactured home duct sealing billing analysis realization rate (96%) was applied for Idaho.

** Quantities for weatherization measures are in square feet.

** Savings may not add exactly to total row due to rounding.

Step 1: Tracking Database Reviews

The program administrator provided three tracking databases containing Idaho data covering all 2013 and 2014 participation for the three delivery methods: upstream (lighting), mail delivery (kits), and downstream (HVAC, appliance, and weatherization).

The upstream lighting measures database collected meaningful information, such as tracking lighting at a per-bulb level and including data about retailers, electric savings, purchase dates, and stock keeping units (SKUs).[9] Cadmus' review of the database tracking for 2013 and 2014 found no discrepancies in total reported quantities or total savings compared to the 2013 and 2014 annual reports. The tracking data and price scheduling database did contain some inconsistencies with respect to bulb type definitions, SKUs, and model numbers. The data tracking improved significantly between 2013 and 2014.

The database for energy efficiency kits provided names and quantities of kit types, but the program administrator did not track or provide phone numbers, which were required for conducting the participant kit survey. Rocky Mountain Power, however, was able to provide participant phone numbers

[9] SKU numbers represent unique make and model indicators for a specific retailer.

using customer account numbers. Cadmus' review of the database tracking for 2013 and 2014 found no discrepancies in total reported quantities or total savings compared to the 2013 and 2014 annual reports.

Cadmus also reviewed the program administrator's tracking of 2013 and 2014 non-lighting measures. This database collected measure-level information such as efficiency standards, quantities of units, purchase dates, and incentive amounts. Cadmus found the total quantities and savings exactly matched the 2013 and 2014 annual reports.

Though the upstream lighting and the non-lighting databases yielded total quantities in agreement with the annual reports, there was an inconsistent use of delivery channel for light fixtures in that they were first classified as a downstream measure and then were later moved to an upstream measure.

Step 2: Verification

To verify the in-service rates (ISRs) (i.e., installation rates), Cadmus used the non-lighting participant survey for non-lighting measures, the participant kit survey for kit measures, and the general population survey for upstream CFLs and LEDs.

Non-Lighting In-Service Rate

For each measure category, Cadmus asked survey respondents a series of questions designed to determine if they had installed products for which they had received incentives. Table 16 shows the ISRs for each of these measures.

Although light fixtures are evaluated very similarly to light bulbs in this evaluation, they are classified as non-lighting by the program implementer and their in-service rate is evaluated along with the non-lighting measures. One survey respondent reported holding two light fixtures in storage for later use in an unfinished basement. All other survey respondents reported installing all of the measures listed in the survey, which resulted in a 99% ISR for appliances and a 100% ISR for all other non-lighting measures. Table 16 also shows the breadth and quantity of measures addressed by the survey.

Table 16. ISR by Measure Category, 2013–2014

Measure Category	Measure	2013 and 2014			
		Total Surveyed Measures	Installed Measures	Percentage Installed	Percentage Average Weighted Installation
Appliances	Clothes Washer	23	23	100%	99.6%
	Dishwasher	9	9	100%	
	Electric Water Heater	2	2	100%	
	Light Fixture	324	322	99%	
	Refrigerator	5	5	100%	
	Room Air Conditioner	3	3	100%	
HVAC	Central Air Conditioner	2	2	100%	100%
	Ductless Heat Pump	13	13	100%	
	Evaporative Cooler	4	4	100%	
	Furnace	3	3	100%	
	Ground Source Heat Pump	1	1	100%	
	Heat Pump	1	1	100%	
	Heat Pump Water Heater	2	2	100%	
Weatherization	Attic Insulation	6,811	6,811	100%	100%
	Wall Insulation	3,854	3,854	100%	
	Windows	327	327	100%	

Energy Efficiency Kits In-Service Rate

Cadmus calculated ISRs for each kit measure using data collected through a survey administered by Cadmus of 130 Idaho kit recipients. The survey, which was conducted six months to one year after kit delivery, verified the number of kit measures received and asked survey respondents how many measures they had installed at the time of the survey. If respondents reported that the measure was not currently installed, the survey asked additional questions about why the measure was not installed and what ultimately happened to the measure (stored, discarded, etc.).

Table 17 shows the measure-level ISR results for the kit measures, along with the total measures surveyed and reported installed.

Table 17. ISR by Kit Measure, 2014

Measure	Total Surveyed Measures	Measures Reported to Be Installed	ISR
Bathroom Aerator	135	74	55%
CFLs*	272	204	75%
Kitchen Aerator	78	38	49%
LEDs*	224	198	88%
Showerheads	134	76	57%

* Consistent with the upstream CFL and LED ISR analysis, bulbs that were removed because they had burned out were considered to have been installed and were not counted as removed.

CFLs and LEDs had the highest ISRs of the five measures reported installed at the time of the survey, with 75% ISR for CFLs and 88% for LEDs. Aerators had the lowest ISRs, with 49% ISR for kitchen aerators and 55% ISR for bathroom aerators installed at the time of the survey.

Cadmus compared the HES program kit ISRs with those of two other utilities' residential energy efficiency kit programs. As shown in Table 18, the ISRs from the other kit programs are similar to those of the HES program.

Table 18. Mailed-In Kit Program ISRs Comparison

Measure	Ameren IL 2013*	Ameren MO 2014**	Idaho HES 2013–2014
Faucet Aerators	49%	52%	**49%–55%**
Showerheads	41%	47%	**57%**
CFLs	66%	75%	**75%**
LEDs	N/A	92%	**88%**

* Opinion Dynamics. *Impact and Process Evaluation of 2013 (PY6) Ameren Illinois Company Residential Energy Efficiency Kits Program*. 2015. Available online: http://ilsagfiles.org/SAG_files/Evaluation_Documents/Ameren/AIU%20Evaluation%20Reports%20EPY6/AIC_PY6_EEKits_Report_FINAL_2015-07-20.pdf

** Cadmus and Nexant. *Efficient Products Impact and Process Evaluation: Program Year 2014*. 2015. Available online: https://www.efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=935933387

CFL and LED In-Service Rates

Cadmus calculated CFL and LED first-year ISRs for 2013–2014 using data collected through the general population survey of 250 Rocky Mountain Power Idaho customers. The survey asked participants about the number of CFL and LEDs bulbs they purchased, installed, removed, and stored within the prior 12 months. If respondents reported removing bulbs, the survey asked why the removal took place and adjusted the ISR accordingly. The calculated ISR does not account for installations occurring after the first year of purchase. Appendix D of the 2011–2012 Rocky Mountain Power Idaho Home Energy Savings Program Evaluation Report provides more information regarding second and third year ISRs.

The Uniform Methods Project (UMP) recommends adjusting (increasing) the ISR to account for bulbs initially placed in storage that the customer will subsequently install in the years following the purchase.[10] At the direction of Rocky Mountain Power, this evaluation takes a conservative approach and claims savings attributed to just the first year of bulb installations.

CFL

Of the 250 customers surveyed, 85 did not purchase CFLs and 13 could not confirm or estimate how many they had purchased; consequently, the analysis excluded these data. The analysis also removed an additional 19 responses for other reasons, including not knowing how many bulbs were installed, removed, or stored or reporting demonstrably inconsistent bulb quantities. Cadmus used data from the remaining 133 respondents to calculate the ISR.

Cadmus implemented two changes in the methodology compared to the 2011–2012 program evaluation, which proved important when comparing ISRs across the years and for other jurisdictions. The first change affecting the ISR calculations was to include a bulb that burned out as having been installed because the burnout rate is considered in the assumed effective useful life.

The second change occurred in the survey's phrasing about timing. For this evaluation, the survey asked customers to consider bulbs purchased in the past 12 months rather than those purchased during the entire two-year evaluation period. Cadmus revised this question because of concerns about a customer's ability to recall purchases that occurred more than two years prior to the survey.

Table 19 provides ISR results for 2013–2014 CFLs.

Table 19. 2013 and 2014 First-Year CFL ISR*

Bulb Status	Bulbs Reported	ISR
Purchased	**1,361**	69.7%
Installed	956	
Stored	405	
Removed	78	
Removed After Burning Out	71	
In-Service Bulbs (including burned out)	**949**	

*n = 133 respondents

[10] The UMP is a framework and set of protocols established by the U.S. Department of Energy for determining energy savings from energy efficiency measures and programs. Its latest update was in February 2015. National Renewable Energy Laboratory. *The Uniform Methods Project.* Chapter 21: Residential Lighting Evaluation Protocol. February 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

The formula for calculating the lighting ISR is:

$$ISR = \frac{Installed\ in\ first\ year - (Removed - Removed\ After\ Burning\ Out)}{Purchased}$$

Table 20 compares first-year ISRs evaluated for similar programs across the country (and for some past HES program evaluations in Idaho). Idaho's CFL ISR has declined slightly year over year.

Table 20. Comparison of Evaluated First-Year CFL ISR Estimates

Source	Data Collection Method	Reported Year	ISR
Midwest Utility 1	Self-reporting: determined by interview during home inventory site visits	2016	86%
Avista 2012-2013 Electric Impact Report	Regional Technical Forum (RTF)*	2014	75%
Rocky Mountain Power Idaho 2009-2010 HES Evaluation	Self-reporting: 250 in-territory lighting surveys	2011	75%
Rocky Mountain Power Idaho 2011–2012 HES Evaluation	Self-reporting: 245 in-territory lighting surveys	2014	73%
Northeast Utility	Self-Reporting: 200 telephone surveys	2012	73%
Rocky Mountain Power Idaho 2013–2014 HES Evaluation	**Self-reporting: 133 in-territory lighting surveys**	**2016**	**70%**
Midwest Utility 2	Self-reporting: 301 customer surveys	2012	68%

* The Regional Technical Forum (RTF) is an advisory committee in the Northwest that develops standards to verify and evaluate conservation savings.

LED

Cadmus calculated the first-year LED ISR using the same methodology and customer sample as were used for CFLs. After filtering survey results for those who purchased LEDs and provided reliable responses, 110 customers remained for inclusion in the LED ISR analysis. Table 21 lists the LED ISR results and shows a higher ISR for LEDs compared to the ISR for CFLs. The higher cost of LEDs is most likely driving the higher ISR; customers are more likely to install the bulb right after purchasing it if they just spent a significant amount of money on the bulb (significant compared to CFL or other bulb costs).

Table 21. 2013–2014 First-Year LED ISR*

Bulb Status	Bulbs Reported	ISR
Purchased	**926**	86.1%
Installed	804	
Stored	122	
Removed	17	
Removed After Burning Out	10	
In-Service Bulbs (including burned out)	**797**	

* n = 110 respondents

Table 22 compares LED ISR values to those calculated for LEDs in other jurisdictions. Fewer comparable studies have assessed ISRs for LEDs compared to ISRs for CFLs because of the more recent emergence of LED technology. For this reason, Table 22 compares just one self-report LED ISR value to the Rocky Mountain Power 2013–2014 LED ISR value. The other LED ISR values were determined from data collected through site visits.

Table 22. Comparison of Evaluated LED ISR Estimates

Source	Data Collection Method	Reported Year	ISR
Arkansas 2013 Evaluation Report	75 Residential Site Visits	2014	100%
Midwest Utility 1	Self-reporting: determined by interview during home inventory site visits	2016	99%
Midwest Utility 2	103 Residential Site Visits	2013	96%
Northeast Utility	70 Residential Site Visits	2015	96%
Rocky Mountain Power Idaho 2013–2014 HES Evaluation	**Self-reporting: 110 General Population Survey**	**2016**	**86%**
Southwest Utility	70 Residential Site Visits	2015	84%

Step 3: Unit Energy Savings Reviews

Cadmus conducted either an engineering review or a billing analysis to estimate UES values for measures representing 99% of program-reported gross savings. Engineering reviews addressed the following program measures:

- Upstream CFL and LED bulbs
- Light fixtures
- Clothes washers
- Energy efficiency kits (including CFLs, LEDs, faucet aerators and high efficiency showerheads)
- Heat pumps and conversions

Cadmus evaluated the following measures using billing analysis:

- Attic, wall, and floor insulation
- Duct sealing

Further, Cadmus applied realization rates of 100% to all measures not listed above (when combined, they contributed less than 1% of savings to the program). As shown in Table 23, UES realization rates for evaluated measures ranged between 70% for ductless heat pump and 287% for clothes washers.

Table 23. 2013–2014 Measurement Analysis and Gross Unit Realization Rate Summary Table

Measure Category	Measure	Average Unit Energy Savings (kWh/Unit)		UES Realization Rate*	Gross UES Method
		Reported	Evaluated		
Appliance	Clothes Washer	131	377	287%	Engineering Review
	Light Fixture	24.0	27.1	113%	Engineering Review
HVAC	Ductless Heat Pump	3,500	2,463	70%	Engineering Review
	Heat Pump	5,584	5,584	100%	Engineering Review
	Heat Pump System Conversion	5,166	5,946	115%	Engineering Review
Kits	wattsmart Starter Kits	423	333	79%	Engineering Review
Lighting	CFL Bulbs	17.9	16.4	92%	Engineering Review
	LED Bulbs	30.9	22.4	72%	Engineering Review
Manufactured Homes	Duct Sealing	3,267	3,121	96%	Billing Analysis
Weatherization	Attic Insulation**	1.2	1.3	102%	Billing Analysis
	Floor Insulation**	2.4	2.4	102%	Billing Analysis
	Wall Insulation**	1.4	1.4	102%	Billing Analysis

* UES realization rate may not calculate exactly due to rounding reported and evaluated UES values.
**Attic, floor, and wall insulation units are kWh/square foot.

The following sections describe the methodology and results of the measurement activities for each measure listed in Table 23.

CFL and LED Bulbs

During the 2013–2014 program years, Rocky Mountain Power awarded incentives for 147,468 CFLs and 622 LEDs through 15 different Idaho retailers representing 27 stores. Table 24 shows quantities and savings for the 14 different bulb types. Overall, upstream lighting represented 36% of the total HES reported savings.

Table 24. 2013-2014 Incented CFL and LEDs Bulbs by Type

Lighting Type	Bulb Category	Bulb Type	Reported Quantity (Bulbs)	Reported Savings (kWh)
CFL	Standard	A-Lamp	2,421	36,513
		Spiral	116,531	1,973,498
	Specialty	3-Way	93	3,176
		Candelabra	1,106	16,419
		Daylight	16,514	382,696
		Dimmable	27	836
		Globe	3,550	56,846
		Outdoor	146	2,954
		Reflector	7,080	167,655
LED	Standard	A-Lamp	273	6,551
	Specialty	Candelabra	37	557
		Globe	9	229
		Reflector	0	0
	Downlight	Downlight	303	11,886
Total*			**148,090**	**2,659,815**

* Savings may not add exactly to totals due to rounding.

Cadmus estimated four parameters to calculate gross savings for LEDs and CFLs:

- Delta watts (ΔWatts)
- ISR
- Hours-of-use (HOU)
- Waste heat factor (WHF)

The following equation provides gross lighting savings:

$$Evaluated\ Per\ Unit\ Savings\ (kWh\ per\ unit) = \frac{\Delta Watts * ISR * HOU * 365 * WHF}{1{,}000}$$

Where:

ΔWatts = The difference in wattage between a baseline bulb and an evaluated efficient bulb

ISR = The percentage of incented units installed within the first year

HOU = The daily lighting operating hours

WHF = Accounts for the interactive effects with the home's heating and cooling systems

To calculate the various CFL and LED lighting component inputs, Cadmus conducted the primary and secondary data collection and analysis activities shown in Table 25.

Table 25. CFL and LED Bulb Evaluated Gross Savings Activities

Gross Savings Variables	Activity
ΔWatts	Lumen Equivalency Method
ISR	General Population Survey (n=250)
HOU	Multistate HOU Model
WHF	RTF Space Interaction Calculator

Cadmus derived the annual savings algorithm from industry standard engineering practices, consistent with the methodology prescribed by the UMP for calculating residential lighting energy use and savings. Discussion follows of each equation component (ISR discussed above in the Though the upstream lighting and the non-lighting databases yielded total quantities in agreement with the annual reports, there was an inconsistent use of delivery channel for light fixtures in that they were first classified as a downstream measure and then were later moved to an upstream measure.

Step 2: Verification section).

Delta Watts

Delta watts represents the wattage difference between a baseline bulb and an equivalent CFL or LED. Cadmus determined baseline wattages using the 2013–2014 upstream lighting tracking data, which included CFL and LED sales data by SKU numbers and bulb types for the 148,090 bulbs sold through the program.

The lumen equivalency method produces delta watts for a given lamp by first determining the lamp's lumen output and type. Each lamp type corresponds with a set of lumen bins, and each bin corresponds to an assumed baseline wattage. Delta watts is the difference between this baseline wattage and the bulb's efficient wattage. Whenever possible, Cadmus estimated each lamp's lumens output and efficient wattage by mapping it to the ENERGY STAR® database. When this was not possible, Cadmus used the database values for lumens and/or efficient wattage. And finally, when even that was not possible, Cadmus interpolated lumen output from efficient wattage, based on a best-fit line derived from the ENERGY STAR database.

In the 2011–2012 HES program evaluation, Cadmus used the three lamp types defined by the UMP:

- Standard
- EISA-exempt
- Reflector

The UMP was updated in February 2015, and now defines five lamp types:

- Standard
- Decorative
- Globe
- EISA-exempt (typically three-way and certain globe lamps)

- Reflector

Cadmus used the latest methodology available in the UMP to evaluate delta watts. Table 26 shows the reported quantities for the five lamp categories.

Table 26. 2013 and 2014 CFL and LED Database Quantities by Bulb Types

Bulb Type	2013 Quantity	Percentage in 2013	2014 Quantity	Percentage in 2014	Overall Quantity	Overall Percentage
Standard	86,929	92.9%	49,293	90.4%	136,222	92.0%
Decorative	410	0.4%	423	0.8%	833	0.6%
Globe	1,913	2.0%	1,646	3.0%	3,559	2.4%
EISA-Exempt	53	0.1%	40	0.1%	93	0.1%
Reflectors	4,276	4.6%	3,107	5.7%	7,383	5.0%
Total	**93,581**	**100%**	**54,509**	**100%**	**148,090**	**100%**

Several federal baseline changes took effect in 2013 and 2014 because of the Energy Independence Security Act of 2007 (EISA). Table 27 presents the baseline wattage and estimated efficient wattage, grouped by lumen bin for standard bulbs, as an example of how baseline wattages changed. Starting in 2013, the standard 100-watt bulb baseline declined to 72 watts, and the 75-watt baseline declined to 53 watts. Similarly, starting in 2014, the 60-watt baseline declined to 43 watts, and the 40-watt baseline declined to 29 watts.

Table 27. Lumen Bins for Standard Lamps and Lamp Quantities

Lumen Bin	2012 Baseline Wattage*	2013 Baseline Wattage	2013 Reported Lamp Quantity	2014 Baseline Wattage	2014 Reported Lamp Quantity
0–309	25	25	0	25	0
310–449	25	25	112	25	0
450–799	40	40	3,443	29	1,986
800–1,099	60	60	61,005	43	34,277
1,100–1,599	75	53	9,101	53	6,815
1,600–1,999	100	72	13,267	72	6,215
2,000–2,600	100	72	1	72	0

*2012 baseline wattages are shown for comparison only and were not used in the evaluation

Appendix B provides lumen bins and quantities for the remaining bulb types,[11] including a plot of baseline wattage versus lumen output for various bulb types. Overall, for a given lumen output, standard lamps possess a lower baseline wattage than reflectors, globes, or EISA-exempt lamps.

[11] Though the UMP provides lumen bins for standard, decorative, globe, and EISA-exempt lamps, it defers to EISA requirements for the determination of lumen bins for reflector lamps. The Mid-Atlantic Technical Reference Manual (TRM) presents an analysis examining the requirements and defines lumen bins for six

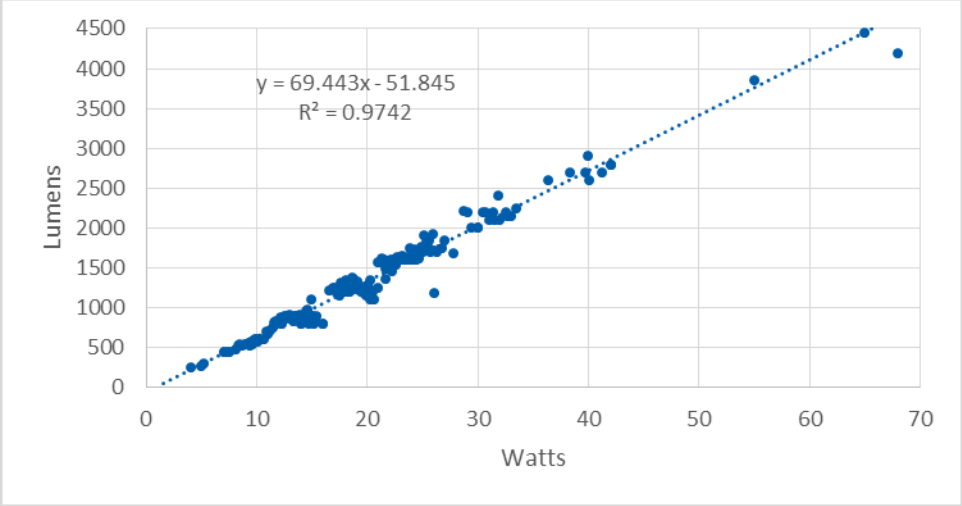
ENERGY STAR Qualified Product List Analysis

While all program bulbs were required to be ENERGY STAR certified, 16% of CFLs and 7% of LEDs were not matched to the ENERGY STAR qualified bulb product list that was current at the time of this evaluation's analysis. To estimate the lumen outputs of unmatched bulbs, Cadmus analyzed the ENERGY STAR qualified product list to develop a general relationship between wattage and lumens for CFLs and LEDs.

To determine a relationship between CFL and LED wattages and lumen outputs, Cadmus used the ENERGY STAR-qualified bulb product list updated on October 5, 2015.[12] The database consisted of approximately 7,900 CFL products and 11,500 LED products, along with their associated wattages and lumens. The lumen outputs for a given lamp wattage varied significantly; for example, 266 CFL products rated for 20 watts had lumen outputs ranging from 850 to 1,500.

Cadmus addressed these variations by using median lumens to create the relationship shown in Figure 2; the figure's calculated trend line shows a strong linear relationship between the CFL wattage and lumen output. Cadmus used this linear relationship to determine the lumen output for the CFL lamps that did not have a model number matching the ENERGY STAR-qualified lamp product list.

Figure 2. Median Lumens vs. CFL Wattage for ENERGY STAR-Qualified Standard CFLs

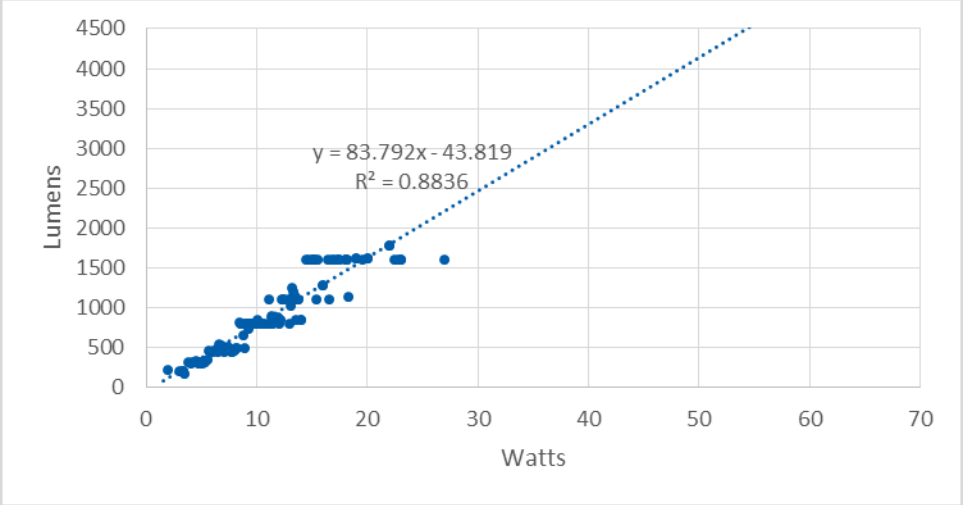


different reflector categories, depending on reflector type and diameter. Northwest Energy Efficiency Partnerships. *Mid-Atlantic Technical Reference Manual V5.* June 2015. Available online: http://www.neep.org/mid-atlantic-technical-reference-manual-v5

[12] The most recent ENERGY STAR-qualified bulb list can be downloaded from the ENERGY STAR webpage. ENERGY STAR. "Find and Compare Products." Accessed May 2016: http://www.energystar.gov/productfinder/product/certified-light-bulbs/results.

Figure 3 shows the same chart for LED standard lamps.

Figure 3. Median Lumens vs. LED Wattage for ENERGY STAR-Qualified Standard LEDs



In total, the upstream lighting analysis employed six linear best-fit lines for LED and CFL standard, reflector, and specialty lamps, such as those shown in Figure 3. Generally, watts and lumens exhibited a stronger relationship for CFLs than for LEDs, as shown in both Figure 2 and Figure 3. Cadmus created two additional trend lines from the ENERGY STAR database for CFL and LED fixtures. All trend lines employed are listed in Appendix B.

Hours of Use

For 2013–2014 lighting products, Cadmus calculated an average of 1.73 HOU for CFLs and 1.90 HOU for LEDs using analysis of covariance (ANCOVA) model coefficients, drawn from combined, multistate, multiyear data produced by two recent CFL HOU metering studies. This model expressed average HOU as a function of room type. Appendix B provides a more detailed explanation of the impact methodology Cadmus used to estimate HOU as well as differences in the model between evaluations.

This method is consistent with those used in the 2009–2010 and 2011–2012 program year evaluations, though the metering studies from which the data were sourced have been updated. The data used for the 2011–2012 evaluation were from five states (Maryland, Michigan, Maine, Missouri, and Ohio), whereas the data for the current evaluation used data from only two states (Maryland and Missouri).

The number of loggers in the current data, although from just two states, were greater than the number from the five states used for the previous evaluation; this allowed Cadmus to use the states (Missouri and Maryland) with the most recent data, which included LEDs in the logger sample. Having LEDs in the logger sample allowed testing for differences in HOU for LEDs and CFLs, whereas the prior data did not. Additionally, the Maryland and Missouri studies employed a sampling strategy that prioritized rooms where efficient lighting is most likely to be installed.

Table 28 compares the evaluations' HOU results.

Table 28. HOU by Evaluation Period

Evaluation Period	Evaluated HOU
2009–2010	2.35 hours
2011–2012	2.34 hours
2013–2014 CFLs	1.73 hours
2013–2014 LEDs	1.90 hours

The lower HOU values for 2013–2014 likely resulted from increased saturations of efficient bulbs. As the efficient lighting market matures and the saturation increases in the average home, efficient lamps are being installed in lower-use sockets, such as rooms with lower use or in supplemental lighting such as desk lamps.

Cadmus estimated the lighting distribution by room using response data from the general population surveys, as shown in Table 29. The reported proportion of bulbs installed in some room types changed markedly between evaluation cycles. The proportion of bulbs installed in outdoor fixtures dropped in 2013–2014 compared to 2011–2012, from 30% to 4% for CFLs and 5% for LEDs. This drop is significant because the average HOU for outdoor fixtures was 2.39 hours per day, which is higher than any room other than kitchens. The "Other" category (e.g., closets, hallways, garages, dining, home office, and utility or storage rooms) exhibited a large increase, to 30% in 2013–2014 compared to 7% in previous evaluations. Because many rooms types in the "Other" category have a lower average HOU, an increase in the proportion of bulbs installed in these room types lowers the overall average HOU.

Table 29. Survey-Reported CFL and LED Installation Locations*

Bulb Location	Percentage of Total CFLs			Percentage of Total LEDs
	2009–2010	2011–2012	2013–2014	2013–2014
Living Space	31%	25%	19%	20%
Bedroom	14%	11%	17%	17%
Kitchen	8%	7%	12%	18%
Bathroom	4%	5%	14%	17%
Outdoor	22%	30%	4%	5%
Basement	14%	15%	5%	2%
Other	7%	7%	30%	20%
Total**	**100%**	**100%**	**100%**	**100%**

* n=250 for the 2009 and 2010 program years; n=245 for the 2011 and 2012 program years; n = 250 for the 2013–2014 program years.

** Percentages may not total to 100% due to rounding.

Current estimated HOU are similar to the HOU calculated by the RTF and a recent metering study for the Northwest Energy Efficiency Alliance (NEEA), both of which are regionally representative. The RTF

workbook approved for 2014 provided an average HOU of 1.9,[13] and the current version 4 RTF workbook has a value of 2.04.[14] The NEEA study found an average of 1.8.[15]

Appendix B provides further details as well as a more detailed list of room installations.

Waste Heat Factor

A WHF adjustment made to energy savings accounts for the effects lighting measures have on the operation of heating and cooling equipment. Lower wattage bulbs produce less waste heat; consequently, their use requires more heating and less cooling to maintain a room's setpoint temperature.

For this evaluation, Cadmus used the Simplified Energy Enthalpy Model (SEEM),[16] with results from the most recent RTF residential CFL and LED savings workbook to serve as a foundation for the analysis.[17]

Table 30 and Table 31 show the RTF SEEM results and evaluation weightings. Saturation weightings for heating and cooling derive from results of Rocky Mountain Power's surveys of its Idaho residential customers in 2014; cooling zone weightings derive from typical meteorological year 3 (TMY3) weather data and census population data for Idaho counties.

[13] RTF savings workbook for residential, screw-in, CFL and LED lamps: ResLightingCFLandLEDLamps_v3_3.xlsm

[14] Both RTF HOU numbers are weighted average HOUs (i.e., weighted by the number of total lamps provided in the RTF workbook for each category).

[15] Northwest Energy Efficiency Alliance. "Residential Building Stock Assessment: Metering Study". April 28, 2014. Accessed January 2016: https://neea.org/docs/default-source/reports/residential-building-stock-assessment--metering-study.pdf?sfvrsn=6

[16] SEEM is a building simulation model. The RTF calibrated the SEEM model for residential homes to provide the magnitude of interaction between the lighting and HVAC systems. Additional background information for SEEM may be found on the RTF website. Regional Technical Forum. "Simplified Energy Enthalpy Model (SEEM)." Accessed May 2016: http://rtf.nwcouncil.org/measures/support/seem/

[17] RTF savings workbook for residential, screw-in, CFL and LED lamps: ResLighting_Bulbs_v4_0.xlsm

Table 30. WHF Heating Inputs Summary*

WHF Component	Heating System Type	SEEM Results (kWh/kWh Saved)**	Cadmus Saturation Weighting
Heating Impact	Electric Zonal	-0.440	13.3%
	Electric Forced Air	-0.479	9.2%
	Heat Pump	-0.258	1.9%
	Non-Electric	0.000	75.6%

* Percentages may not add to 100% due to rounding.

** Regional Technical Forum. "Simplified Energy Enthalpy Model (SEEM)." Accessed May 2016: http://rtf.nwcouncil.org/measures/support/seem/

Table 31. WHF Cooling Inputs Summary

WHF Component	System Type	SEEM Results (kWh/kWh Saved)	Cadmus Zone Weighting*	Cadmus Saturation Weighting
Cooling Impact	Cooling Zone 1	0.033	17.1%	**30%**
	Cooling Zone 2	0.053	30.3%	
	Cooling Zone 3	0.074	52.6%	

* Percentages may not add to 100% due to rounding.

Calculating the weighted averages of values in Table 30 and Table 31 provided the impacts from heating and cooling of a bulb installed in a conditioned space, shown in Table 32. Summing the heating and cooling impacts produced an estimated combined impact of -0.090 kWh per kWh of lighting savings.

Table 32. WHF Weighted Average Impact, Conditioned Space

Component	kWh/kWh Savings*
Heating	-0.108
Cooling	0.018
Combined	**-0.090**

* Table may not sum to total due to rounding

Cadmus also considered the location of bulbs to determine the appropriate WHF to account for bulbs not installed in conditioned spaces. As shown in Table 33, Cadmus applied bulb allocations by space type from the 2013-2014 Rocky Mountain Power general population survey data to thermal coupling factors from the RTF.

Table 33. Thermal Coupling by Space Type

Space Type	RTF Thermal Coupling Correction Factor	Bulb Allocation*
Basement	50%	3.3%
Main House	75%	92.2%
Outdoor	0%	4.5%
Weighted Average		**71%**

* Percentages may not add to 100% due to rounding.

Multiplying the combined impact from Table 32 with the weighted thermal coupling in Table 33 and adding 1 provided the final WHF shown in Table 34.

Table 34. Idaho CFL and LED Bulb WHF, Average Installation Location

Fuel	Value	Units
Electric	0.937*	kWh/kWh Saved

*Final WHF value does not compute exactly from reported variables due to rounding.

Cross-Sector Sales

During the intercept surveys, Cadmus collected data on the intended installation locations of efficient bulbs purchased at retailer stores. Recent data collected in several jurisdictions around the country reveal that many program bulbs are installed in commercial settings. Bulbs installed in commercial spaces produce more first-year savings than bulbs installed in a residential space because commercial locations typically have a higher daily use of bulbs than residential locations (i.e., higher HOU). Percentages of bulbs purchased from retail stores and installed in commercial buildings are called cross-sector sales.

Of all bulbs purchased at participating retailers as estimated by the intercept surveys, Cadmus calculated that 3.9% of efficient bulbs ultimately would be installed in commercial applications. Cadmus did not include this adjustment in the gross savings calculation. Other jurisdictions around the country have increasingly accommodated cross-sector sales factors in calculating lighting savings; such an adjustment would require an update to savings calculations from those presented in this report. Appendix B contains further details regarding cross-sector sales methodology and results.

CFL and LED Bulbs Total Savings

Table 35 shows reported savings inputs and input sources. Cadmus determined these inputs using assumptions provided by Rocky Mountain Power and information drawn from the tracking database. Reported values for ISR, HOU, and WHF were sourced directly from the assumption workbooks provided. Reported values for UES were calculated from the tracking database, and average values for delta watts were back-calculated from the reported savings using the ISR, HOU, and WHF assumptions from the UES workbooks Rocky Mountain Power provided.

Table 35. 2013-2014 Reported CFL and LED Bulb Savings Inputs

Bulb Type	Reported Inputs	2013	2014	Source
CFLs	Quantity	93,581	53,887	Database/Annual Report
	Total Gross Savings (kWh)	1,672,771	967,822	Database/Annual Report
	Average Unit Energy Savings (kWh/bulb)	17.9	18.0	Database/Annual Report
	Average Delta Watts*	40.3	33.8	Back-calculated
	ISR	0.760	0.730	2011-2012 Idaho Residential Home Energy Savings Evaluation Report
	HOU	1.881	2.340	2011-2012 Idaho Residential Home Energy Savings Evaluation Report
	WHF	0.850	0.850	2011-2012 Idaho Residential Home Energy Savings Evaluation Report
LEDs**	Quantity	0	622	Database/Annual Report
	Total Savings (kWh)	N/A	19,223	Database/Annual Report
	Average Unit Energy Savings (kWh)	N/A	30.9	Database/Annual Report
	Average Delta Watts*	N/A	42.5	Back-calculated
	ISR	N/A	1	RTF
	HOU	N/A	2.34	2011-2012 Idaho Residential Home Energy Savings Evaluation Report
	WHF	N/A	0.851	2011-2012 Idaho Residential Home Energy Savings Evaluation Report

*Reported ΔW values back-calculated from average reported unit savings and reported ISR, HOU, and WHF.

**LEDs were introduced to the program in 2014, and no LEDs were provided in 2013.

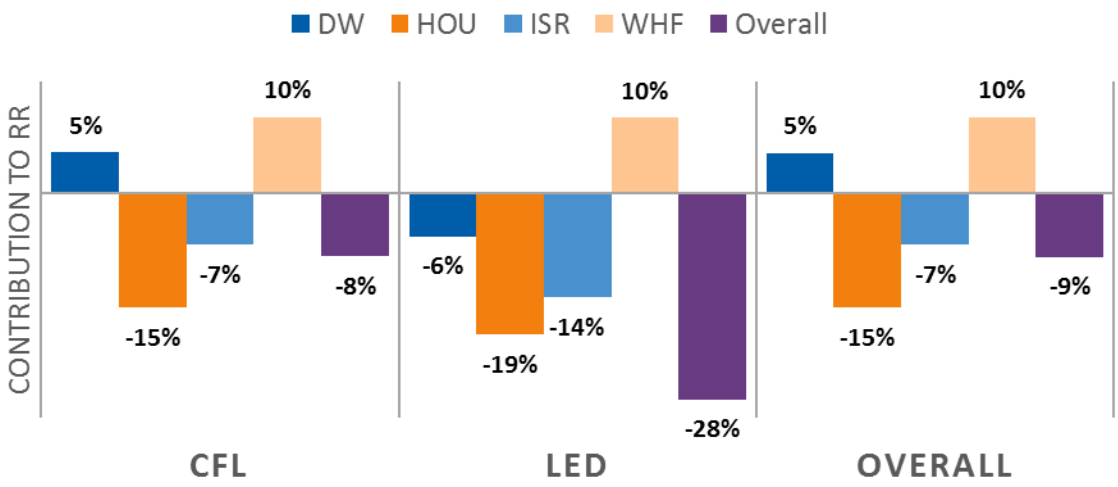
Table 36 shows evaluated savings inputs and input sources. The preceding section described the sources for these inputs.

Table 36. 2013–2014 Evaluated CFL and LED Bulb Savings Inputs

Bulb Type	Evaluated Inputs	2013	2014	Source
CFLs	Quantity	93,581	53,887	Upstream Lighting Tracking Database
	Total Savings (kWh)	1,700,971	716,226	Calculated
	Average Unit Energy Savings (kWh)	18.2	13.3	
	Average Delta Watts	44.0	32.1	Lumens equivalence method
	ISR	69.7%	69.7%	General Population Survey (n= 250)
	HOU	1.73	1.73	Cadmus HOU model
	WHF	0.937	0.937	RTF, updated for Idaho weather
LEDs	Quantity	0	622	Upstream Lighting Tracking Database
	Total Savings (kWh)	N/A	13,912	Calculated
	Average Unit Energy Savings (kWh)	N/A	22.4	
	Average Delta Watts	N/A	40.1	Lumens equivalence method
	ISR	N/A	86.1%	General Population Survey (n= 250)
	HOU	N/A	1.90	Cadmus HOU model
	WHF	N/A	0.937	RTF, updated for Idaho weather

Figure 4 compares the impact of reported and evaluated inputs on savings shown in Table 35 and Table 36. Positive percentages indicate that an evaluated input was higher than a reported input, driving up the realization rate by that percentage due to that input. For example, the evaluated HOU variable for CFLs for 2013 and 2014 was 15% lower than the reported value, and evaluated ISR value was 7% lower than the reported value. But because evaluated delta watts WHF values were respectively 5% and 10% than reported values, overall evaluated savings for 2013 CFLs were actually 8% less than the reported savings (realization rate = 92%).

Figure 4. 2013-2014 Impact of Calculation Parameters on Savings



In 2013 for both LEDs and CFLs, a combination of RTF and 2011-2012 program evaluation values were used for HOU, ISR, WHF, and delta watts inputs. Notably in 2013, for most bulbs an RTF watts ratio (WR) of 3.6 or 4.0 was used to calculate baseline wattages (W_{base}) from bulb efficient wattages (W_{eff}) using the formula $W_{base} = WR * W_{eff}$. The resulting formula for delta watts is $\Delta W = W_{base} – W_{ee} = (W_{ee} * WR) – W_{ee} = (WR – 1) * W_{ee}$. However for standard bulbs ≥ 20 W, EISA-impacted baseline wattages were used, which reduced savings for these bulbs.

As a result, for CFLs in 2013 the average reported watts ratio was approximately 3.5. However for evaluated bulbs the average watts ratio was 3.8, meaning that average evaluated delta watts is ~9% higher than average reported delta watts for 2013 CFLs. This is likely a result of several factors. A first likely factor is that the RTF bulb categorizations and binning practices are different from those of the evaluation. This may have affected savings in either direction, in this case likely in favor of higher evaluated delta watts. A second likely factor is that the RTF watt ratios come from residential bulb stock assessments conducted in 2013 and 2010. These assessments had higher average efficient wattages than the average efficient wattages of the 2013 HES upstream program, which reduces watts ratios derived from them.

Figure 5 shows contributions from each lighting factor for CFLs in 2013 and 2014. It can be seen that in 2014, reported delta watts values are much more in-line with evaluated values. This is a result of a lumens equivalence approach being applied more uniformly across the population of bulbs, though some error still results from assuming a single lumen value for each bulb type and wattage. Figure 5 also shows that the disparity between reported and evaluated HOU is primarily responsible for the low realization rate for CFLs in 2014.

Figure 5. Impact of Calculation Parameters on CFL Savings by 2013 and 2014

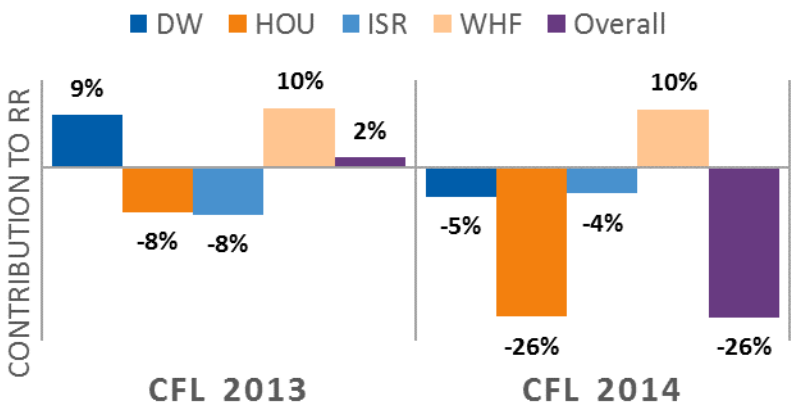


Table 37 provides evaluated CFL quantities, gross savings, and realization rates by bulb type. Overall, CFL and LED bulbs realized 91% of reported savings.

Table 37. 2013-2014 Evaluated and Reported HES Program CFL and LED Savings

Program Year	Technology	Quantity Purchased	Program Savings (kWh)		Average Unit Energy Savings (kWh)		Realization Rate
			Reported	Evaluated	Reported	Evaluated	
2013	CFL	93,581	1,672,771	1,700,971	17.88	18.18	102%
2014	CFL	53,887	967,822	716,226	17.96	13.29	74%
	LED	622	19,223	13,912	30.90	22.37	72%
2013–2014	CFL	147,468	2,640,593	2,417,197	17.91	16.39	92%
	LED	622	19,223	13,912	30.90	22.37	72%
Total		**148,090**	**2,659,816**	**2,431,109**	**17.96**	**16.42**	**91%**

Light Fixtures

During the 2013–2014 program period, Rocky Mountain Power provided incentives for nearly 30,000 ENERGY STAR light fixtures, representing 9.7% of reported program savings. Light fixture participation ramped up during the 2013-2014 evaluation period. Because of this increased participation, Cadmus conducted a more granular evaluation of light fixtures in 2013-2014 than in the 2011-2012 program evaluation.

In the 2011-2012 evaluation period, Cadmus used weighted averages based on model lookups to determine mean values for the efficient wattages and number of bulbs per fixture and applied a weighted average CFL baseline wattage to all fixtures. These mean values were then applied across all fixtures to calculate delta watts. For 2013-2014, Cadmus grouped and analyzed savings for the fixtures within three categories:

- Downlight fixtures
- Fluorescent fixtures

- Miscellaneous fixtures

Downlight fixtures contributed 92.7%, fluorescent fixtures contributed 0.1%, and miscellaneous fixtures contributed 1.7% of program fixtures by quantity (with 5.5% unidentifiable). Generally, Cadmus used the same methodology to calculate fixture savings as employed for light bulbs, though the three fixture types required slight variations in their energy savings calculations. Again, the general equation for lighting gross saving evaluation follows:

$$Evaluated\ Per\ Unit\ Savings\ (kWh\ per\ unit) = \frac{\Delta Watts * ISR * HOU * 365 * WHF}{1{,}000}$$

To calculate the various light fixture component inputs, Cadmus conducted the primary and secondary data collection activities shown in Table 38.

Table 38. Light Fixture Evaluated Gross Savings Activities and Results

Gross Savings Variables	Activity	Mean Value
ΔWatts	Downlights and Miscellaneous: Lumens Equivalence Fluorescents: RTF	39.6*
ISR	Non-Lighting Participant Survey	0.996
HOU	Multistate HOU Model	1.896*
WHF	RTF Space Interaction Calculator	0.937

* Weighted average for all fixtures

Cadmus applied the same HOU and WHF used in the CFL and LED bulb analysis and generated an ISR (99.6%) from the non-lighting participant surveys. For delta watts, Cadmus conducted a lumens equivalence approach whenever possible (and when appropriate for the fixture type). A detailed discussion of the delta watts calculation follows for each fixture category.

Downlight Fixtures

Figure 6 is an example of a downlight fixture. These fixtures are designed to be installed into recessed ceiling or "can" light receptacles (intended to accept reflector lamps). Therefore, this fixture type differs from other fixtures in that each purchase replaces a particular lamp, meriting the application of the lumens equivalence method to calculate delta watts.

Figure 6. Example of a Downlight Fixture

To calculate baseline wattages for LED downlights, the types of lamps typically replaced by LED downlight fixtures must be determined. Although recessed ceiling fixtures are typically designed to accommodate reflector lamps that point light down to maximize the light output, sometimes other lamp types may be installed. Using data compiled from household lighting inventories conducted in four other jurisdictions across the United States, Cadmus calculated a weighted baseline wattage for LED downlight fixtures that accounts for the mix of bulb types typically installed in recessed ceiling receptacles.

To do this, Cadmus first calculated an average set of reflector lumen bins and baseline wattages that accounted for the six different types of reflector lamps. The lumen bins and baseline wattages for each reflector type were weighted by their quantities in the upstream lighting database, which is the closest source of granular sales data available.

Cadmus then combined this set of average reflector baseline wattages and lumen bins with the lumen bins and baseline wattages for other lamp types, weighted by saturation of bulb types typically installed in recessed ceiling receptacles as determined by the four lighting inventories. The inventories collected data on the type of bulb installed in every fixture in over 200 homes. Using these data, Cadmus determined saturation levels of various lamp types typically installed in recessed ceiling receptacles.

Results are presented in Table 39 and show that 85.6% of lamps installed in ceiling receptacles were reflector lamps and 13.5% were standard lamps, with the other categories comprising the rest. Cadmus used these saturation values to create an average set of lumen bins and baseline wattages for recessed ceiling receptacles for both 2013 and 2014. Plots of the weighted reflector and final recessed can lumen bins and baseline wattages can be found in Appendix B. Like reflector baseline wattages in general, the recessed can baseline wattage values are generally higher than those for standard lamps.

Table 39. Lamp Type Saturation in Recessed Ceiling Receptacles

Lamp Type	Southwestern Utility	Central Utility	Midwest Utility	Mid-Atlantic Utility	Combined
Standard	11.70%	17.60%	13.20%	12.70%	13.52%
Globe	0.60%	0.50%	0.00%	0.90%	0.60%
Reflector	87.70%	81.90%	86.00%	86.00%	85.57%
Decorative	0.00%	0.00%	0.30%	0.40%	0.22%
EISA-Exempt	0.00%	0.00%	0.50%	0.00%	0.09%
Total Bulbs	**473**	**431**	**393**	**928**	**2225**
Total Households	**38**	**46**	**68**	**65**	**217**

Fluorescent Fixtures

The UMP does not specify a lumens equivalence approach for fluorescent lamps (0.1% of fixtures) and EISA legislation does not provide discrete lumen bins or baseline wattages for these types of lamps. To calculate savings for these lamps, Cadmus applied a single delta watts value for all fluorescent lamps in the database. Although the database includes some circline and other types of fluorescent lights, the majority (> 80%) of fluorescent lamps are two-lamp T8 fluorescents.

Cadmus applied the delta watts value from the RTF for fluorescent fixtures. The High-Performance T8 Lamps Workbook (Version 1.1) provides a delta watts value of 42 watts for four-foot, two-lamp T8 fixtures installed in kitchens and 43 watts value for the same fixtures installed in garages.[18] Because the installation locations for these fixtures were unknown, Cadmus applied a 42.5 delta watts value for all fluorescent lamp fixtures in the database. Cadmus also applied CFL values for HOU and WHF.

Miscellaneous Fixtures

Just 1.7% of fixtures sold could not be classified as downlights or fluorescent lights (e.g., single- and multibulb sconce lights, motion sensors, track lighting). Roughly one-third were single-lamp CFL fixtures, one-third were two-lamp CFL fixtures, and one-third were LED fixtures of various types. Cadmus applied the lumens equivalence approach to evaluate these fixtures.

Unknown Fixtures

The database included 5.5% of fixtures falling within unknown categories. Of these, 96% had no model numbers in the database. The remainder could not be matched to the ENERGY STAR database. Consequently, Cadmus applied the weighted average UES for the downlight, fluorescent, and miscellaneous fixture categories.

Lighting Fixture Findings

In 2013–2014, the HES program provided incentives for 29,861 light fixtures. Table 40 provides lamp quantities, savings, and realization rates by fixture type for 2013–2014.

[18] Source. RTF Unit Energy Savings Measures. Lighting - High Performance 4-foot T8 Lamps. Version 1.1 http://rtf.nwcouncil.org/measures/measure.asp?id=205

Table 40. 2013–2014 Light Fixture Quantity and Gross Savings

Fixture Category	CFL/LED	Quantity	Reported Savings (kWh)	Evaluated Savings (kWh)	Evaluated UES (kWh/unit)	Realization Rate
Downlight	LED	27,666	658,996	751,162	27.2	114%
	CFL	22	917	491	22.3	53%
Fluorescent	N/A	44	1,835	1,105	25.1	60%
Miscellaneous	LED	459	10,914	9,878	21.5	91%
	CFL	40	1,668	949	23.7	57%
Unknown	N/A	1,630	43,221	41,252	25.3	95%
Total*		**29,861**	**717,552**	**804,836**	**27.0**	**112%**

* Savings may not sum exactly to totals due to rounding.

The overall realization rate of 112% is heavily driven by the realization rate for downlights (114%), which have high delta watts values. However, realization rates for other fixture types are lower, ranging from 53% to 95%. All LED fixtures received a reported unit energy savings of 23.7 kWh and all CFL fixtures received a reported unit energy savings of 41.7 kWh. The CFL fixture savings assumption to derive the 41.7 kWh is based on two bulbs per fixture, which was calculated by doubling an average savings value for several wattages of general lamps, in a 2012 analysis. This analysis does not reflect baseline updates due to EISA for 2013 and 2014 that drove down evaluated savings for miscellaneous fixtures. However, reflector lamps are unaffected by EISA and generally have higher baselines than standard or general lamps. This brings evaluated and reported savings for downlight fixtures more in-line with each other.

Energy Efficiency Kits

Rock Mountain Power's HES program includes eight varieties of energy efficiency kits, which contain unique combinations of 13-watt CFLs, 10-watt LEDs, kitchen aerators, bathroom aerators, and showerheads. Table 41 shows the components in each of the eight kits available in 2013 and 2014.

Table 41. Components in Each Energy Efficiency Kit

Kit Name	Quantity per Kit				
	CFL	LED	Kitchen Aerator	Bathroom Aerator	Showerhead
Basic 1	4	0	1	1	1
Basic 2	4	0	1	2	2
Better 1	4	0	1	1	1
Better 2*	4	0	1	2	2
Best 1	0	4	1	1	1
Best 2	0	4	1	2	2
CFL Only	4	0	0	0	0
LED Only	0	4	0	0	0

* Better and basic kits 1 and 2 have the same quantities of measures, but differ in the type of showerhead provided: Better kits provide a handheld showerhead in the kit with the same flow rate as the fixed showerhead in the Basic kits.

Kit CFLs and LEDs

Cadmus estimated energy savings for CFLs and LEDs distributed through the energy efficiency kit, using the following equation (outlined in the UMP's Residential Lighting Evaluation Protocol):[19]

$$\Delta kWh_{CFL/LED} = \left(\frac{Watts_{Base} - Watts_{CFL/LED}}{1{,}000}\right) \times ISR_{CFL/LED} \times HOURS_{CFL/LED} \times (WHF_E)$$

Table 42 defines the key variables in the equation above and provides the values used in the analysis and the sources for these values.

Table 42. Energy Efficiency Kit CFL and LED Key Variables and Assumptions

Parameter	Definition	Value	Unit	Source
$Watts_{Base}$	Baseline bulb wattage	43	W	Lumens equivalence method
$Watts_{CFL}$	Efficient bulb wattage	13	W	Program materials
$Watts_{LED}$	Efficient bulb wattage	10	W	Program materials
1000	W to kW conversion	1,000	$\frac{W}{kW}$	Constant
ISR_{CFL}	In-Service Rate	75	%	2014 kit participant telephone survey results n = 68
ISR_{LED}	In-Service Rate	88	%	2014 kit participant telephone survey results n = 56
$HOURS_{CFL}$	Annual Hours of Use	1.73	$\frac{hours}{day}$	Cadmus HOU model
$HOURS_{LED}$	Annual Hours of Use	1.9	$\frac{hours}{day}$	Cadmus HOU model
WHF_E	Waste Heat Factor	0.937	–	2013-2014 HES Upstream Lighting WHF analysis
ΔkWh_{CFL}	**Energy Savings**	**13**	$\frac{kWh}{year}$	**Calculated**
ΔkWh_{LED}	**Energy Savings**	**19**	$\frac{kWh}{year}$	**Calculated**

Cadmus based the lighting ISRs on surveys of respondents only receiving CFLs or LEDs as part of a kit, thus providing a value is specific to the kit measure. Otherwise, the analysis remains consistent with the approach Cadmus used in evaluating upstream lighting.

Cadmus determined measure-level *ex ante* savings for CFLs and LEDs by dividing the total *ex ante* savings by the number of bulbs in the CFL or LED-only kits. Table 43 shows *ex ante* and *ex post* savings for each bulb type, along with realization rates. For CFL kit lamps, the realization rate is driven primarily by HOU, which was 1.73 for evaluated savings—26% less than the reported HOU of 2.34. Reported ISR for CFL kits is 2.7% higher than evaluated ISR, and WHF is 10% higher. These factors produce an overall kit CFL realization rate of 84%. For kit LEDs, reported HOU and ISR are 19% and 8% lower than evaluated values, respectively, and WHF is again 10% higher, producing an overall realization rate of 82%.

[19] National Renewable Energy Laboratory. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*, Chapter 21: Residential Lighting Evaluation Protocol. December 2014. Available online: http://www.nrel.gov/extranet/ump/pdfs/ump-res-lighting-clean.pdf

Table 43. Kit CFL and LED per Unit Reported and Evaluated *Ex Post* Savings

Bulb Type	Reported Savings Per Unit (kWh)	Evaluated *Ex Post* Savings Per Unit (kWh)	Realization Rate
CFL	16	13	84%
LED	23	19	82%

Kit Aerators

Cadmus evaluated faucet aerator electric savings using the following equation:

$$\Delta kWh = ISR \times (GPM_{Base} - GPM_{Low}) \times MPD \times \frac{PH}{FH} \times 8.3 \times (T_{Mix} - T_{In}) \times \frac{365}{RE \times 3{,}412} \times \%DHW_{elec}$$

Table 44 defines the key variables in the equation and provides values used in the analysis and the sources for these values.

Table 44. Energy Efficiency Kit Aerator Key Variables and Assumptions

Parameter	Definition	Value	Unit	Source
ISR_K	Kitchen aerator ISR	49	%	2014 kit participant telephone survey results n = 78
ISR_B	Bathroom aerator ISR	55	%	2014 kit participant telephone survey results n = 76
GPM_{Base}	Baseline flow rate	2.20	GPM	Federal rated maximum flow rate for faucets (10CFR430.32 (p) (DOE 1998)
GPM_{Low}	Efficient flow rate	1.5	GPM	Program Materials
MPD_K	Average minutes of use per person per day (kitchen)	4.5	$\frac{min}{day}$	2013 Cadmus Study*
MPD_B	Average minutes of use per person per day (bathroom)	1.6	$\frac{min}{day}$	2013 Cadmus Study*
PH	Average people per household	2.85	$\frac{people}{household}$	2014 kit participant survey results n = 79. Variable reflects average for only those that received water saving measures.
FH_K	Average kitchen faucets per household	1	$\frac{faucets}{household}$	Assume 1 kitchen per household.
FH_B	Average bathroom faucets per household	2.43	$\frac{faucets}{household}$	2014 kit participant survey results n = 80. Variable reflects average for only those that received water saving measures.
$T_{Mix,K}$	Average temperature out of kitchen faucet	93	$°F$	2013 Cadmus Study*
$T_{Mix,B}$	Average temperature out of bathroom faucet	86	$°F$	2013 Cadmus Study*
T_{In}	Average temperature into water heater	50.65	$°F$	Calculated for Idaho based on DOE Hot Water Scheduler workbook and 2013 US Census Bureau Population.
RE	Recovery efficiency of electric hot water heater	98	%	NREL, "Building America Research Benchmark Definition"**

Parameter	Definition	Value	Unit	Source
$\%DHW_{elec}$	Percent of households with electric hot water	80.8	%	2014 kit participant survey results n = 78. Variable reflects average for only those that received water saving measures.
ΔkWh_K	**Kitchen Aerator Energy Savings**	**135.5**	$\frac{kWh}{year}$	**Calculated**
ΔkWh_B	**Bathroom Aerator Energy Savings**	**45.3**	$\frac{kWh}{year}$	**Calculated**

* Cadmus and Opinion Dynamics. *Showerhead and Faucet Aerator Meter Study*. Prepared for Michigan Evaluation Working Group, 2013.

** National Renewable Energy Laboratory (NREL), *Building America Research Benchmark Definition*. December 2009. pg. 12. Available Online: http://www.nrel.gov/docs/fy10osti/47246.pdf

Table 45 shows *ex ante* and *ex post* savings for each bulb type, along with realization rates.

Table 45. Kit Kitchen and Bathroom Aerator per Unit Reported and Evaluated *Ex Post* Savings

Kit Measure	Ex Ante Savings	Ex Post Savings	Realization Rate
Kitchen Aerator	26	135	526%
Bathroom Aerator	63	45	72%

The *ex ante* kit aerator savings are based on a 2013 potential study that provides per household savings assuming there are 2.16 bathroom aerators and 1 kitchen aerator per household.[20] The *ex ante* estimates assume that there is no difference in savings between an aerator installed in a kitchen and a bathroom. The kitchen aerator *ex ante* savings represent the average savings of 2.16 aerators installed in bathrooms and one aerator installed in a kitchen, all with a flow rates of 1.5 GPM. The bathroom aerator *ex ante* savings represent the average savings of 2.16 aerators installed in bathrooms and one

[20] Cadmus. Assessment of Long-Term, System-Wide Potential for Demand-Side and Other Supplemental Resources, 2013-20132 Volume I and II. Prepared for Pacificorp, March 2013. Available online: https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjp1JmsoNbPAhUKqFQKHcmTAtAQFggeMAA&url=http%3A%2F%2Fwww.pacificorp.com%2Fcontent%2Fdam%2Fpacificorp%2Fdoc%2FEnergy_Sources%2FDemand_Side_Management%2FDSM_Potential_Study%2FPacifiCorp_DSMPotential_FINAL_Vol%2520I.pdf&usg=AFQjCNGWykZoZQk4JArl71ZelvYV0eoDzw&sig2=vBMmVteS8SecO0o6FShbUw&cad=rja and https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwjp1JmsoNbPAhUKqFQKHcmTAtAQFggjMAE&url=http%3A%2F%2Fwww.pacificorp.com%2Fcontent%2Fdam%2Fpacificorp%2Fdoc%2FEnergy_Sources%2FDemand_Side_Management%2FDSM_Potential_Study%2FPacifiCorp_DSMPotential_Vol-II_Mar2013.pdf&usg=AFQjCNFQVYe3-f5HtQDVU7caujZopw_rZQ&sig2=PNmxnYHKDOGBoro_0ObmYA&cad=rja

aerator installed in a kitchen, all with a flow rates of 0.5 GPM. In both cases, the *ex ante* savings do not take into account the difference in operation between kitchen and bathroom faucets.

The ISR used to calculate *ex ante* savings (76%) is greater than the ISR used to calculate ex post savings (49% and 55% for kitchen and bathroom aerators, respectively). The *ex ante* ISR is based on the RTF showerhead savings workbook from 2011.[21]

The *ex post* kit aerator savings are superior to the *ex ante* estimates because they are specific to the end use and equipment flow rate. The *ex post* kitchen aerator savings are specific to a 1.5 GPM aerator installed in a kitchen, and the *ex post* bathroom aerator savings are specific to a 0.5 GPM aerator installed in a bathroom. Although the rated flow rate of the bathroom aerators is lower than that of the kitchen aerators, the expected daily use of the kitchen aerators is much greater than that of the bathroom aerators. For that reason, the kitchen aerators result in greater savings.

The Energy Efficient Kit Participant survey asked respondents who received water-saving measures (aerators and showerheads) about their water heating fuel type, and 80.8% of respondents reported having an electric water heater. The program strives to provide kits with water-saving measures only to customers with an electric water heater by including a question on the online kit ordering portal; customers are disqualified from receiving water-saving measures if they report having a water heater fueled by natural gas or another fuel type. Cadmus assigned electric savings only to the 80.8% of participants who reported having an electric water heater.

Kit Showerheads

Cadmus evaluated showerhead electric savings using the following equation:

$$\Delta kWh = (GPM_{Base} - GPM_{EE}) \times ISR \times MPS \times N_S \times Qty \times PH \times \frac{(T_{Mix} - T_{in})}{RE} \times \%DHW_{elec} \times \frac{365 \times 8.33}{3412}$$

Table 46 defines the key variables in the equation and provides values used in the analysis and the sources for these values. Cadmus based the ISRs for showerheads on surveys of respondents receiving a kit during 2014.

[21] Regional Technical Forum. "Residential: DHW – Showerheads." ResShowerheads_v2_1.xlsx. July 12, 2011. Available online: http://rtf.nwcouncil.org/measures/measure.asp?id=126#

Table 46. Energy Efficiency Kit Showerhead Key Variables and Assumptions

Parameter	Definition	Value	Unit	Source
GPM_{Base}	Baseline flow rate	2.5	GPM	Federal rated maximum flow rate for faucets (10CFR430.32 (p) (U.S. Department of Energy, 1998)
GPM_{EE}	Efficient flow rate	1.5	GPM	Program Materials
ISR	In-service rate	56.7	%	2014 kit participant telephone survey results n = 79
MPS	Average shower duration	7.8	$\frac{min}{shower}$	2013 Cadmus Study*
N_S	Average showers per person per day	0.6	$\frac{showers}{day}$	2013 Cadmus Study*
Qty	Average showerheads per household	2	$\frac{showerheads}{household}$	2014 kit participant telephone survey results n = 79
PH	Average people per household	2.85	$\frac{people}{household}$	2014 kit participant survey results n = 79. Variable reflects average for only those that received water saving measures.
$T_{Mix,B}$	Average temperature out of showerhead	101	$°F$	2013 Cadmus Study*
T_{In}	Average temperature into water heater	50.65	$°F$	Calculated for Idaho based on U.S. Department of Energy Hotwater Scheduler workbook and 2013 U.S. Census Bureau Population
RE	Recovery efficiency of electric hot water heater	98	%	NREL, "Building America Research Benchmark Definition"**
$\%DHW_{elec}$	Percent of households with electric hot water	80.8	%	2014 kit participant survey results n = 78. Variable reflects average for only those that received water saving measures.
365	Days per year	365	$\frac{day}{year}$	Constant
8.33	Pound to gallon conversion	8.33	$\frac{lbs}{gal}$	Constant
3412	kWh to Btu conversion	3,412	$\frac{Btu}{kWh}$	Constant
ΔkWh	**Energy Savings**	**140**	**$\frac{kWh}{year}$**	**Calculated**

* Cadmus and Opinion Dynamics. *Showerhead and Faucet Aerator Meter Study*. Prepared for Michigan Evaluation Working Group. 2013.

** National Renewable Energy Laboratory (NREL). *Building America Research Benchmark Definition*. December 2009. pg. 12. Available Online: http://www.nrel.gov/docs/fy10osti/47246.pdf

Cadmus based the showerhead ISR on surveys of respondents receiving a kit during 2014. Table 47 shows *ex ante* and *ex post* savings for kit showerheads, along with realization rates.

Table 47. Kit Showerhead per Unit Reported and Evaluated *Ex Post* Savings

Kit Component	Ex Ante Savings	Ex Post Savings	Realization Rate
Showerhead	260	140	54%

The *ex ante* kit showerhead savings are from version 2.1 of the Residential DHW Showerhead RTF workbook.[22] The *ex ante* value from the RTF workbook is specific to residential showerhead replacements on any shower (primary or secondary) received by a mail in request to a home with electric water heating.

There are two major factors causing the *ex ante* savings to exceed the *ex post* savings. First, the *ex ante* estimates assume that 100% of the showerheads were installed at homes with electric water heaters, while Cadmus assumed only 80.8% of participants have electric water heaters. This is consistent with Cadmus's approach for kit aerators (see the Kit Aerators section for more details). Second, the *ex ante* estimates used an ISR of 76%, based on a PSE survey of homeowners that received low flow showerheads s part of a direct mail program in 2007.[23] Cadmus used an ISR of 56.7%, based on surveys of 79 participants in Idaho that received kits in 2014.

Energy Efficiency Kits Summary

Using the evaluated savings shown above for CFLs, LEDs, aerators, and showerheads, Cadmus calculated savings for each variety of kit. Table 48 shows the percentage of evaluated savings attributable to each kit component.

[22] Regional Technical Forum. "Residential: DHW – Showerheads." ResShowerheads_v2_1.xlsx. July 12, 2011. Available online: http://rtf.nwcouncil.org/measures/measure.asp?id=126

[23] Puget Sound Energy. "2008 Low Flow Showerhead Study Documents." 2008 Low Flow Showerhead Study/pdf. 2008. Available online: https://conduitnw.org/_layouts/Conduit/FileHandler.ashx?rid=252

Table 48. Percent of Evaluated Savings by Kit Component

Kit Name	Percent of Kit Evaluated Savings				
	CFL Bulbs	LED Bulbs	Kitchen Aerators	Bathroom Aerators	Showerheads
Basic 1	14%	0%	36%	12%	37%
Basic 2	10%	0%	24%	16%	50%
Better 1	14%	0%	36%	12%	37%
Better 2	10%	0%	24%	16%	50%
Best 1	0%	19%	34%	11%	35%
Best 2	0%	13%	23%	16%	48%
CFL Only	100%	0%	0%	0%	0%
LED Only	0%	100%	0%	0%	0%

For all kits that included more than lighting, showerheads accounted for the greatest share of evaluated savings, followed by kitchen aerators. Lighting and bathroom aerators accounted for roughly the same amount of energy savings in all of the non-lighting-only kits.

For each of the eight energy efficiency kits, Table 49 shows the quantity of each component that makes up the kit, the quantity of kits installed in 2013 and 2014, the reported and evaluated savings per kit, and the realization rates.

Table 49. Components in Each Energy Efficiency Kit

Kit Name	Quantity per Kit					Kits Distributed	Reported kWh Savings per Kit	Evaluated kWh Savings per Kit	Realization Rate
	CFL	LED	Kitchen Aerator	Bathroom Aerator	Showerhead				
Basic 1	4	0	1	1	1	1,047	412	374	91%
Basic 2	4	0	1	2	2	3,008	735	559	76%
Better 1	4	0	1	1	1	42	412	374	91%
Better 2*	4	0	1	2	2	124	735	559	76%
Best 1	0	4	1	1	1	51	440	396	90%
Best 2	0	4	1	2	2	282	763	581	76%
CFL Only	4	0	0	0	0	2,769	64	53	84%
LED Only	0	4	0	0	0	189	92	76	82%
Total	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7,512**	**3,180,964****	**2,504,094****	**79%**

* Better and basic kits 1 and 2 have the same quantities of measures, but differ in the type of showerhead provided. Better kits provide a handheld showerhead in the kit, which has no impact on reported or evaluated savings per kit.

** Total savings from all installed kits, which is the sum-product of the quantity installed and savings per kit.

Clothes Washers

Cadmus estimated clothes washer energy savings using the same approach described in the ENERGY STAR calculator from April 2013, which compared the modified energy factor (MEF) of an efficient unit to the MEF of a unit meeting the federal standard. The evaluation divided savings among the three possible end uses—clothes washer machines, dryers, and water heating—and adjusted the savings based on program-specific data from Cadmus' survey, such as the number of loads washed per year and the percentage of loads dried in a dryer. This presented the most appropriate approach because it drew upon the federal standard that was effective from 2011–2015 and, whenever possible, incorporated program-specific information from the tracking database and participant surveys.

The evaluation estimated an average gross evaluated savings value of 378 kWh per unit, yielding a 288% realization rate for 2013–2014. Two factors primarily drove the high realization rate:

- Reported savings were consistent with the RTF values, which had been calculated using a current practice baseline, not a federal standard baseline, thus the reported savings tended to decrease savings because the current practice baseline was more efficient than the federal standard.
- Savings typically were underreported for the highest-efficiency clothes washers. Since the RTF is divided into distinct tiers, many incented units falling into the highest energy efficiency levels (MEF $\geq$ 3.2) were assigned the same savings values as less-efficient units. For example, 19 units with MEF of 3.45 received the same reported savings as units with an MEF as low as 2.2, despite the significant improvements in expected energy performance.

Using the following equations, Cadmus compared the energy consumption of efficient ENERGY STAR clothes washers to a model that met the minimum federal standard concurrently with the program (2013–2014):

$$kWh_{sav\ total} = kWh_{sav\ dryer} + kWh_{sav\ HW} + kWh_{sav\ mach}$$

$$kWh_{sav\ dryer} = \left[\left(\frac{1}{MEF_{base}} - \frac{1}{MEF_{ES}}\right) \times Loads_{act} \times Cap - kWh_{sav\ HW} - kWh_{sav\ mach}\right] \times (\%Dry)$$

$$kWh_{sav\ HW} = (Ref\ Energy_{base} - Ref\ Energy_{ES}) \times (\%WH) \times \left(\frac{Loads_{act}}{Loads_{ref}}\right)$$

$$kWh_{sav\ mach} = (Ref\ Energy_{base} - Ref\ Energy_{ES}) \times (1 - \%WH) \times \left(\frac{Loads_{act}}{Loads_{ref}}\right)$$

Table 50 defines the variables in the equations above and, when applicable, provides values and sources.

Table 50. Clothes Washer Key Variables and Assumptions

Parameter	Definition	Value	Unit	Source
$kWh_{sav\ total}$	Total energy savings	Varied	$\frac{kWh}{year}$	Calculated
$kWh_{sav\ dryer}$	Total dryer energy savings	Varied	$\frac{kWh}{year}$	Calculated
$kWh_{sav\ HW}$	Total hot water energy savings	Varied	$\frac{kWh}{year}$	Calculated
$kWh_{sav\ mach}$	Total machine energy savings	Varied	$\frac{kWh}{year}$	Calculated
MEF_{base}	Modified energy factor of baseline unit	1.26	$\frac{ft^3 * load}{kWh}$	Federal Standard (as of 2011)
MEF_{ES}	Modified energy factor of ENERGY STAR unit	Varied	$\frac{ft^3 * load}{kWh}$	Tracking Data
$Loads_{act}$	Loads per year	299*	$\frac{loads}{year}$	Idaho 2013–2014 non-lighting participant survey
Cap	Clothes washer capacity	4.1	ft^3	Tracking Data (Model # lookup of 80% of installed washers)
$\%Dry$	Percent of loads dried in the dryer	88%**	%	Idaho 2013–2014 non-lighting participant survey
$Ref\ Energy_{base}$	Reference rated energy consumption of baseline unit	417	$\frac{kWh}{year}$	ENERGY STAR Appliance Calculator (April 2013)
$Ref\ Energy_{ES}$	Reference rated energy consumption of ENERGY STAR unit	186	$\frac{kWh}{year}$	ENERGY STAR Appliance Calculator (April 2013)
$\%WH$	Percent of rated electricity consumption used for water heating	80%	%	ENERGY STAR Appliance Calculator (April 2013)
$Loads_{ref}$	Reference loads per year	392	$\frac{loads}{year}$	ENERGY STAR Appliance Calculator (April 2013)

*The number of loads per year used in the 2011–2012 Idaho HES Program Evaluation was 342.

**The percent of loads dried in the dryer used in the 2011–2012 Idaho HES Program Evaluation was 81%.

Cadmus identified four clothes washer efficiency levels derived from measure names and the rated MEF provided in the program tracking database. The evaluation estimated savings for each efficiency level by estimating savings for each combination of domestic hot water (DHW) fuel, dryer fuel, and average MEF for each level. If the DHW or dryer fuel was not electrically powered (e.g., natural gas or propane), Cadmus set those savings components—respectively, $kWh_{sav\ HW}$ and $kWh_{sav\ dryer}$—equal to zero.

Table 51 shows the quantity of units incented, reported and evaluated savings, realization rates, and percentages of reported savings for each combination of DHW and dryer fuel at each efficiency level during 2013 and 2014.

Table 51. Clothes Washer Savings by Performance Level and DWH/Dryer Fuel

Efficiency Level	MEF Low	MEF High	DHW Fuel	Dryer Fuel	Quantity		Reported Unit Energy Savings		Evaluated Unit Energy Savings		Realization Rate*		Percentage of Reported Savings*	
					2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Level 1**	2.0	2.19	Electric	Electric	1	0	321	N/A	340	N/A	106%	N/A	0%	0%
			Electric	Other	0	0	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%
			Other	Electric	0	0	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%
			Other	Other	0	0	N/A	N/A	N/A	N/A	N/A	N/A	0%	0%
Level 2	2.2	2.59	Electric	Electric	85	27	191	191	434	434	227%	227%	24%	15%
			Electric	Other	3	0	88	N/A	176	N/A	200%	N/A	0%	0%
			Other	Electric	77	28	107	106	293	293	273%	277%	12%	8%
			Other	Other	15	3	3	3	35	35	1098%	1098%	0%	0%
Level 3	2.6	3.19	Electric	Electric	96	33	196	191	503	503	256%	264%	28%	18%
			Electric	Other	4	0	88	N/A	176	N/A	200%	N/A	1%	0%
			Other	Electric	100	35	109	106	363	363	332%	342%	16%	11%
			Other	Other	23	8	5	3	35	35	709%	1098%	0%	0%
Level 4	3.2	N/A	Electric	Electric	36	49	191	162	542	542	284%	336%	10%	22%
			Electric	Other	0	2	N/A	88	N/A	176	N/A	200%	0%	1%
			Other	Electric	42	83	108	106	401	401	370%	379%	7%	25%
			Other	Other	9	19	3	11	35	35	1098%	332%	0%	1%
All Levels	2.0	N/A	Electric	Electric	218	109	194	178	482	504	249%	283%	44%	38%
			Electric	Other	7	2	88	88	176	176	200%	200%	1%	1%
			Other	Electric	219	146	108	106	346	371	319%	350%	45%	51%
			Other	Other	47	30	4	8	35	35	866%	446%	10%	10%
Weighted Average* **					**491**	**287**	**136**	**123**	**374**	**385**	**275%**	**313%**	**100%**	**100%**

* Realization rates may not calculate exactly due to rounding of evaluated UES values. Reported savings may not add to 100% due to rounding.

** One level 1 clothes washer application was approved in late 2012 and fell into the 2013–2014 program accounting period. Clothes washers at level 1 (MEF 2.0-2.19) were not eligible in the 2013–2014 program period.

*** "Quantity" and "Percent of Report Savings" values are summations, not average values.

As shown in Table 51, a clothes washer, paired with a non-electric dryer and a non-electric water heater, offers lower savings than a unit paired with an electric dryer and/or water heater. In 2013 and 2014, the tracking database showed that units combining natural gas dryers and water heaters accounted for 10% of all incented units. Although the savings are low for units with non-electric dryers and water heaters, instituting fuel eligibility requirements could lead to logistical burdens and inaccurate self-reporting if customers are aware that their eligibility depends upon an electric dryer and/or water heater.

Table 52 shows the percentage of units installed in 2013 and 2014 at each performance level.

Table 52. Clothes Washer Performance Level by Year

Efficiency Level	Percent of Units		Source
	2013	2014	
Level 1—Least Efficient	0%	0%	ID 2013–2014 Non-Lighting Tracking Database
Level 2	37%	20%	ID 2013–2014 Non-Lighting Tracking Database
Level 3	45%	26%	ID 2013–2014 Non-Lighting Tracking Database
Level 4—Most Efficient	18%	53%	ID 2013–2014 Non-Lighting Tracking Database

From 2013 to 2014, units given incentives in the highest efficiency level (Level 4) increased by 36%. Participating units became more efficient in 2014, while federal standards remained the same; therefore, average savings per clothes washer increased from 2013 to 2014. In most cases, reported per-unit savings for Level 4 units equaled Level 3 units despite the increase in efficiency (as shown in Table 51). Increasing the savings for these high-efficiency units increased the realization rate of evaluated savings.

Table 53 summarizes the percentage of savings attributable to each of the three savings components—the clothes washers and the associated dryers and DWHs.

Table 53. Clothes Washer Savings by System Component

Source of Clothes Washer Savings	Percent of Savings*			
	Level 1	Level 2	Level 3	Level 4
Dryer	48%	59%	65%	68%
DHW	41%	32%	28%	26%
Clothes Washer	10%	8%	7%	6%

*Calculated using the equations above and the parameters listed in Table 50.

Reduced dryer load produces the largest energy savings component, with its share of savings increasing as the units become more efficient.

Table 54 shows the percentage of units installed in homes with electrically heated DHW and dryers.

Table 54. Clothes Washer Percent of Electric DHW and Dryer Fuel

Input Categories		2013–2014 Saturation of Fuel Types	2011–2012 Saturation of Fuel Types	Source
DHW Fuel	Electric	43%	42%	ID 2011–2012 and 2013–2014 Non-Lighting Tracking Databases
	Other	57%	58%	
Dryer Fuel	Electric	89%	89%	
	Other	11%	11%	

Heat Pumps

Cadmus evaluated savings for three heat pump measures for which Rocky Mountain Power offers incentives: ductless heat pumps, heat pump system conversions, and heat pump upgrades.[24] Cadmus estimated savings for all heat pump measures using version 3.2 of the RTF residential single-family heat pump savings workbook.[25]

Whenever possible, Cadmus refined the RTF model by incorporating program or Idaho specific data. Specifically, Cadmus used Idaho participant surveys to more completely define the baseline condition, estimating that 22% of homes had central air conditioning prior to the installation of heat pumps, 83% of homes used electric resistance zonal systems, and 17% used electric forced air furnaces.

The RTF provides unique savings values for distinct heating and cooling zones, which are defined by the average annual HDDs and CDDs. Cadmus calculated a distribution of heating and cooling zones based on the population and average annual HDD and CDD in Idaho.[26] Table 55 shows the calculated distribution of population by climate zone.

[24] The "heat pump" measure comprises four sub-measures incented by Rocky Mountain Power in 2014: electric system to heat pump conversion, heat pump to heat pump upgrade, electric system to ground source heat pump conversion, and heat pump best practice installation & sizing.

[25] Regional Technical Forum. "Residential: Heating/Cooling – Air Source Heat Pump Conversions SF." ResSFExisitngHVAC_v3_2.xlsx. May 12, 2015. Available online: http://rtf.nwcouncil.org/measures/measure.asp?id=131

[26] Regional Technical Forum. Supporting Data Files, PNW HDD and CDD Zone Assignments.xlsx. June 4, 2013. Available online: http://rtf.nwcouncil.org/measures/support/files/Default.asp

Table 55. Distribution of Population by Climate Zone

Climate Zone	Percentage of Population
Heating Zone 1 Cooling Zone 1	0%
Heating Zone 1 Cooling Zone 2	0%
Heating Zone 1 Cooling Zone 3	39%
Heating Zone 2 Cooling Zone 1	6%
Heating Zone 2 Cooling Zone 2	31%
Heating Zone 2 Cooling Zone 3	5%
Heating Zone 3 Cooling Zone 1	12%
Heating Zone 3 Cooling Zone 2	7%
Heating Zone 3 Cooling Zone 3	0%

Table 56 shows the quantity of each heat pump measure incented in 2013 and 2014, the reported and evaluated savings, and realization rates.

Table 56. 2013-2014 Reported and Evaluated Heat Pump Savings

Measure	Quantity 2013	Quantity 2014	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Ductless Heat Pump	16	21	3,500	2,463	70%
Heat Pump System Conversion	2	0	5,166	5,946	115%
Heat Pump*	0	7	3,036	5,584	184%
Weighted Average**	**18**	**28**	**3,890**	**3,089**	**79%**

*Measure comprises electric system to heat pump conversion, heat pump to heat pump upgrade, electric system to ground source heat pump conversion, and heat pump best practice installation and sizing.
**Quantity values are summations, not average values.

The majority of heat pump savings in 2013 and 2014 are attributable to ductless heat pump projects because they were by far the most common heat pump measure incented. The reported savings value for ductless heat pumps (3,500 kWh per unit) was consistent with an earlier version of the RTF workbook from April 17, 2012.[27] The evaluated savings are lower for ductless heat pumps than the reported savings because of refinements made to the models used in updated versions of the RTF workbook to better account for heat pump energy consumption.

[27] Regional Technical Forum. "Residential: Heating/Cooling – Ductless Heat Pumps for Zonal Heat SF." ResHeatingCoolingDuctlessHeatPumpsSF_v1_4.xlsx. Available online: http://rtf.nwcouncil.org/measures/measure.asp?id=131

Attic, Wall, and Floor Insulation

Cadmus conducted billing analysis to assess actual net energy savings associated with insulation measure installations.[28] The analysis determined the savings estimate using a pooled, conditional savings analysis (CSA) regression model, which involved these two groups:

- 2013–2014 insulation participants (combined attic, wall, and floor insulation)
- Nonparticipant homes, serving as the comparison group

Cadmus used program participants, a control group, billing consumption, and Idaho weather data to create a final database for conducting the billing analysis. This required matching participant program data with billing data and, using zip codes, mapping daily HDDs and CDDs to respective monthly read-date periods. The process defined the billing analysis pre-period as 2012 (before measure installations occurred) and the post-period as September 2014 through August 2015.[29]

To ensure the final model used complete pre- and post-participation and nonparticipant billing data, Cadmus applied several screening mechanisms (Appendix C provides further details).

Insulation Results

Cadmus estimated average insulation savings of 1,402 kWh per participant, translating to a 102% net realization rate for insulation measures. This analysis resulted in net (rather than gross) savings as it compared participant usage trends to a nonparticipant group, accounting for market conditions outside of the program.

With an average participant pre-usage of 17,956 kWh, savings represented an 8% reduction in total energy usage from insulation measures installed. Table 57 presents the overall net savings estimate for wall, floor, and attic insulation.

Table 57. Insulation Net Realization Rates

Model	Billing Analysis Participants (n)	Reported kWh Savings per Premise	Evaluated Net kWh Savings per Premise	Net Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall*	**39**	**1,380**	**1,402**	**102%**	**±48%**	**52%–151%**
Electric Heat	29	1,850	1,869	101%	±41%	59%–143%

* Overall model includes both electric and gas heat – could not split out gas heat due to small sample size.

[28] Billing analysis performed for customers installing only attic, wall, or floor insulation measures.

[29] Because participants who installed measures in late 2014 had less than 10 months of post-period data, Cadmus removed them from the analysis. Similarly, Cadmus removed customers participating in 2013 with measure installation dates before November 2012 because this produced less than 10 months of pre-period data.

Cadmus used only overall model results (which included both electric and gas heat) to determine measure-level net savings but also provided results for the electric space heating fuel. Separate results could not be estimated for gas heated homes because of the small sample size (n=10).

Manufactured Home Duct Sealing and Insulation

Cadmus was not able to conduct a separate Idaho billing analysis for manufactured homes duct sealing because only eight participants remained in the analysis after the screening. Instead, Cadmus applied the current 2013-2014 program year evaluation realization rate for Pacific Power's Washington manufactured home duct sealing (which had more participant data) for Idaho. Washington had actual manufactured homes participants with electric heat, while there was only one manufactured home remaining in the entire Utah analysis. Almost all the duct sealing customers in Utah were gas heated single family residences and were not expected to have savings similar to electrically heated manufactured home residences. Furthermore, Washington also had a matched group of manufactured home nonparticipants to account for non-program changes in usage specifically for manufactured homes. As a result, applying the Washington realization rate was most appropriate.

Manufactured Home Duct Sealing and Insulation Results

For Washington, Cadmus estimated average manufactured home duct sealing and duct insulation savings of 1,825 kWh per home, which translated to a 96% net realization rate for these measures. It is reasonable to apply the Washington results to Idaho because the sample size for Washington was considerably higher at 118 and the associated relative precision on the Washington savings is 16%, and Washington has similar weather to Idaho. As with the insulation results, this produced net (rather than gross) savings because it compared participant usage trends to a nonparticipant group, accounting for market conditions outside of the program.

With average participant pre-usage of 17,671 kWh, savings represented a 10% reduction in total energy use from installing the manufactured homes duct measure. Table 58 presents the overall savings estimate for duct sealing and duct insulation from the Washington billing analysis.

Table 58. Manufactured Home Ductwork Net Realization Rates

Model	Billing Analysis Participant (n)	Reported kWh Savings per Premise	Evaluated Net kWh Savings per Premise	Net Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall	**118**	**1,910**	**1,825**	**96%**	**±16%**	**80%–111%**
Electric Heat (Heat Pump)	24	3,214	3,000	93%	±20%	74%-112%
Electric Heat (Non-Heat Pump)	94	1,577	1,525	97%	±21%	76%-117%

Cadmus used only the overall Pacific Power Washington model results to determine the Idaho measure-level net savings, but provided results by for heat pump and non-heat pump participants. Overall,

participants with heat pumps achieved savings of 3,000 kWh (15%), and those without heat pumps achieved 1,525 kWh (9%).

Evaluated Net Savings

Cadmus tailored the net savings adjustment analysis to each measure and measure category and developed NTG analysis methods prioritized by the highest saving measures. For CFL and LED bulbs, Cadmus conducted demand elasticity modeling to estimate the freeridership of a discounted bulb's price. For non-lighting measure categories (including kits), Cadmus conducted freeridership and participant spillover analysis using responses from the non-lighting survey and participant kit survey.

Further, Cadmus included a series of questions in the general population survey to estimate nonparticipant spillover, that is, the savings generated by customers who were motivated by the program's reputation and marketing to conduct energy efficiency installations for which they did not receive an incentive. However, the analysis did not apply these nonparticipant spillover to program savings for this period; these were instead calculated for informational purposes at 5% of total HES program savings. Appendix E provides detailed nonparticipant spillover analysis methods and results.

Table 59 provides the net savings evaluation results: evaluated gross savings, evaluated net savings, and NTG by measure type, as well as the NTG methodology utilized.

Table 59. HES Program NTG Methods and Results for 2013–2014

Measure Category	Measure Name	Program Savings (kWh)		NTG	NTG Methodology
		Evaluated Gross	Evaluated Net		
Appliance	Clothes Washer	293,062	208,074	71%	Self-Response NTG
	Dishwasher	13,999	9,939		
	Electric Water Heater	3,930	2,790		
	Portable Evaporative Cooler	209	149		
	Freezer	94	66		
	Light Fixture	807,603	573,398		
	Refrigerator	7,470	5,304		
	Room Air Conditioner	1,593	1,131		
HVAC	Central Air Conditioner Equipment	383	291	76%	Self-Response NTG
	Heat Pump Water Heater	4,405	3,348		
	Evaporative Cooler	4,652	3,536		
	Gas Furnace	7,920	6,019		
	Ground Source Heat Pump Conversion	12,525	9,519		
	Heat Pump	39,091	39,091	100%	No Adjustments*
	Heat Pump System Conversion	11,893	11,893		
	Ductless Heat Pump	91,120	91,120		

Measure Category	Measure Name	Program Savings (kWh)		NTG	NTG Methodology
		Evaluated Gross	Evaluated Net		
Kit	wattsmart Starter Kit	2,504,094	2,253,684	90%	Self-Response NTG
Lighting	CFL Bulbs	2,417,197	1,321,106	55%	Demand Elasticity Modeling
	LED Bulbs	13,912	4,255	31%	
Manufactured Homes	Duct Sealing	43,700	43,700	100%	No Adjustments**
Weatherization	Attic Insulation	401,705	401,705		
	Floor Insulation	11,594	11,594		
	Wall Insulation	12,759	12,759		
	Windows	15,359	12,134	79%	Self-Response NTG
Total		**6,720,267**	**5,026,604**	**75%**	

* No net adjustments applied to heat pump measures as the engineering review used a current practice baseline to estimate savings.

**No net adjustments applied to insulation and ductwork measures as the billing analysis conducted to generate savings produced a net result.

The following sections describe the NTG methodology used and the detailed results for lighting and non-lighting measures.

Lighting Evaluated Net Savings

To estimate HES program freeridership for CFLs and LEDs, Cadmus performed demand elasticity modeling, which is a method for estimating net lighting savings based on actual observed sales. Cadmus used information from the tracking database (provided by the program administrator) to predict bulb sales in the absence of program incentives. The analysis expressed sales as a function of price (including incentives), seasonality, retail channel, and bulb characteristics. Appendix B outlines the equation for the elasticity model.

To complete the analysis, Cadmus used model coefficients to predict sales as though prices had remained at their original levels and promotional events had not taken place. Cadmus then multiplied predicted sales at the incented program price and at the price-absent program incentives by the evaluated gross kWh savings per bulb.[30] The difference in savings between the hypothetical original price scenario and what actually occurred produced CFL and LED bulb savings attributable to the program.

However, because the Rocky Mountain Power program had insufficient price variation for an evaluation specific to just the Idaho territory, Cadmus combined the sales from Idaho with Rocky Mountain Power's

[30] Though statistical models over- or under-predict to some degree, predicted program sales should be close to actual sales using a representative model. Using predicted program sales rather than actual sales mitigates bias by comparing predicted program sales to predicted non-program sales.

Utah and Wyoming sales data to produce elasticity estimates. While there may be differences in consumer behavior between the three regions, the combined Rocky Mountain Power sales is primary data for Rocky Mountain Power covering the evaluation period and is the most representative data available with which to estimate price elasticities. Cadmus then applied these elasticity estimates to Idaho sales data to reflect the observed markdown levels (the incentive compared to the un-incented price) specific to Rocky Mountain Power Idaho. The elasticities are shown in Table 60.

Table 60. Elasticities by Bulb Type

Bulb Type	Elasticity
CFL	1.03
LED	1.45

The elasticity estimates were greater for LEDs. This means that for each percentage decrease in price, LED sales increased by 1.45% compared with 1.03% for CFLs. Table 61 shows the net savings results.

Table 61. Lighting Freeridership and NTG

Bulb Type	Freeridership	NTG*
CFLs	45%	55%
LEDs	69%	31%
All Bulbs**	**46%**	**54%**

* Some upstream lighting spillover was estimated from the intercept surveys at 0.4% but was not applied.
** The model results for all bulbs were not applied at this level. Individually modeled CFL and LED NTG rates were applied to determine net savings.

Overall, freerider savings were estimated at 46%, resulting in a 54% NTG (55% for CFLs and 31% for LEDs). Though demand for LEDs was more elastic – meaning that for a given percent change in price, the change in demand was greater for LEDs – the markdown levels for LEDs, in percentage terms, were less than half of the markdowns observed for CFLs. This resulted in higher freeridership for LEDs. Markdown levels are shown in Table 62.

Table 62. Per-Bulb Price and Freeridership by Retail Channel and Bulb Type

Bulb Type	Average Original Price Per Bulb	Average Final Price Per Bulb	Percentage Markdown	Freeridership
CFL	$2.09	$1.25	53%	45%
LED	$10.93	$8.63	21%	69%

Appendix B provides a detailed report on the price response modeling methodology and results.

Freeridership Comparisons

Table 63 compares CFL freeridership estimates from several recent evaluations using the elasticity model approach. The table also shows the average, sales-weighted original retail price of program bulbs and the markdown as a percentage of the original price, which is a significant driver of freeridership estimates.

Table 63. Comparisons of CFL Freeridership and Incentive Levels

Utility	Bulb Type	Average Original Price per Bulb	Average Markdown per Bulb	Percentage Markdown	Freeridership
Mid-Atlantic Utility 1 (2012-2013)	Standard	$1.97	$1.41	72%	27%
Mid-Atlantic Utility 3 (2012-2013)	Standard	$2.10	$1.59	76%	27%
New England Utility (2011)	Standard	$2.11	$1.00	47%	32%
Rocky Mountain Power Idaho (2011-2012)	Standard	$2.27	$1.43	63%	34%
Mid-Atlantic Utility 2 (2012-2013)	Standard	$2.14	$1.43	67%	35%
Mid-Atlantic Utility 4 (2012-2013)	Standard	$2.22	$1.46	66%	35%
Midwest Utility (2014)	Standard	$1.82	$1.13	62%	43%
Rocky Mountain Power Idaho (2013–2014)	**Standard**	**$2.23**	**$1.11**	**53%**	**45%**
Southeast Utility (2013)	Standard	$2.15	$1.09	51%	48%

The freeridership estimates for Rocky Mountain Power are within the range of those observed in other programs; however, they have increased since the 2011–2012 evaluation. The most obvious difference that could account for the increase is a decrease in the markdown levels. In the 2011–2012 program years, the average markdown for standard CFLs was 63% compared with 53% in the 2013–2014 program years.

Another factor contributing to freeridership could be the maturation of the efficient lighting market. As CFLs become a more familiar and accepted technology, demand may become less elastic—that is, consumers who are willing to substitute CFLs for less efficient bulbs may have become less dependent on promotional activities over time. Some of this effect may be because of utility-sponsored programs, such as the Rocky Mountain Power program, as well as factors such as improved lighting quality and customers realizing energy savings from switching to CFLs. For customers who are less inclined to substitute CFLs, their decision may remain the same regardless of price changes.

Saturation of CFLs could be another factor contributing to freeridership. Customers who responded to price drops in 2011 or 2012 by stocking up on CFLs may need to buy fewer bulbs in subsequent years if they still have previously purchased bulbs in storage. That is, if customers have already purchased CFLs in the past and do not have an immediate need to buy more, the program would need to discount CFLs to a greater degree to entice customers to purchase more bulbs, which would lead to lower observed elasticities.

Table 64 shows LED freeridership estimates for four other recent evaluations. The freeridership estimate for Rocky Mountain Power Idaho program is greater than for the other utilities. Additional details for

markdown levels and prices are not provided because the retail and product mix varies considerably between evaluations, a major factor in the per-bulb prices. However, LED markdown levels are typically in the 40% to 50% range, which is considerably higher than the 21% markdown observed in the Rocky Mountain Power Idaho program.

Table 64. Comparison of LED Freeridership

Utility	Freeridership
Wisconsin (2015)	29%
Midwest (2014)	30%
South (2015)	48%
Mid-Atlantic (2014-2015)	48%
Rocky Mountain Power Idaho (2013-2014)	**69%**

Upstream Lighting Spillover

Upstream participant lighting spillover was estimated from the intercept surveys at 0.4% (the Intercept Survey Spillover section of this report describes the methodology). That is, for every 1,000 kWh of evaluated gross savings, an additional 4 kWh of unreported savings may have occurred as a result of the program's operation. This value, however, was not applied due to the nature of sampling which was prioritized by the leakage study. Because the majority of stores Cadmus visited were on the edges and outside of Rocky Mountain Power's service territory, the results did not represent the full picture of spillover occurring from the upstream lighting incentives and likely provided a low estimate. Also, spillover proves particularly difficult to measure for upstream programs. Customers often remain unaware of their participation in the program so they generally cannot identify its influence on other purchasing decisions.

Non-Lighting Evaluated Net Savings

Cadmus relied on the non-lighting participant surveys to determine NTG for appliance, HVAC, weatherization, and kit measure categories for 2013 and 2014 participants.

Freeridership and participant spillover constitute the NTG. Cadmus used the following formula to determine the final NTG ratio for each non-lighting program measure category:

$$\textit{Net-to-gross ratio} = (1 - \textit{Freeridership}) + \textit{Spillover}$$

Methodology

Cadmus determined the freeridership amount for the appliance, HVAC, and weatherization measure categories based on a previously developed approach for Rocky Mountain Power, which ascertained freeridership using patterns of responses to a series of survey questions. These questions—answered as "yes," "no," or "don't know"—asked whether participants would have installed the same equipment in the program's absence, at the same time, and in the same amount and efficiency. Question response

patterns received freerider scores, and confidence and precision estimates were calculated based on score distributions.[31]

Cadmus used a separate set of questions and scoring approach when estimating the freeridership for the kit measure category. After conducting participant surveys with energy efficiency kit recipients, Cadmus studied responses from three questions to estimate a freeridership score for each participant, using the scoring approach described in Appendix D. Freeridership questions focused on whether the participant was already using the measure in their home and if they had plans to purchase the measure before signing up to receive the kit.

Cadmus determined participant spillover by estimating the savings amount derived from additional measures installed and whether respondents' credited Rocky Mountain Power with influencing their decisions to install additional measures. Cadmus included measures eligible for program incentives, provided the respondent did not request or receive the incentive.

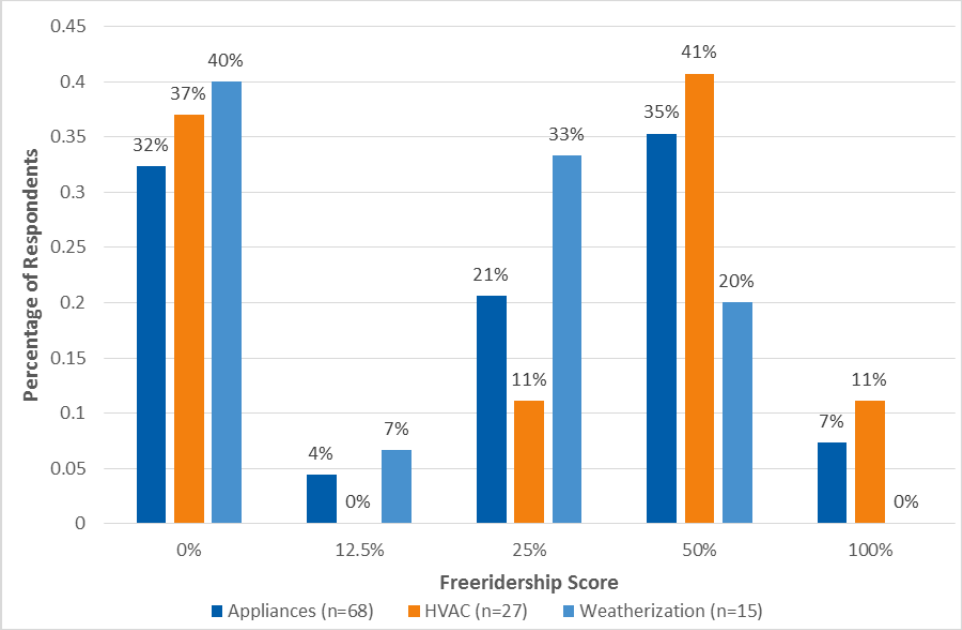
Cadmus then used the measure category freeridership and spillover results to calculate the program's NTG ratio. Appendix D provides a detailed explanation of Cadmus' self-reported NTG methodology.

Appliance, HVAC, and Weatherization Freeridership

After conducting surveys with appliance, HVAC, and weatherization participants, Cadmus converted the responses to six freeridership questions to a score for each participant, using the Excel-based matrix approach described in Appendix D. Cadmus then derived each participant's freerider score by translating his or her responses into a matrix value and applying a rules-based calculation. Figure 7 shows freeridership score distributions for appliances, HVAC, and weatherization survey respondents.

[31] This approach was outlined in Schiller, Steven, et al. "National Action Plan for Energy Efficiency." Model Energy Efficiency Program Impact Evaluation Guide. 2007. Available online: https://www.epa.gov/sites/production/files/2015-08/documents/evaluation_guide.pdf.

Figure 7. Distribution of Freeridership Scores by Measure Category*



*Totals may not sum to 100% due to rounding. This figure is not weighted by measure savings and does not reflect the final freeridership rates.

Approximately 32% of appliance respondents, 37% of HVAC measure respondents, and 40% of weatherization respondents indicated no freeridership. That is, these respondents would not have purchased the efficient measure in the absence of Rocky Mountain Power's program. More HVAC respondents indicated high freeridership (scores of 50% to 100%) than the other measure categories.

Kit Freeridership

Table 65 summarizes freeridership findings by measure for the kit measure category. The measure-level freeridership estimates are weighted by the evaluated gross program population kWh savings to arrive at an 11% freeridership estimate for the kit measure category.

Table 65. HES Kit Measure Category Freeridership by Measure

Measure	Responses (n)	Freeridership Ratio	Evaluated Program Population kWh Savings
CFL	64	23%	372,986
LED	55	20%	39,505
Kitchen Faucet Aerator	35	5%	616,885
Bathroom Faucet Aerator	43	5%	360,950
Showerhead	47	11%	1,113,767
Overall		**11%***	**2,504,094**

*Weighted by evaluated program population kWh savings.

Spillover

This section presents the results from additional, energy-efficient measures customers installed after participating in the HES program. Although many participants installed such measures after receiving incentives from Rocky Mountain Power, Cadmus attributed program spillover only to additional purchases significantly influenced by HES program participation and not claimed through the program.[32] Only one respondent—a kit participant—fell into this category.

Cadmus used evaluated savings values from the deemed savings analysis to estimate spillover measure savings. This involved estimating the spillover percentage for the kit measure category by dividing the sum of the additional spillover savings by the total gross program savings achieved by all 130 kit respondents. Table 66 shows the results.

Table 66. Non-Lighting Spillover Responses

Measure Category	Spillover Measure Installed	Quantity	Electric Savings (kWh)	Surveyed Measure Category Savings	Spillover Ratio
Kit	Clothes washer	1	377	35,915	1%

Non-Lighting NTG Findings

Cadmus conducted 68 surveys with appliance measure category participants, 27 with HVAC measure category participants,[33] and 15 with weatherization measure category participants.[34] Additionally, 130 surveys were conducted with customers who received energy efficiency kits. Cadmus used these

[32] "Highly Influential" response for question "How influential would you say the wattsmart Home Energy Savings program was in your decision to add the[MEASURE] to your home? Was it...?" qualifies the measure for being significantly influenced by HES.

[33] Out of a population of 83.

[34] Out of a population of 121.

participant responses to generate NTG ratios of 71% for appliance measures, 79% for weatherization, and 90% for kits. Table 67 lists these findings.

Table 67. Non-Lighting NTG Ratio by Measure Category

Program Category	Responses (n)	Freeridership Ratio*	Spillover Ratio*	NTG*	Absolute Precision at 90% Confidence
Appliances	68	29%	0%	71%	±7%
HVAC	27	24%	0%	76%	±10%
Weatherization	15	21%	0%	79%	±8%
Kit	130	11%	1%	90%	±2%

*Weighted by evaluated program savings.

The NTG column indicates the percentage of gross savings attributable to the program. For example, participants purchasing an appliance measure received a 71% NTG, which indicates 71% of gross savings for appliance measures could be attributed to the HES program.

Table 68 shows freeridership, spillover, and NTG estimates for appliance and HVAC rebate programs reported for prior Rocky Mountain Power program years as well as for other utilities with similar programs and measure offerings.

Table 68. Non-Lighting NTG Comparisons*

Utility/Region	Reported Year	Responses (n)	FR** %	Spillover %	NTG
Appliances					
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Appliances	**2016**	**68**	**29%**	**0%**	**71%**
Rocky Mountain Power Idaho 2011–2012 HES Evaluation: Appliances	2013	225	37%	0%	63%
Northeast Utility—Appliances	2015	65	65%	3%	38%
Northwest Utility—Appliances	2014	73	79%	2%	23 %
HVAC					
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: HVAC	**2016**	**27**	**24%**	**0%**	**76%**
Midwest Utility—HVAC	2015	73	51%	1%	50%
Northwest Utility—HVAC	2014	48	72%	1%	29%
Weatherization					
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Weatherization	**2016**	**15**	**21%**	**0%**	**79%**
Midwest Utility—Weatherization	2015	208	30%	2%	72%
Midwest Utility—Weatherization	2015	79	36%	2%	66%

Utility/Region	Reported Year	Responses (n)	FR** %	Spillover %	NTG
Kit					
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Kit	**2016**	**130**	**11%**	**1%**	**90%**
Mideast Utility—Kit	2015	150	8%	1%	93%

*NTG values derive from self-response surveys, though differences in analysis and scoring methodologies may vary across evaluations.

**FR = freeridership

For the appliance measure category, fewer respondents in 2013–2014 reported already purchasing measures before learning of the program—the largest driver of the NTG increase compared with the 2011–2012 evaluation. Fewer appliance measure category respondents in 2013-2014 reported that they would have purchased a measure at the same efficiency level within one year without the HES program incentive compared to 2011-2012 respondents. These shifts in freeridership response patterns are key contributing factors to the decrease in HES appliance freeridership rates since the prior evaluation.

Another contributing factor to the drop in appliance measure category freeridership is that in the 2013–2014 program period lighting fixture respondents represented 54% of the total appliance measure category analysis sample and produced an average 16% freeridership rate. In the 2011–2012 appliance measure category's freeridership analysis sample, lighting fixture respondents represented 12% of the appliance category analysis sample, with an average estimated freeridership rate of 10%. All other appliance measure level freeridership estimates in the 2011–2012 evaluations were 42% or more.

The 2013–2014 HVAC measure category exhibited an NTG estimate of 76%, which is higher than other utilities' comparable HVAC programs. The 2011–2012 Idaho HES Evaluation did not include an HVAC NTG estimate. Similarly, the weatherization measure category's 79% NTG estimate was also higher than were other utilities' comparable weatherization programs.

In 2013–2014, the kit measure category's 90% NTG is similar to a recent estimate from a Mideast utility kit program. This utility introduced energy efficiency kits to its program in 2014, so Cadmus could not compare the results to prior evaluations for Idaho. The Mideast utility kit program did not include light bulbs and was focused on water heating saving measures such as showerheads, kitchen aerators, bathroom aerators, and pipe wrap.

Lighting Leakage Study

Cadmus conducted intercept surveys at stores in Utah, Idaho, and Washington; the surveys were designed to determine how many light bulbs purchased within PacifiCorp's territory had been installed outside of PacifiCorp's territory—this is generally referred to as leakage.[35] Cadmus also conducted intercept surveys at stores outside of PacifiCorp's territory to determine the percentage of light bulbs

[35] This study did not review Internet lighting purchases, only those made at brick and mortar stores.

installed within PacifiCorp's territory. Given the low number of surveys completed in Washington and Idaho, and the fact that the RSAT algorithm is the same across states, Cadmus combined the results for all three states to show key findings along with Idaho-specific results.

The leakage study sought to test scores from PacifiCorp's RSAT, which was developed to determine the best stores for cost-effectively offering discounted energy-efficient light bulbs. The Retailer Allocation Review in Appendix F describes the RSAT. This section also discusses the leakage study's methodology and results.

Overall, Cadmus found that the RSAT predicts well. Although there was some variation in the results by store, particularly if the number of intercept surveys Cadmus was able to conduct was low, the RSAT scores were within Cadmus' estimated range of leakage scores (calculated from the intercept survey responses). Cadmus found that lighting leakage rates averaged roughly 2.5 percentage points higher than predicted by the RSAT, with a confidence level of 90% and precision of ±2.0%.

Methodology

Cadmus targeted 20 Idaho stores for intercept surveys—15 in Rocky Mountain Power's service territory and five outside of its territory. Among the 15 stores in the service territory, Cadmus established targets of eight stores with RSAT scores greater than or equal to 96% and seven stores with RSAT scores less than 96%, the latter of which included 34 nonparticipating stores. Because it was difficult to gain cooperation (discussed later in this report), Cadmus amended the target to 15 stores in Idaho and Washington combined.

The program administrator provided Cadmus with store rosters for each state that included retailer addresses, phone numbers, and RSAT scores, and each store's location in Rocky Mountain Power's service territory. Cadmus also created rosters of stores outside of the service territory in each state. Cadmus used Pacific Power's and Rocky Mountain Power's service area maps to identify areas adjacent to the service territories.[36] Cadmus then used Google Maps to locate all relevant retailers in the specified areas, supplemented by phone calls to the stores to verify they were outside of the service territory.

To set up store visits, CLEAResult contacted the store managers to inform them of the study, then a Cadmus representative called a targeted store and asked for the contact provided by CLEAResult. If that contact was unavailable, Cadmus asked for a manager or another employee in charge of daily operations. The representative followed a script that explained the study's purpose and Cadmus' intentions for conducting intercept surveys at the store. By calling ahead, Cadmus sought to ensure that store visits by Cadmus field technicians would not only be authorized but be welcome. From late October to early December, the Cadmus representative attempted to contact each store's manager or

[36] Rocky Mountain Power. Map of service territories and facilities. Accessed May 2016: https://www.rockymountainpower.net/content/dam/pacificorp/doc/About_Us/Company_Overview/PC-10k-ServiceAreaMap-2015-v2.pdf

owner until he or she could confirm if the store manager would participate. Consequently, Cadmus contacted most stores more than once. For each store that granted authorization, Cadmus scheduled two-day visits, typically a week or more in advance, and Cadmus field technicians followed up with each store in advance of the visit to remind the store manager (or employee in charge of daily operations) of the appointments.

Cadmus achieved more success scheduling visits with independent retailers and independently owned franchises than with big-box home and hardware stores. Managers of large retail chains (e.g., Home Depot, Lowe's, Bed Bath & Beyond, Walmart, Target, Albertson's, Dollar Tree) frequently redirected Cadmus to their corporate offices, which most commonly resulted in rejections or nonresponses to the contact attempts. This is explored further in the Leakage Survey Results by Store Size section of this report.

Difficulty in gaining the cooperation of big-box stores, which draw extensive foot traffic, limited the possible number of surveys Cadmus could complete. In addition, Cadmus acknowledged that the rate at which stores agreed to participate—about one in eight—would likely prevent it from achieving the original targets.

Table 69 lists the stores, states and territories, number and percentage of contacts, and number and percentage of stores visited.

Table 69. Store Contact Summary

State	Stores on Roster	Stores Contacted*	Stores Visited	
			Rocky Mountain Power/Pacific Power**	Non-Rocky Mountain Power/Pacific Power
Washington	57 (21 in, 36 out)	57 (100%)	5/21 (24%)	5/36 (14%)
Idaho	50 (19 in, 31 out)	50 (100%)	5/19 (26%)	1/31 (3%)
Utah	345 (295 in, 50 out)	244 (71%)	19/194 (10%)	8/50 (16%)
Total	**452 (335 in, 117 out)**	**351 (78%)**	**29/234 (12%)**	**14/117 (12%)**

*Cadmus did not further contact stores by phone if corporate offices rejected solicitation in all stores.

**Percentages expressed as a percentage of stores contacted. Among all Idaho stores in Rocky Mountain Power's territory, regardless of contact, 12% participated. Among all Rocky Mountain Power or Pacific Power stores in all states, 9% participated.

Using all valid survey responses, Cadmus calculated leakage rates for each store and state. A valid survey for leakage calculations was defined as one in which the respondent identified the utility serving the

location where their bulbs would be installed. Interviewers asked respondents who did not wish to complete the entire survey if they would at least identify the utility.[37]

Thus, some respondents answered the key question that determines leakage, while not providing data about bulbs they purchased. For respondents with a determined leakage status but no recorded light bulb counts, Cadmus used the mean number of light bulbs for all survey respondents (i.e., five light bulbs). The following equation calculated leakage scores:

$$Leakage\ Rate = \frac{\#\ Bulbs\ Installed\ Outside\ Utility\ Territory}{Total\ Bulbs\ Purchased\ within\ Utility\ Territory}$$

Summary of Stores Visited in Idaho

Cadmus visited six stores in southeast Idaho. Field technicians completed 42 surveys with customers who purchased light bulbs (Table 70).

Table 70. Idaho Summary

Territory	Stores Visited	Surveys Administered
Rocky Mountain Power	5	36 completed, 3 refused
Other Utility Territory	1	6 completed, 2 refused
Total	**6**	**42 completed, 5 refused**

Table 71 shows the distribution of RSAT scores among the 19 stores within Rocky Mountain Power's Idaho territory. Sixteen of the 19 Rocky Mountain Power stores in Idaho that Cadmus contacted had RSAT scores of 99% or greater. Ultimately, Cadmus visited five Rocky Mountain Power stores, all of which had RSAT scores of 99.8% or higher.

Table 71. Distribution of RSAT Scores for Rocky Mountain Power Idaho Stores

RSAT Score Range	Number of Stores	Percentage
0% up to 99%	3	16%
99% up to 100%	8	42%
100%	8	42%
Total	**19**	**100%**

Leakage Survey Results

Table 72 shows the results of the lighting leakage surveys conducted in five participating stores and one store outside of Rocky Mountain Power territory.

[37] A total of 601 valid surveys from all states were used for leakage calculations, but 595 surveys were completed. The difference is because some respondents identified their utility without completing the survey (valid for leakage calculation but not considered a completed survey) and some respondents completed the survey without identifying their utility (completed survey but not considered valid for leakage calculation).

Table 72. Idaho Leakage Results Summary

Stores	Valid Surveys for Leakage Calculation	Total Bulbs Purchased by Respondents	Intercept Leakage	Precision at 90% Confidence*	RSAT Based Leakage	Difference Between Intercept and RSAT**
Total for Participating Rocky Mountain Power Stores	**36**	**157**	**2.5%**	**±2.0%**	**Average 0%**	**-2.5 points**
Participating store #1	1	2	0.0%	-	0%	0 points
Participating store #2	9	48	0.0%	-	0%	0 points
Participating store #3	7	31	0.0%	-	0%	0 points
Participating store #4	7	42	0.0%	-	0%	0 points
Participating store #5	12	34	11.8%	±8.5%	0%	-11.8 points
Total for Stores Not in Rocky Mountain Power Territory	**6**	**13**	**23.1%**	**±16.6%**	**N/A**	**N/A**
Non-Rocky Mountain Power store #1	6	13	23.1%	±16.6%	N/A	N/A

*Precision cannot be calculated for stores with 0% or 100% leakage due to a zero variance.

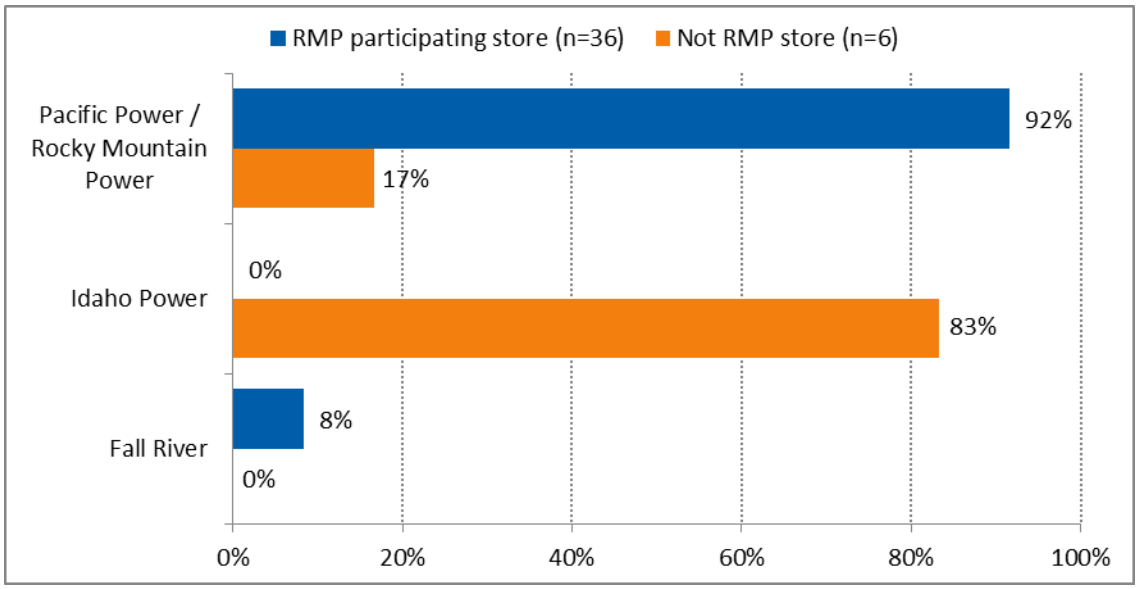
**The calculation used: (RSAT Based Leakage) - (Intercept Leakage). A negative difference between RSAT-based leakage and intercept leakage means the RSAT underestimates leakage.

Four of the five participating stores surveyed had RSAT scores of 100% and equivalent leakage rates of 0%, while one store that also had an RSAT score of 100% had a leakage rate of 11.8%. When results for all stores are combined, the overall rate of leakage was 2.5% of bulbs sold in participating stores.

Cadmus surveyed only one store outside of Rocky Mountain Power territory in Idaho, and only six respondents purchased a total of 13 light bulbs in 10 hours of surveying. Because of this limited sample, the reverse leakage rate was 23.1%. Participating stores sold bulbs at a faster pace (2.0 per hour surveyed) compared to the store outside of Rocky Mountain Power territory (1.3 per hour surveyed), though none of the stores surveyed in Idaho sell light bulbs at the rates seen in some of the larger stores in Washington and Utah (up to 15 light bulbs sold per hour surveyed).

The distribution of utilities served by store customers is a key component in computing leakage rates. Figure 8 shows that 92% of surveyed customers intercepted in participating Idaho stores intended to install the bulbs they purchased in Rocky Mountain Power territory, while only 17% of those surveyed outside of Rocky Mountain Power territory intended to install their bulbs inside of Rocky Mountain Power territory.

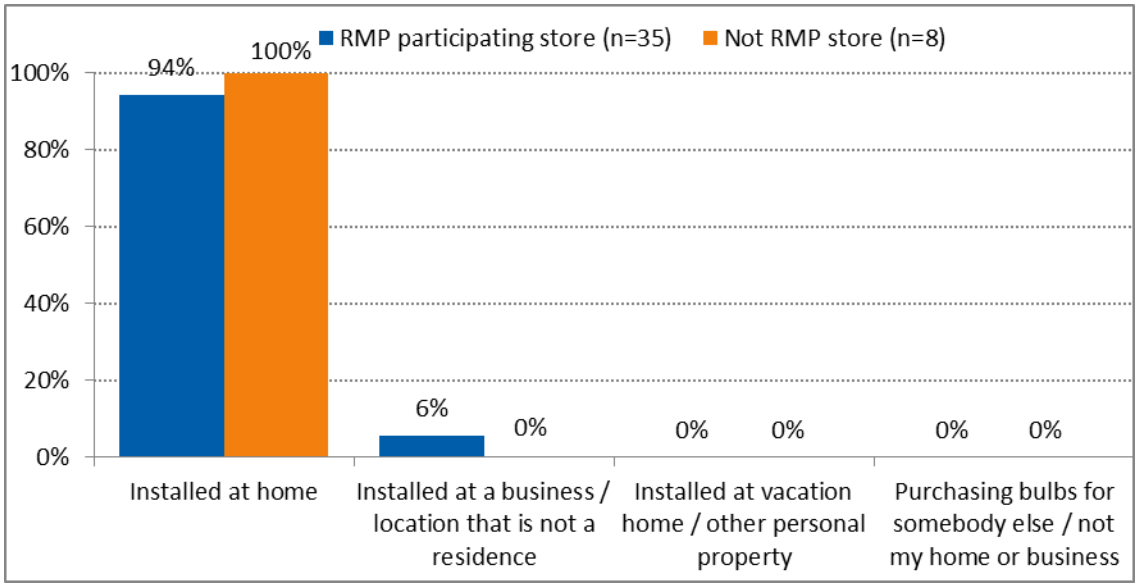
Figure 8. Respondent's Utility by Store Type in Idaho



Installation Location

Survey respondents confirmed where they intended to install the bulbs they were purchasing. Figure 9 indicates that the overwhelming majority of respondents were purchasing light bulbs for their homes, while business locations accounted for 6% of purchases in participating stores. None of the Idaho respondents reported purchasing light bulbs for vacation homes or for other people.

Figure 9. Installation Location for Bulbs Purchased in Idaho

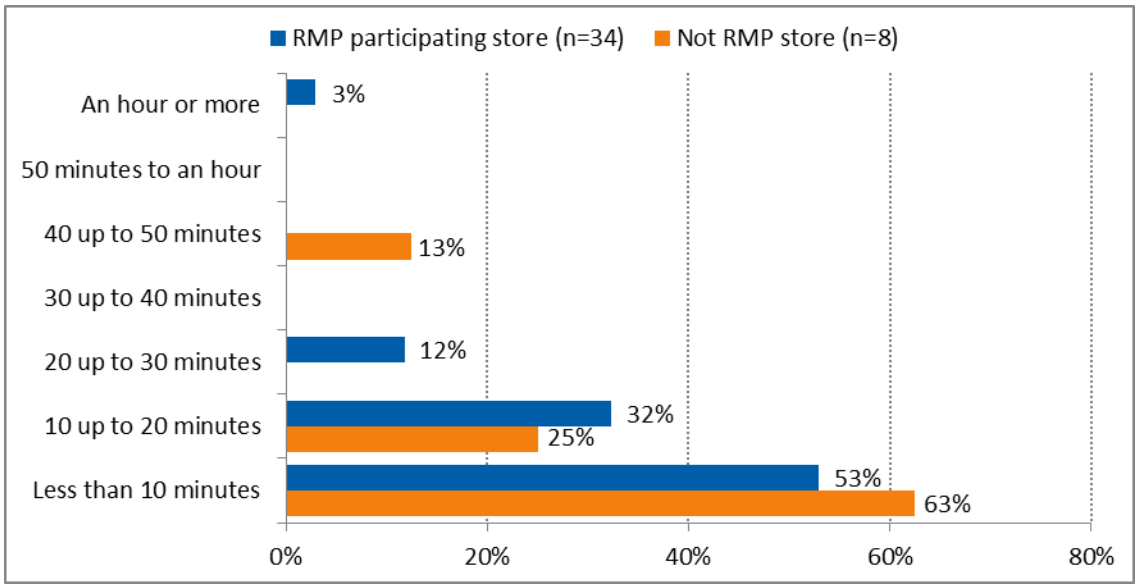


Distance Traveled

Because travel distances are a key component in calculating RSAT scores, surveys asked respondents to indicate how far away their intended installation location was from the store where they purchased their bulbs.

Figure 10 shows that more than four out of five respondents in participating stores (88%) and at the one store outside of the territory (85%) intended to install their light bulbs within a twenty minutes' drive of the store where they purchased them.

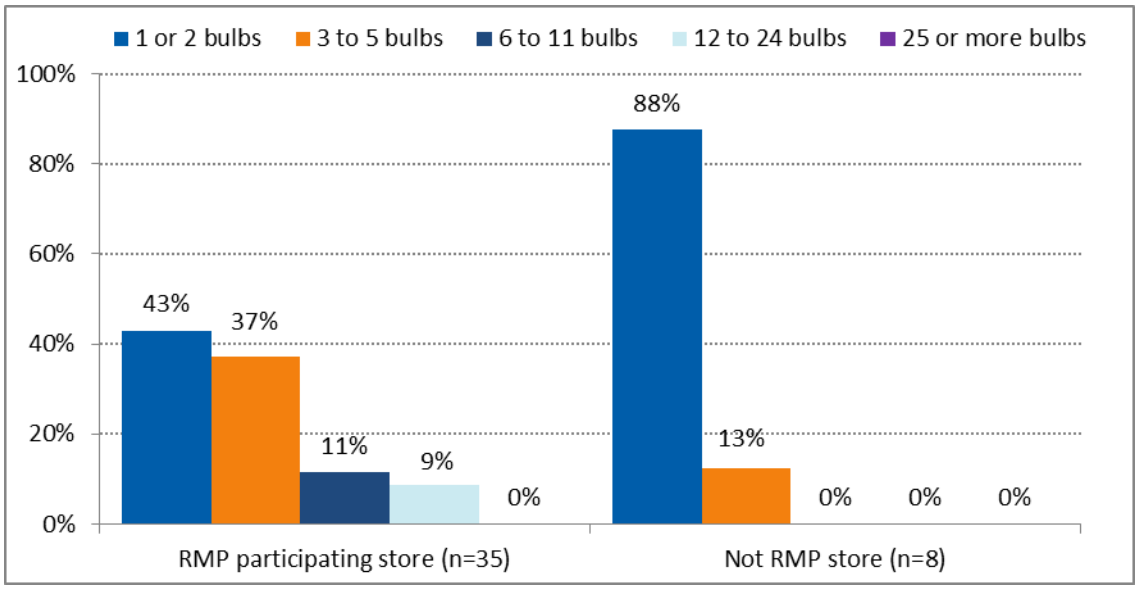
Figure 10. Distance From Store to Installation Location in Idaho



Purchase Quantities

Figure 11 shows the distribution of total bulbs purchased by survey respondents. Customers in participating stores tended to make larger purchases, with 20% buying at least six bulbs and a mean of 4.4 and median of three bulbs purchased. At the store outside of Rocky Mountain Power territory, none of the respondents purchased more than three bulbs, and the mean number purchased was 2.2 and the median was only one bulb.

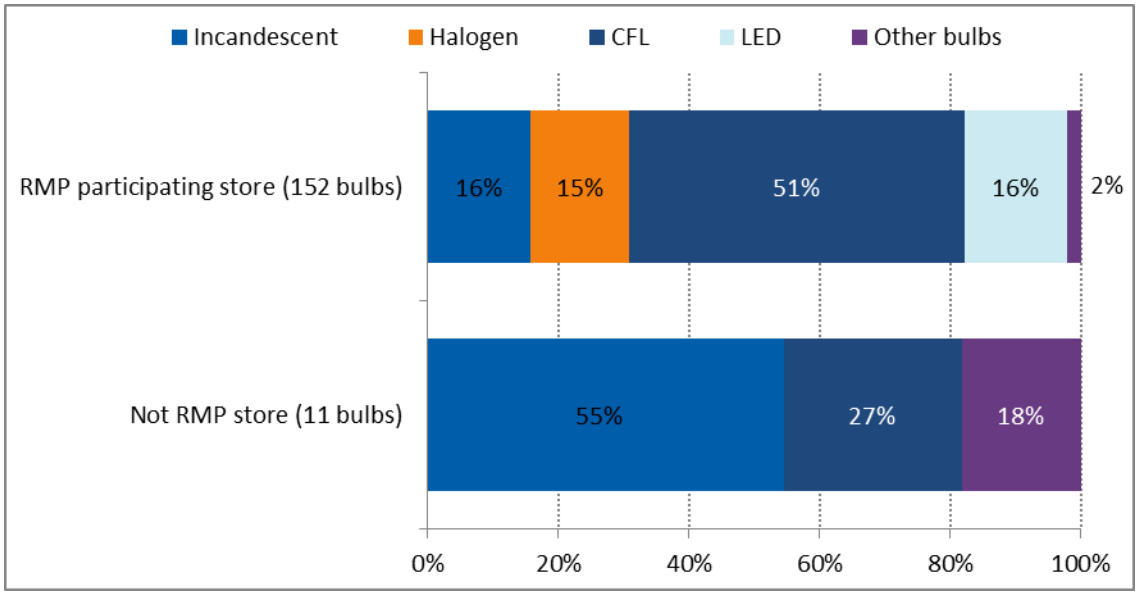
Figure 11. Total Bulbs Being Purchased in Idaho



Bulb Type

Half (51%) of bulbs purchased in participating stores were CFLs, and another 16% were LEDs. In nonparticipating stores, customers most commonly purchased incandescent bulbs (55%), and only one in four bulbs purchased were efficient (27% CFL and 0% LED). Figure 12 shows the percentage of bulb types purchased by respondents intercepted in Idaho stores.

Figure 12. Types of Bulbs Being Purchased in Idaho: Distribution of Bulbs



Purchasing Decisions

Table 73 lists respondents' reasons for purchasing energy efficient and standard light bulbs. The reason given most often for buying efficient bulbs was energy efficiency (39% for participating stores, 33% for nonparticipating stores), while fewer than 10% of respondents buying standard bulbs gave this reason. Respondents in participating stores were also more likely to mention low prices, while those in stores outside of the territory were more likely to say that they were purchasing bulbs because they needed them right away.

Table 73. Reasons for Purchasing Bulbs in Idaho

Reason	Participating Store		Nonparticipating Store	
	Purchasing Energy Efficient Bulbs (n=18)*	Purchasing Standard Bulbs (n=13)*	Purchasing Energy Efficient Bulbs (n=3)*	Purchasing Standard Bulbs (n=5)*
Energy efficiency/saving energy	39%**	8%	33%	0%
Low bulb price/reduced price/on sale	28%	15%	0%	0%
Bulbs I always buy/I am used to	17%	38%	0%	20%
Environment/"green" reasons	11%	0%	33%	0%
Needed bulbs right away	11%	8%	67%	40%
Stocking up/spare bulbs	17%	8%	0%	20%
Information in the store/store display or advertising	11%	0%	33%	0%
Bulb color/light quality	6%	15%	0%	0%
Appearance/looks good in my fixtures	6%	0%	0%	20%
Someone made a recommendation	0%	8%	0%	0%

*Indicates number of respondents answering the question.

**Respondents were allowed to provide multiple reasons; therefore, the results do not add up to 100%.

Leakage Survey Results for Idaho, Washington, and Utah Combined

Table 74 shows the leakage rates for all three PacifiCorp states separately and combined. Overall, leakage was 6.1% for all stores surveyed in PacifiCorp territory, and leakage was 34.3% in all stores surveyed outside of the territory. The only nonparticipating stores surveyed inside PacifiCorp territory were in Utah, so there are no results combined across states.

Table 74. Leakage Results Summary for All States

States	Valid Surveys for Leakage Calculation	Total Bulbs Purchased by Respondents	Intercept Leakage	Precision at 90% Confidence	RSAT Based Leakage	Difference Between Intercept and RSAT*
Total for Participating PacifiCorp Stores**	**423**	**2,043**	**6.1%**	**±4.2%**	**0.8%*****	**-5.3 points**
Washington	114	558	8.1%	±3.3%	0.7%	-7.4 points
Idaho	36	157	2.5%	±2.0%	0%	-2.5 points

States	Valid Surveys for Leakage Calculation	Total Bulbs Purchased by Respondents	Intercept Leakage	Precision at 90% Confidence	RSAT Based Leakage	Difference Between Intercept and RSAT*
Utah	273	1,328	6.2%	±5.3%	1.1%	-5.1 points
Total for Nonparticipating Stores in PacifiCorp Territory	**23**	**252**	**29.0%**	**±12.7%**	**20.4%**	**-8.6 points**
Utah	23	252	29.0%	±12.7%	20.4%	-8.6 points
Total for Stores Not in PacifiCorp Territory	**155**	**708**	**34.3%**	**±6.0%**	**Not applicable**	**Not applicable**
Washington	60	217	0.9%	±0.8%	N/A	N/A
Idaho	6	13	23.1%	±16.6%	N/A	N/A
Utah	89	478	49.8%	±8.6%	N/A	N/A

*Calculation used: (RSAT Based Leakage) - (Intercept Leakage). A negative difference between RSAT Based Leakage and Intercept Leakage meant the RSAT underestimated leakage.

**For combined participating stores in Utah and the overall total across states, intercept leakage and precision are weighted by sample stratification. The two strata are stores with RSAT scores greater than 96% and stores with RSAT scores of 96% or less. The survey samples for other groups of stores were not stratified, and intercept leakage is not weighted.

***Because of the variables input into the RSAT score described in Appendix F, averaging the RSAT-based leakage scores does not provide a statistically significant result. This simple average of the RSAT-based leakage scores does not include any sampling weights that represent retail customer drive time, retailer locations, retailer trade areas, customer purchasing power, or retail sales allocation. Therefore, the average is a qualitative estimate. However, the variance of the RSAT score of the sampled stores is low, so a simple average is likely a reasonable approximation of the weighted RSAT-based leakage.

In aggregate, RSAT scores slightly underestimated leakage observed in the survey results, with an average RSAT score for all surveyed participating scores of 99.2%, implying 0.8% leakage. Survey results calculated a leakage rate of 6.1% for these stores—a difference of 5.3 points on the RSAT scale. Nonparticipating Utah stores produced an average RSAT score of 79.6%, implying 20.4% leakage, while survey results produced a leakage rate of 29.0%—a difference of 8.6 points on the RSAT scale.

Leakage Survey Results by Store Size

Cadmus categorized stores as "big box stores" or "other stores,"[38] enabling leakage result comparisons between the two types. There is only one big box store in PacifiCorp's Idaho territory, which Cadmus was not allowed to visit; all big box stores in Washington were participating stores in PacifiCorp's territory. All Utah big box stores were participating stores in PacifiCorp's territory, but Cadmus surveyed both store types among those outside PacifiCorp's territory and among participating stores within the territory. Overall, Cadmus interviewed 57% (n=601) of survey respondents in big box stores, with these

[38] "Big box stores" are large retail chains such as Home Depot, Lowe's, Walmart, Target, Sutherland's, and Big Lots.

surveys accounting for 56% (n=3,003) of the total bulbs purchased by all respondents. Table 75 shows big box stores usually exhibited leakage rates slightly higher than other stores, though comparisons within states are not statistically significant.

Table 75. Leakage Results by Size of Store

States	Big Box Stores*			Other Stores**		
	Valid Surveys for Leakage Calculation	Total Bulbs Purchased	Intercept Leakage	Valid Surveys for Leakage Calculation	Total Bulbs Purchased	Intercept Leakage
Total for Participating PacifiCorp Stores* **	**291**	**1,447**	**7.7%**	**132**	**596**	**3.2%**
Washington	72	287	11.5%	42	271	4.4%
Idaho	0	0	N/A	36	157	2.5%
Utah	219	1,160	6.6%	54	168	3.9%
Total for Nonparticipating Stores in PacifiCorp Territory	**0**	**0**	N/A	**23**	**252**	**29.0%**
Utah	0	0	N/A	23	252	29.0%
Total for Stores Not in PacifiCorp Territory	**51**	**247**	**52.2%**	**104**	**461**	**24.7%**
Washington	0	0	N/A	60	217	0.9%
Idaho	0	0	N/A	6	13	23.1%
Utah	51	247	52.2%	38	231	47.2%

*Twelve big box stores total: nine in Utah, three in Washington, zero in Idaho.

**Twenty-seven other stores total: 15 in Utah, six in Washington, six in Idaho.

***For combined participating stores in Utah and the overall total across states, intercept leakage and precision are weighted by sample stratification. The two strata are stores with RSAT scores greater than 96% and stores with RSAT scores of 96% or less. The survey samples for other groups of stores were not stratified, and intercept leakage is not weighted.

Intercept Survey Spillover

Of PacifiCorp customers in all states, 17 respondents surveyed in participating stores purchased energy-saving items in addition to light bulbs (7%, n=257 answering the question). Seven (3%) considered their bulb purchase as “very important” in their decision to purchase the additional items. These respondents were all Rocky Mountain Power customers in Utah, and they reported that all items purchased would be installed right away. Not enough Idaho-specific data was collected to estimate spillover from intercepts.

Process Evaluation

This section describes the detailed findings of Cadmus' process evaluation of the HES program. These findings are based on an analysis of data collected through program staff interviews, the general population survey, two participant surveys, and secondary research. In conducting the evaluation, Cadmus focused on assessing the following:

- Effectiveness of the delivery structure and implementation strategy
- Marketing approaches and materials review
- Customer satisfaction
- Internal and external communication channels

Cadmus focused the research activities on the key research topics identified during the evaluation kick-off as well as on topics of interest identified by program stakeholders. Cadmus' primary research questions are listed in Table 76.

Table 76. Research Areas

Research Areas	Researchable Questions and Topics
Program Implementation and Delivery	
Program status	How did the program perform in 2013-2014 and what opportunities and challenges do program staff foresee for future program years?
Satisfaction	How satisfied are customers with their CFLs/LEDs, energy efficiency kits, or incented non-lighting measures? Why?
Awareness	Are customers aware of the Rocky Mountain Power programs? If so, how did they learn about the programs?
Motivations	What actions have customers taken to save energy and what motivated them to purchase a rebated CFL/LED, energy efficiency kit, or non-lighting measure?
Demographics	How do awareness/activities/behaviors vary by demographic characteristic?

Methodology

Cadmus conducted the following process evaluation research:

- Program and marketing materials review
- Utility and administrator staff interviews
- General population survey
- Non-lighting participant survey
- Energy efficiency kit participant survey

Program Materials Review

The program materials review concentrated on critical program documents, including past evaluation reports, the program logic model, and program marketing and communications materials developed to promote HES program participation and educate target audiences in Idaho about program offerings.

Cadmus also discussed marketing effectiveness with program stakeholders and considered their insights when analyzing participant survey findings and industry best practices.

- In assessing program progress and analyzing trends across program years, Cadmus considered the findings and conclusions from the *Rocky Mountain Power 2011-2012 Idaho Residential Home Energy Savings Evaluation* and the *Rocky Mountain Power 2009-2010 Idaho Residential Home Energy Savings Evaluation*.
- Cadmus reviewed the HES program logic model to reflect the 2013–2014 program processes (see Appendix H).
- Cadmus reviewed Rocky Mountain Power's marketing plans and online materials and compared its messages to the challenges and motivations described by customers; Cadmus sought to assess whether the program's marketing has been appropriately targeted. Cadmus reviewed the HES program marketing strategy, executional plans, and online (website) and social media elements.

Utility and Administrator Staff Interviews

Cadmus developed stakeholder interview guides and collected information about key topics from program management staff. The evaluation involved two interviews: one with program staff at PacifiCorp, and one with program staff at CLEAResult (the program administrator), which oversees the HES program in five PacifiCorp service territory states. The interviews covered the following topics:

- Program status and delivery processes
- Program design and implementation changes
- Marketing and outreach tactics
- Barriers and areas for improvement

Cadmus conducted the interviews by telephone and then contacted the interviewees via e-mail with follow-up questions or clarification requests.

Participant Surveys

Cadmus conducted telephone surveys with non-lighting and energy efficiency kit participating customers, designing the survey instruments to collect data about the following process topics:

- ***Program process***. Details to inform the following performance indicators:
  - Effectiveness of the program processes
  - Program awareness
  - Participation motivations and barriers
  - Customer satisfaction
  - Program strengths and/or areas for improvement
- ***Customer information***. Demographic information and household statistics.

General Population Survey

Cadmus conducted a telephone survey with customers regarding lighting purchases, designing the survey instrument to collect data regarding the following process topics:

- ***Program process***. Details to inform the following performance indicators:
  - Upstream lighting rebate awareness
  - Lighting purchase decisions and barriers to purchasing energy-efficient lighting
  - Customer satisfaction with products purchased
- ***Customer information***. Demographic information and household statistics

Program Implementation and Delivery

Drawing on stakeholder interviews and participant survey data, this section discusses the HES program implementation and delivery.

Program Overview

Through the HES program, Rocky Mountain Power provided cash incentives to residential customers toward the purchase of energy-efficient products, home improvements, and heating and cooling equipment and services. Through the program, customers could install multiple measures to create customized efficiency portfolios, thus lowering their utility bills. Rocky Mountain Power encouraged all of its residential customers, including non-homeowners and owners of multifamily buildings and manufactured homes, to participate in the program.

During the evaluation period, Rocky Mountain Power offered energy efficiency measures in three primary categories based on the program's three delivery channels: lighting, non-lighting, end energy efficiency kits. (Note that only internal program staff referred to these three categories; the company did not market the program this way to customers.) The lighting component used an upstream mechanism that may not be apparent to customers, whereas the non-lighting component operated using a mail-in or online (for select measures) incentive approach, which required participant awareness and action. All incentives for the non-lighting component were prescriptive.

The third delivery channel consisted of an energy efficiency kit, which was added in 2014 as a way to reach Idaho's rural population. These rural markets are a considerable distance from any stores or qualified retailers that meet program requirements, so the program designed the kits to be ordered through Rocky Mountain Power's website and delivered by mail. Rocky Mountain Power created eight kit types that contained a mix of measures depending on the participant's lighting preferences (CFLs or LEDs) and if the participant had an electric water heater.

The base package included four standard CFLs and was delivered at no cost to customers. If customers reported having an electric water heater, they also qualified for water savings measures such as bath and kitchen faucet aerators and a high efficiency showerhead. The program began offering a kit upgrade option from CFLs to LEDs (for $19.99) because staff had observed customizable options could improve

installation rates, and LEDs tended to have much higher installation rates than CFLs (confirmed by the impact analysis).

Tariff Changes

Each year, Rocky Mountain Power files program modifications (i.e., tariff changes) with the Idaho Public Utilities Commission. The most significant tariff change during the evaluation period was the addition of the energy efficiency kits in 2014. In 2014, Rocky Mountain Power also changed the delivery method for CFL and LED fixtures from downstream to upstream to allow the program to capture additional savings while reducing incentives and administrative costs.

Delivery Structure and Processes

The addition of the energy efficiency kit offering was a significant change in the HES program's delivery structure in 2014. Program staff described challenges in reaching rural markets with the existing lighting and home energy upgrade rebates, particularly in Idaho where rural customers reside a considerable distance from any stores or qualified retailers. The energy efficiency kit offered a way to reach these rural markets.

According to program staff, the HES program saw minimal changes to its customer delivery method since 2009 other than the addition of the energy efficiency kits. Program staff coordinated with participating distributors, retailers, and trade allies to deliver the program's different components. For most program-qualifying measures, customers received cash-back incentives. For qualifying light bulbs, the program paid incentives directly to manufacturers, which provided high-efficiency bulbs to retailers at a discount. Retailers, sales associates, and trade allies supported the program by encouraging customers to purchase higher-efficiency equipment that qualifies for an incentive.

Data Tracking

Program Data

The program administrator, CLEAResult, reported that the data tracking systems met, and in some cases exceeded, its needs, allowing for meaningful use of data. The program administrator reported entering program data into its Key What You See (KWYS) system, a Microsoft Access-based tool, then transferring some of the KWYS data into a Salesforce database. Weekly aggregation of participant databases allowed the program administrator to monitor incentives paid and goal achieved, and each month the program administrator provided Rocky Mountain Power a report so program staff could evaluate any program activity changes and adjust the program delivery if needed.

Although Rocky Mountain Power and the program administrator reported that the upstream lighting data tracking effectively met their needs and expectations, Cadmus experienced some challenges when using the data for evaluation purposes. Specifically, significant issues emerged when Cadmus tried to match lighting tracking data (in a system called Sprocket) to price scheduling data for the purpose of evaluating the impact of bulb prices and incentives on lighting products sold.

Data issues included the following:

- Inconsistent bulb types for each SKU
- Inconsistent use of SKUs or model numbers to track products
- Inconsistent use of "posted," "reconciled," and "posted-reconciled" tags to track the final quantities of bulbs sold through the program
- Very limited tracking of product merchandising and promotional events

Most of these issues, generated from 2013 tracking data, had been resolved in 2014 data with the exception of the product merchandising and promotional events tracking.

Rebate Data

In 2013, the program administrator began transferring rebate data entry to a new third-party vendor, National Business Systems (NBS), because the program administrator reported dissatisfaction with the previous vendor. The transition began with the program administrator providing NBS access to one measure at a time until NBS proved it could operate under all program rules. The program administrator reported that the transition was a success.

The program processed upstream lighting invoices through Sprocket. The program administrator received invoices from the manufacturer, verified the information's accuracy, and entered data into Sprocket.

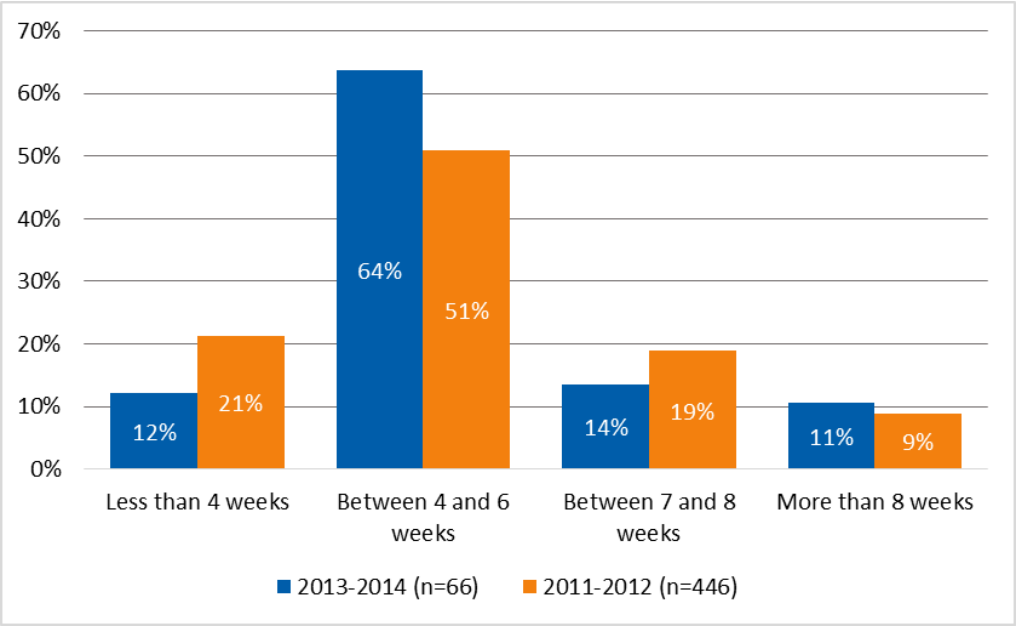
Application Processing

Application processing largely remained unchanged during the 2013–2014 program years, with online applications covering most qualifying products. As discussed above in the Data Tracking Section, one change was contracting the new third-party vendor, NBS, to process the data measure by measure.

The program administrator reported that it made an effort in 2013 to revise the customer application to make it more efficient for customers and trade allies to complete. For example, in 2013, the application included every measure type; in 2014, the program administrator developed an application for each measure type. The program administrator reported that this change resulted in fewer errors and missing information on applications.

As shown in Figure 13, 12% of non-lighting customers reported it took less than four weeks to receive their incentive in 2013–2014, a significant decrease from 2011–2012. The program experienced improvement among customers reporting it took four to six weeks to receive their incentive, with 64% of respondents selecting this response. This represents a significant increase from 2011–2012, when 51% of respondents reported it took four to six weeks to receive their incentive. Eleven percent of respondents said it took more than eight weeks to receive their incentive. Notably, this question gauged participants' perceptions of the time required to receive the rebate, and their responses probably included the time required to resubmit their applications if information was missing or incorrect.

Figure 13. Time Between Non-lighting Application Submission and Incentive Receipt (2011-2014)



Source: Rocky Mountain Power Idaho HES Residential Non-Lighting Survey (Appendix A). Don't know, refused, and have not received the incentive yet responses removed. Less than four weeks and between four and six weeks were statistically significant changes from 2011-2012 to 2013-2014.

Eighty-five percent of non-lighting customers expressed satisfaction with the time required to receive the incentive. Among the 15% of customers who expressed dissatisfaction (10 total customers), six reported the incentive taking too long to arrive.

Overall, 65% of non-lighting customers expressed high satisfaction rates (very satisfied) with the application process, and 34% said they were somewhat satisfied. Two percent said they were not very satisfied and offered the following reasons:

- "It was a time consuming process."
- "I had to have my son-in-law help with the application, I got confused."

Retailers and Trade Allies

The program administrator continued using the tiered account management system developed in earlier program years to streamline the process of working with trade allies and retailers. The program administrator divided the trade allies into two tiers for internal tracking purposes only and estimated that Tier 1 trade allies accounted for 80% of the program savings, conducted the most work with customers, and had more projects per year than Tier 2.

The program administrator regularly (at least three times per year) offered training to distributors, retailers, and their associates and reported that regular training is necessary for the following reasons:

- Addressing rapid turnover in the industry

- Keeping trade allies abreast of program changes
- Working toward the program administrator's goal to educate trade allies in order to reduce the number of applications with errors

For example, at the beginning of the heating season, the program administrator contacted retailer account managers to discuss products in demand that season. For the upstream lighting component, the program administrator focused on delivering training to The Home Depot and Lowe's to educate each sales associate about the program and how to sell energy-efficient products. According to the program administrator, the training increased retailer participation between 2013 and 2014, especially during the summer cooling season.

The program administrator also reported focusing its Tier 1 trade ally training and communication efforts on technology and tariff changes. For example, following the 2014 state tariff update, the program administrator conducted training to ensure trade allies understood the changes and their implications and could implement the tariff without interrupting customer service.

Marketing

Approach

According to the 2014 Marketing Plan, the program shifted resources toward targeted marketing and away from mass marketing. The program administrator used bill inserts, social media, sell sheets, and website features that employed tailored messages.

For 2014, the following five key strategies emerged:

- Focus on priority measures during key seasonal selling windows (e.g., heating season, cooling season, and lighting season)
- Shift the marketing mix to more cost-effective, flexible, and measureable delivery
- Simplify and enhance the customer experience to increase participation
- Streamline basic program processes, take advantage of opportunities, and track results to reduce cost of marketing
- Strategically support unplanned opportunities

Effectiveness

The program administrator tracks marketing effectiveness on a limited basis. Its marketing team tracks click-through statistics for the program website and, at the end of the evaluation period, began tracking time spent on the website, how customers reached the website, and materials they viewed. The program administrator was not able to provide information related to these tracking efforts because they had been in effect for a short amount of time.

The program administrator also noted that the guerrilla (marketing in an unconventional way) tool kit developed for lighting and appliances effectively engaged retailers. The tool kit provided talking points

that educated retail employees about the business case for energy efficiency and its contribution to retailer profits. The program administrator also noted that program mailings were more effective for low- to mid-income and older customers.

Program Challenges and Successes

Program staff reported that communicating tariff changes to trade allies was the program's primary challenge in 2013 and 2014. For example, when the Idaho tariff changed, trade allies had difficulty understanding it, how it had changed, and the way it was written. The program administrator mitigated confusion over future tariff changes by providing education and training opportunities to trade allies when a tariff changed.

In 2013, the higher program standards for clothes washers and refrigerators from the U.S. Department of Energy and ENERGY STAR eliminated the majority of program-qualifying models. Program staff reported this change stressed its relationships with retailers but offered an opportunity to contact and begin a dialogue these retail partners.

The participation of contractors in 2013 and 2014 who had not yet become a part of the program's trade ally network caused some confusion and frustration for customers. The program requires the customer to use an eligible contractor to qualify for rebates. Some applications were rejected and customers expressed frustration that their upgrades did not qualify because they did not use an eligible contractor. To mitigate this, the program staff began contacting and encouraging these contractors to enroll with the program within 90 days of a customer submitting a rebate application so it could be processed.

The Idaho market's rural customer population also presented significant challenges. Because rural Rocky Mountain Power customers do not visit participating retailers often enough to see program advertisements or purchase some HES program products, program staff began rethinking its marketing and outreach approach with these customers. This ultimately led to development of the energy efficiency kits, which were introduced in 2014.

Customer Response

Awareness

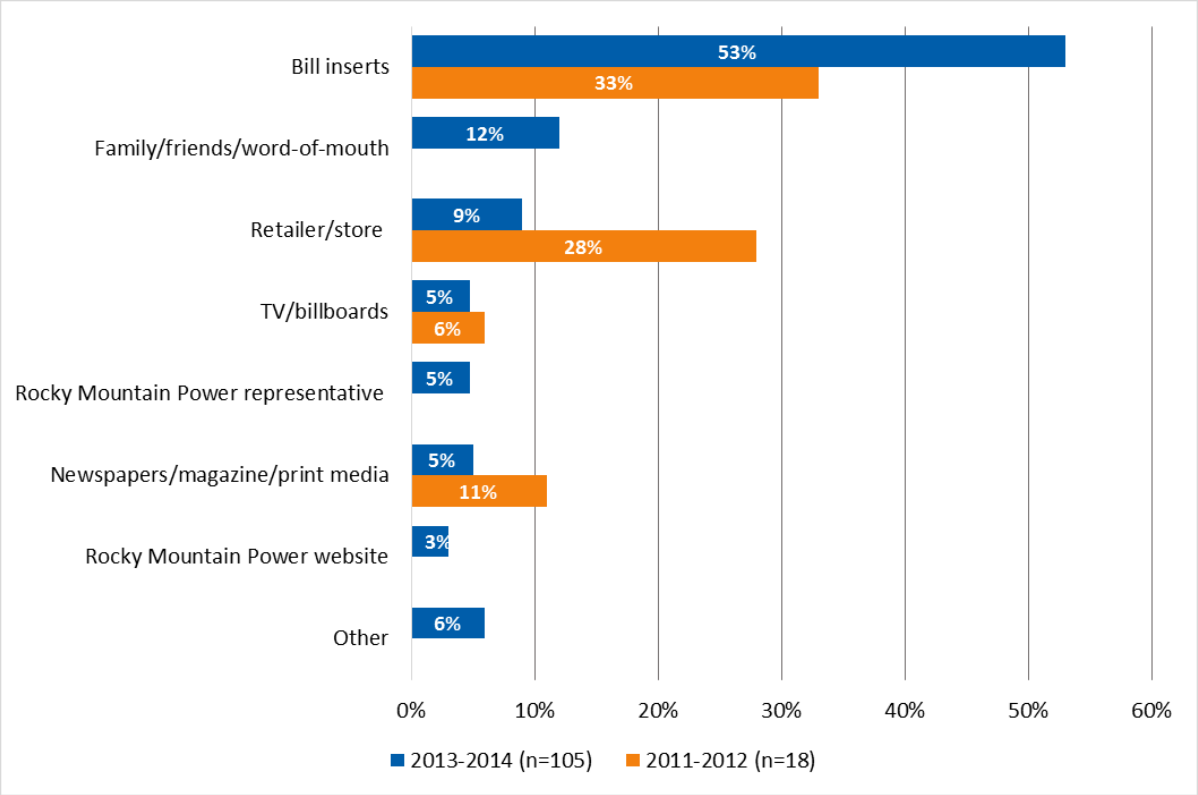
The general population of Rocky Mountain Power's customers learned of the wattsmart HES program through a variety of means. Bill inserts were the most frequently reported source of awareness in the 2013–2014 and 2011–2012 program periods, representing a significant increase.[39] Respondents also mentioned word of mouth (12%) and retailers (9%) as sources of awareness, and the decrease in those citing retailers as a source of awareness is significant.[40] The "Other" responses included the Rocky Mountain Power website, Internet advertising and online advertising, and social media.

[39] Statistically significant change (p-value <0.10).

[40] Statistically significant change (p-value <0.10).

Of the customers who said they learned about the program through the website (n=6), each offered suggestions for ways Rocky Mountain Power could make the website more helpful; these included making program information more clear and concise (n=6) and providing easier access to customer service FAQs (n=1). Figure 14 presents awareness sources from 2011 to 2014.

Figure 14. General Population Survey Source of wattsmart Awareness



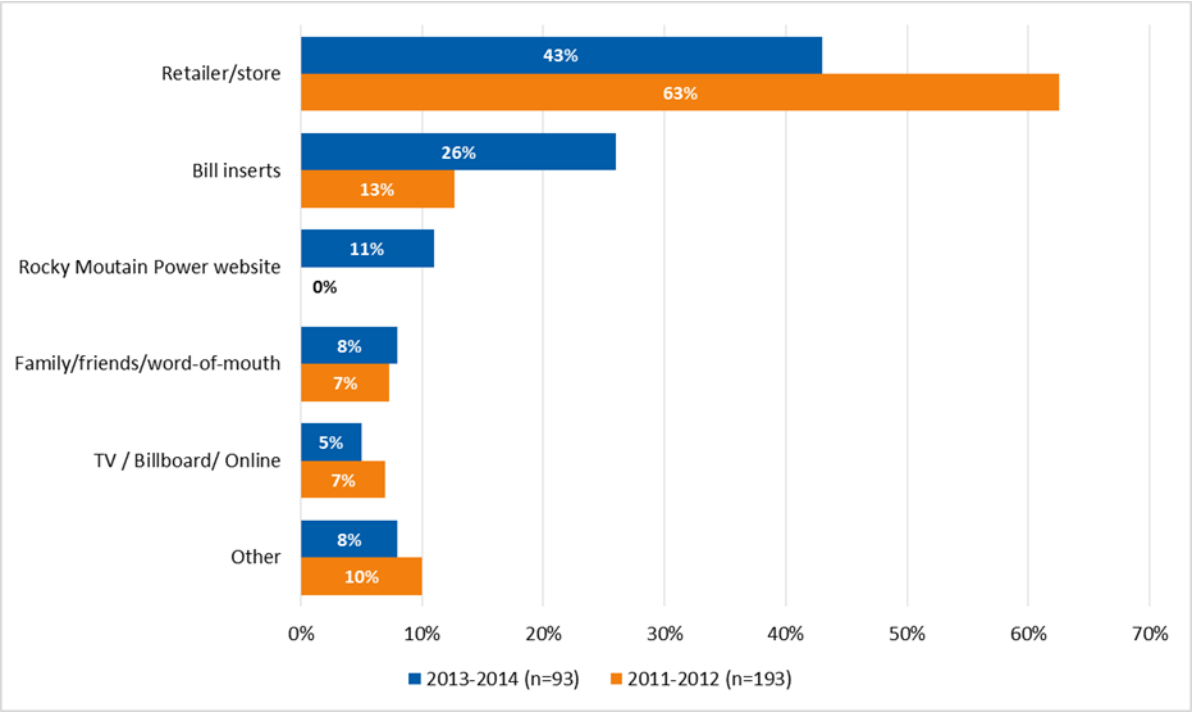
Source: Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A). Don't know and refused responses removed.

As shown in Figure 15, 43% of non-lighting participants reported learning about the program through a retailer, a significant decrease since the 2011–2012 program period.[41] Customers also reported learning about the program through bill inserts (26%) and from the Rocky Mountain Power website (11%), representing a significant increase from 2011–2012.[42] The "Other" responses included home energy reports, Rocky Mountain Power representative, newspapers and print ads, and contactors. Figure 15 shows the ways participants learned about the program.

[41] Statistically significant change (p-value <0.10).

[42] Statistically significant change (p-value <0.10).

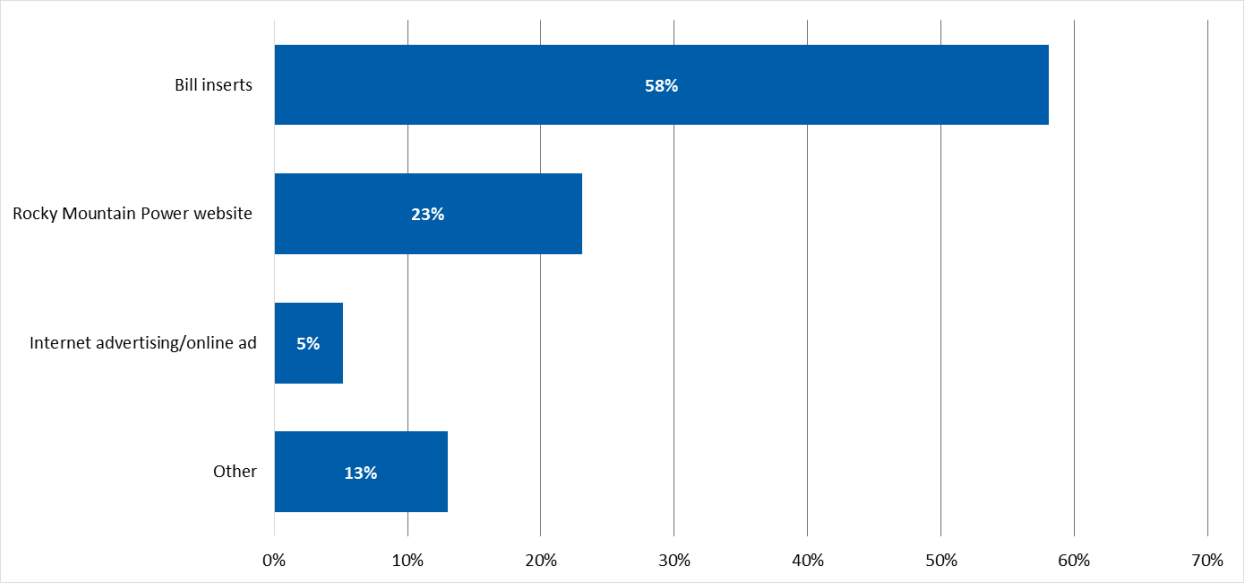
Figure 15. Non-Lighting Participant Source of Awareness



Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A)

Of energy kit customers, 58% reported learning about the program through bill inserts and 23% through Rocky Mountain Power or the HES program website. Figure 16 shows the ways participants learned about the energy efficiency kits. The "Other" responses included mostly friends, family, word of mouth, and e-mail.

Figure 16. Sources of Awareness (Energy Efficiency Kits)



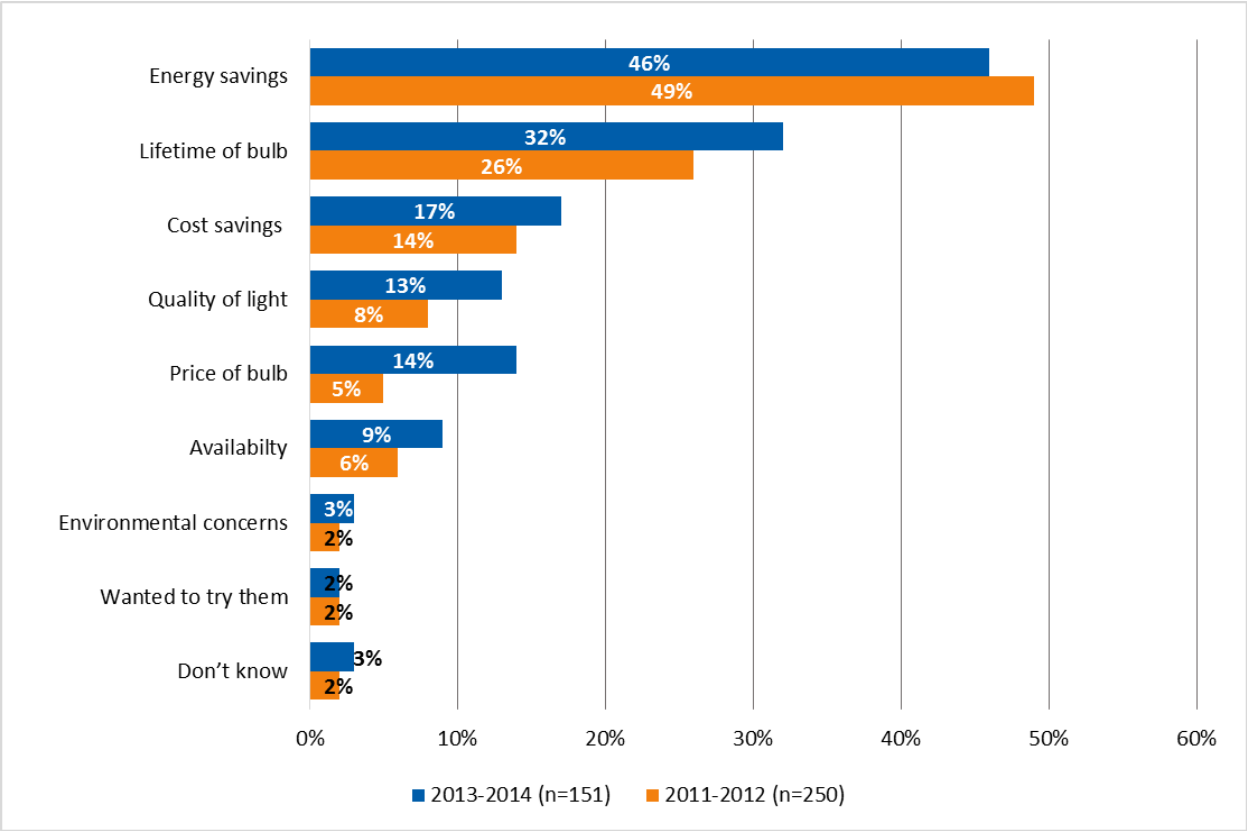
Source: Rocky Mountain Power Idaho HES Energy Kit Survey (Appendix A) (n=113)
Don't know and refused responses removed.

Lighting Purchasing Decisions

In the general population survey, Rocky Mountain Power's Idaho customers expressed a variety of reasons for purchasing energy-efficient bulbs (i.e., CFLs or LEDs). Customers most commonly cited energy savings (46%) and the lifetime of the bulb (32%) as the main reasons for purchasing CFLs over other bulb types. As shown in Figure 17, these reasons remained consistent with 2011–2012 findings, except for one key difference: a significantly larger percentage of customers identified price of bulb as a motivating factor in 2013–2014 than in 2011–2012.[43]

[43] Statistically significant change (p-value <0.10).

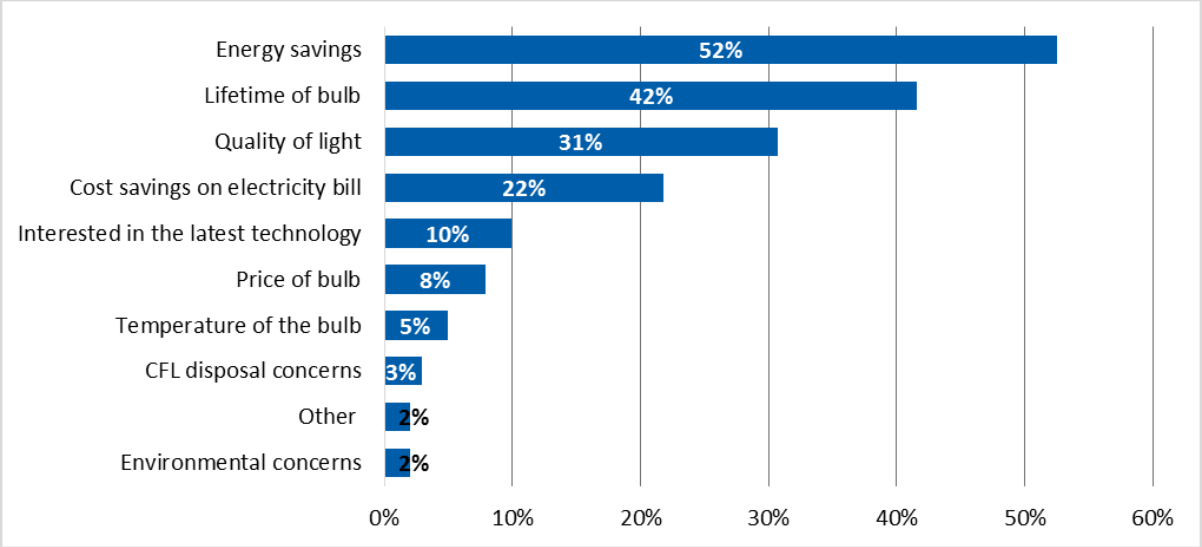
Figure 17. General Population Reasons for Choosing to Buy CFLs



Source: Rocky Mountain Power Idaho HES Residential Lighting Survey
(Appendix A) Refused responses removed. Multiple responses allowed.

Purchasers of LEDs also most commonly cited the energy savings (52%) and lifetime of the bulb (42%) as the reasons they purchased LED bulbs. Figure 18 shows the reasons customers purchased LEDs over other bulbs.

Figure 18. General Populations Reasons for Choosing to Buy LEDs



Source: Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A) (n=101). Don't know and refused responses removed. Multiple responses allowed.

Customers exhibited limited awareness about the fact that the bulbs they purchased were part of a sponsored sale; only 9% of CFL purchasers and 15% of LED purchasers said the bulbs they purchased were part of a utility-sponsored sale. However, the majority of those who were aware of utility sponsorship noted that the discount was highly influential in their decision to purchase the bulb.

Non-Lighting Participation Decisions

Rocky Mountain Power non-lighting participants described a number of different factors influencing their decision to participate in the HES program (Figure 19). Most commonly, participants cited an interest in new technology and equipment brand or features (39%), demonstrating an increase from the 4% of responses in 2011–2012 and 1% from 2009–2010.[44]

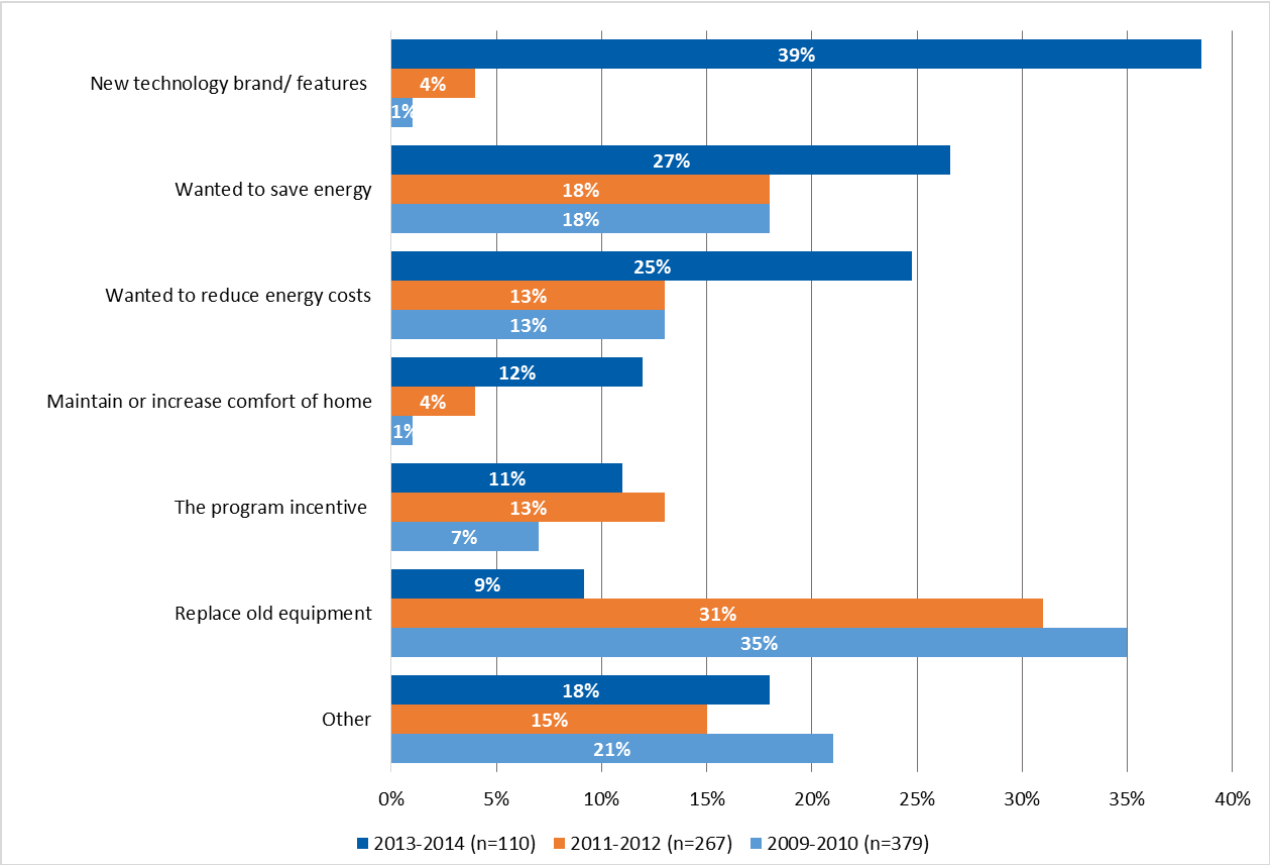
Non-lighting participants in 2013–2014 were also motivated to participate in the HES program because they wanted to save energy (27%) and reduce energy costs (25%).[45] Far fewer participants in 2013–2014 than in past years cited replacing old equipment.[46] The "Other" responses include home remodel, health or environmental concerns, recommendation, and price.

[44] Statistically significant change (p-value <0.10).

[45] Both are statistically significant changes (p-value <0.10).

[46] Statistically significant change (p-value <0.10).

Figure 19. Reasons for Participation (Non-lighting)

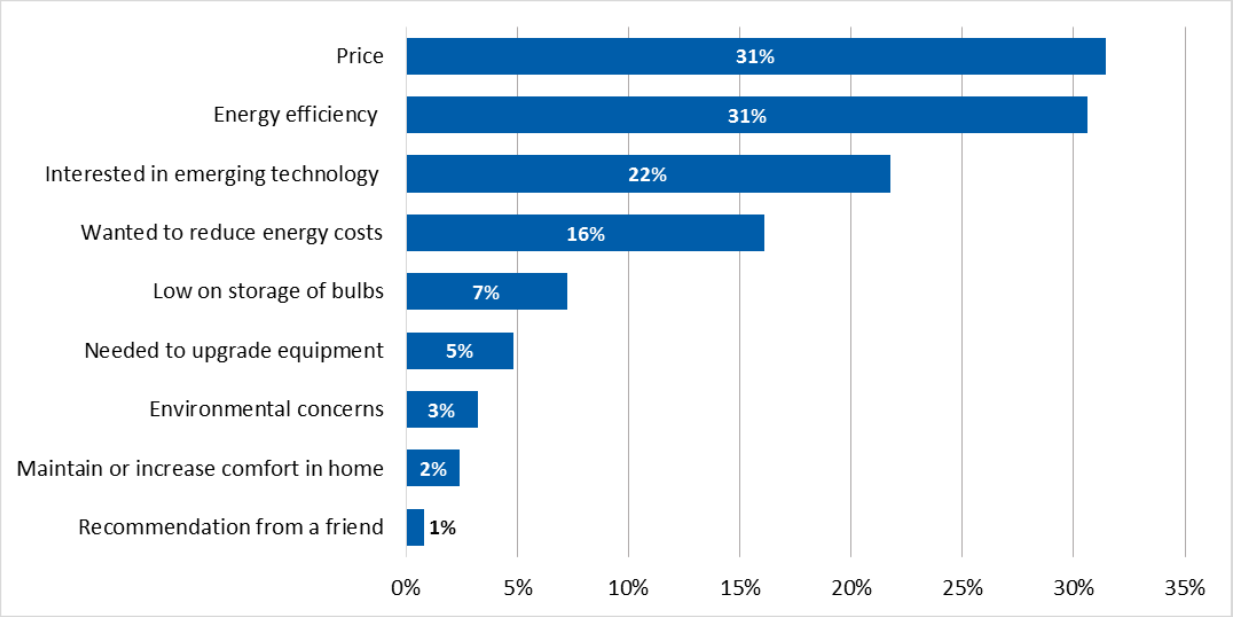


Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A) (n=109)
Don't know and refused responses removed. Multiple responses allowed.

Kit Purchasing Decisions

Rocky Mountain Power customers expressed a variety of reasons for applying for the HES energy efficiency kit and, for those that chose the option, for upgrading to LEDs. Customers most commonly cited price (31%) and energy efficiency (31%) as their main reasons. Also, many customers were motivated to apply for a kit because they were interested in emerging technology (22%) and wanted to try the various energy efficiency measures included in the kits. Figure 20 illustrates the various reasons why the customer was motivated to request a kit.

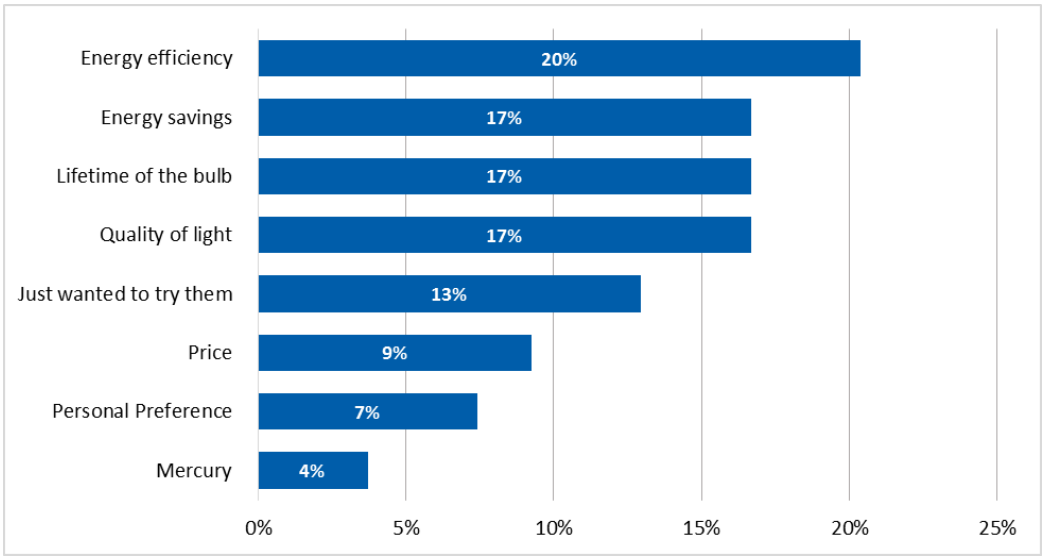
Figure 20. Reasons for Requesting an Energy Efficiency Kit



Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=124).

During the application process, customers had the option to upgrade their energy kits from CFLs to LEDs for $19.99. Of the 54 customers who paid to upgrade their energy kits, the top motivating factors were energy efficiency (20%), energy savings (17%), lifetime of the bulb (17%), and the quality of the light from LEDs (17%). Figure 21 shows the reasons customers decided to upgrade their energy kits to include LEDs instead of CFLs.

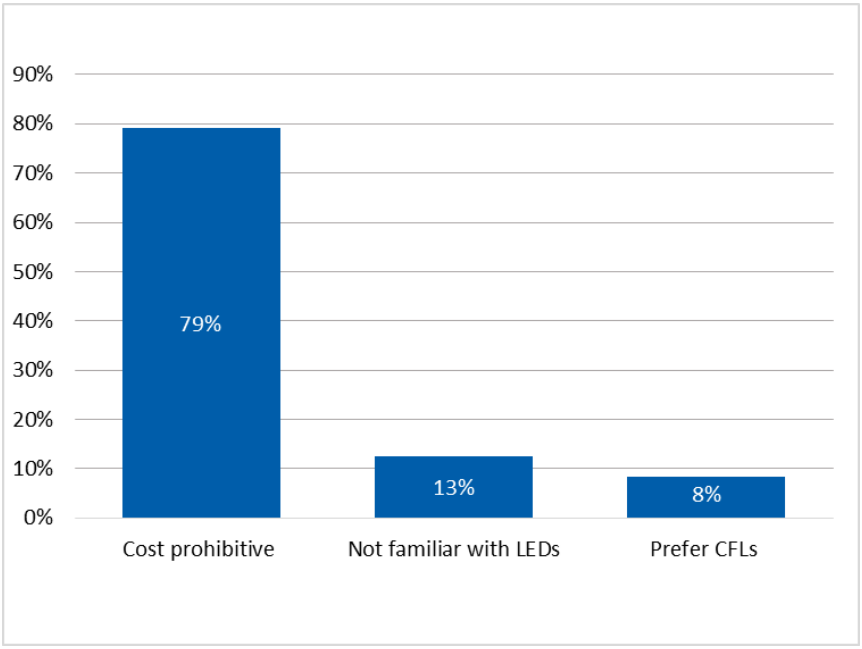
Figure 21. Reasons for LED Upgrade



Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=54).

Customers who selected a CFL kit were asked why they decided not to upgrade their energy kits to include LEDs. Of the 28 customers who responded to this question, 79% said upgrading the energy kit was cost-prohibitive, and 13% were not familiar with LEDs (Figure 22). The remaining 8% expressed their preference for CFL bulbs.

Figure 22. Reasons for Not Upgrading to LEDs



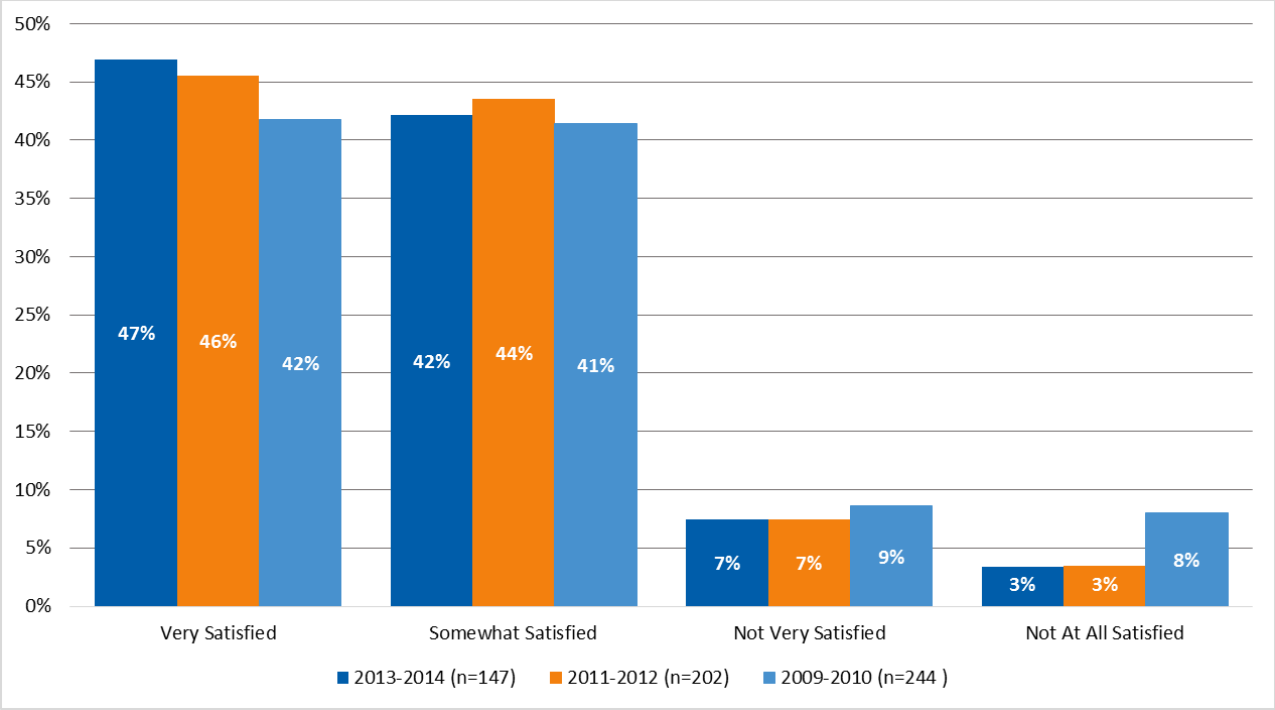
Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=28).

Satisfaction

Lighting

Customers differed somewhat in their satisfaction levels with the products they purchased, depending on whether they purchased CFLs or LEDs. Forty-seven percent of CFL customers said they were very satisfied, 42% were somewhat satisfied, 7% were not too satisfied, and 3% were not at all satisfied with the products they purchased (Figure 23).

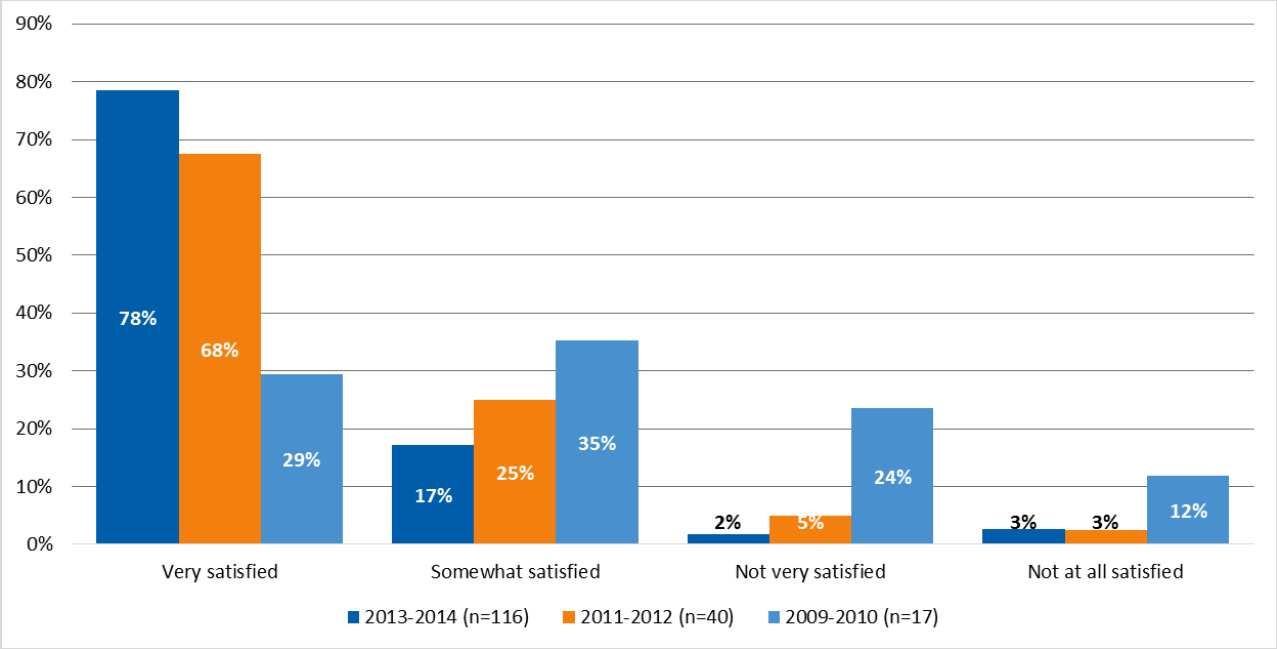
Figure 23. General Population CFL Satisfaction



Source: Rocky Mountain Power Idaho HES Residential Upstream Lighting Survey (Appendix A). Don't know and refused responses removed.

Customers purchasing LEDs expressed higher satisfaction, with 78% very satisfied and 17% somewhat satisfied (Figure 24) with the products they purchased. Satisfaction with LEDs has slowly increased since Rocky Mountain Power began providing incentives for LEDs in 2009.

Figure 24. General Population LED Satisfaction



Source: Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A). Don't know and refused responses removed.

Non-lighting

Non-lighting customers overwhelmingly expressed satisfaction with the HES program, with 97% of participants reporting they were very satisfied or somewhat satisfied. Participants provided the following reasons for their satisfaction:

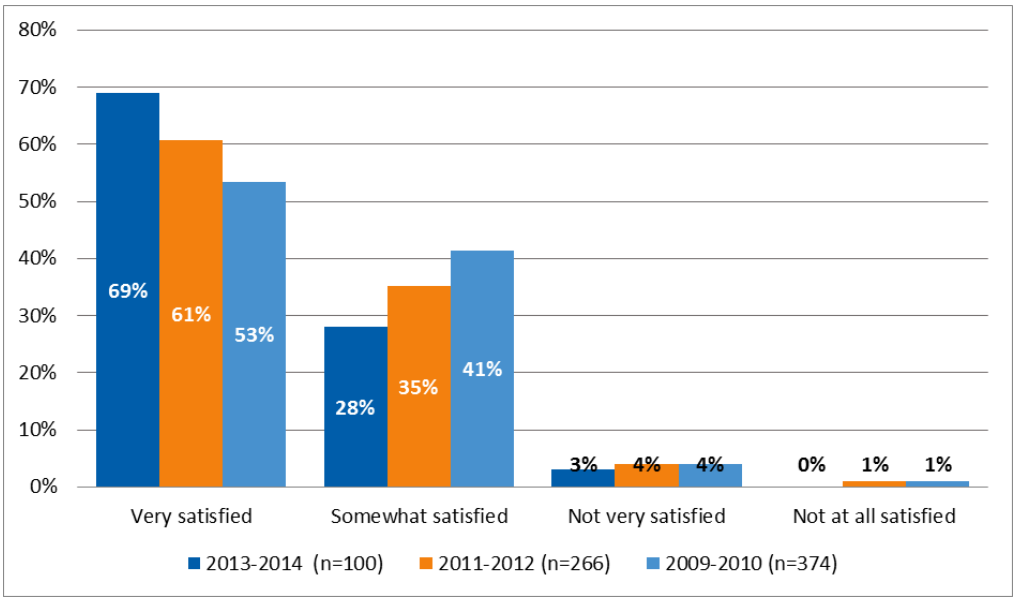
- "It is great to be able to get a discount on things that will save money."
- "I am pleased with the quality and I was happy to have it subsidized."
- "Because I like the incentive and it made my bill go down."
- "Because it is a great programs and I like savings energy."

Dissatisfied customers provided a variety of reasons for their dissatisfaction. Some of their comments included:

- "The bulbs are not bright enough."
- "Because I get these reports that say I'm using a lot of extra gas compared to some of my neighbors but I'm not sure who."
- "There were no discounts for new air conditioners."

Satisfaction has increased since 2009, with the 2013–2014 program year demonstrating a higher level of very satisfied responses than the previous year (69% in 2013–2014 and 61% in 2011–2012). Figure 25 illustrates the trends year over year.

Figure 25. Non-lighting Satisfaction with HES Program

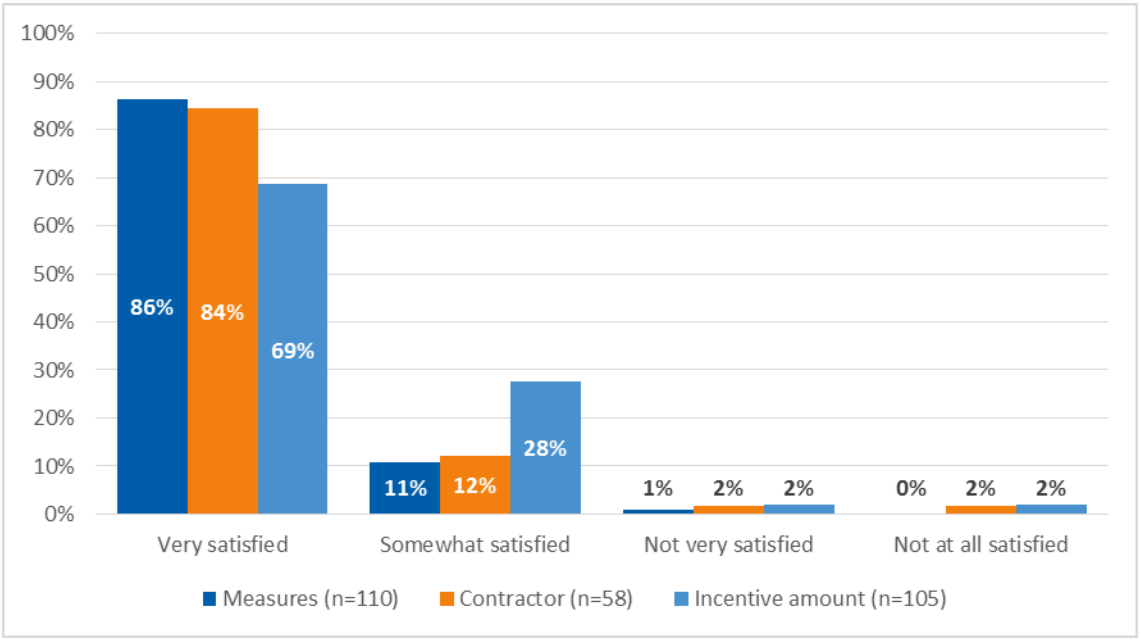


Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A)

Participation in the program appears to have had a positive or neutral effect on most customers' perceptions of Rocky Mountain Power. When asked whether their participation in the HES program caused their satisfaction with Rocky Mountain Power to change, 32% said it increased their satisfaction, 60% said it stayed the same, and 8% said it decreased.

In addition to their overall satisfaction with the HES program, non-lighting customers expressed high satisfaction levels with the measures they installed, their contractors, and the incentive amounts they received. As shown in Figure 26, 79% of non-lighting customers said they were very satisfied with measures installed, and 16% said they were somewhat satisfied.

Figure 26. Non-Lighting Satisfaction with Measures, Contractors, Incentive Amounts



Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A).
Don't know and refused responses removed.

About three-quarters of participants hired contractors to install measures for which they received program incentives; 84% of these participants reported being very satisfied with their contractors and 12% were somewhat satisfied. Participant satisfaction with the incentive amounts they received was not quite as strong, with 69% reporting they were very satisfied with the incentive amounts. An additional 28% said they were somewhat satisfied, and just 4% said they were not very or not at all satisfied.

Non-lighting customers also found the HES program incentive application easy to fill out, with 63% of respondents reporting it very easy to fill out and 32% reporting it somewhat easy. Participants who reported experiencing difficulty with filling out the application (5%) noted the following challenges:

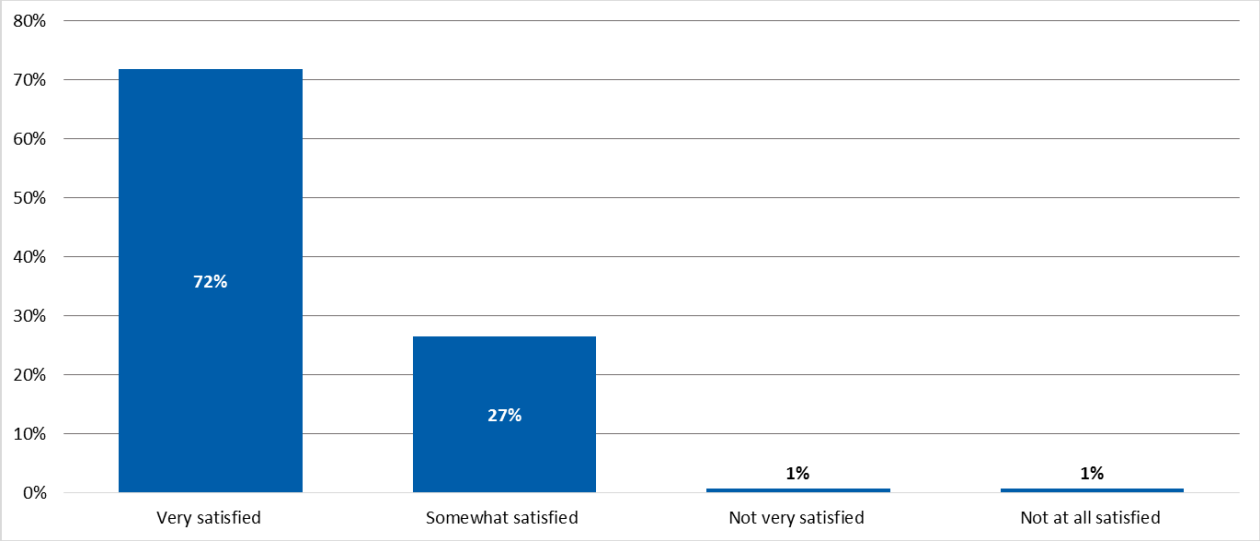
- "Because I don't understand the values."
- "Because at that time no one knew what it was. Even the inspector that was sent by rocky mountain power had no idea what it was and it was a lot of paper work."
- "Just verifying everything took too long."

Energy Efficiency Kits

Program satisfaction

Nearly all kit recipients expressed satisfaction with the HES program (Figure 27), with 99% of participants reporting they were very or somewhat satisfied with the program. One of the participants who expressed dissatisfaction with the program stated, "I don't know how to install it, I wish there were instructions."

Figure 27. Energy Kit Satisfaction with the HES Program



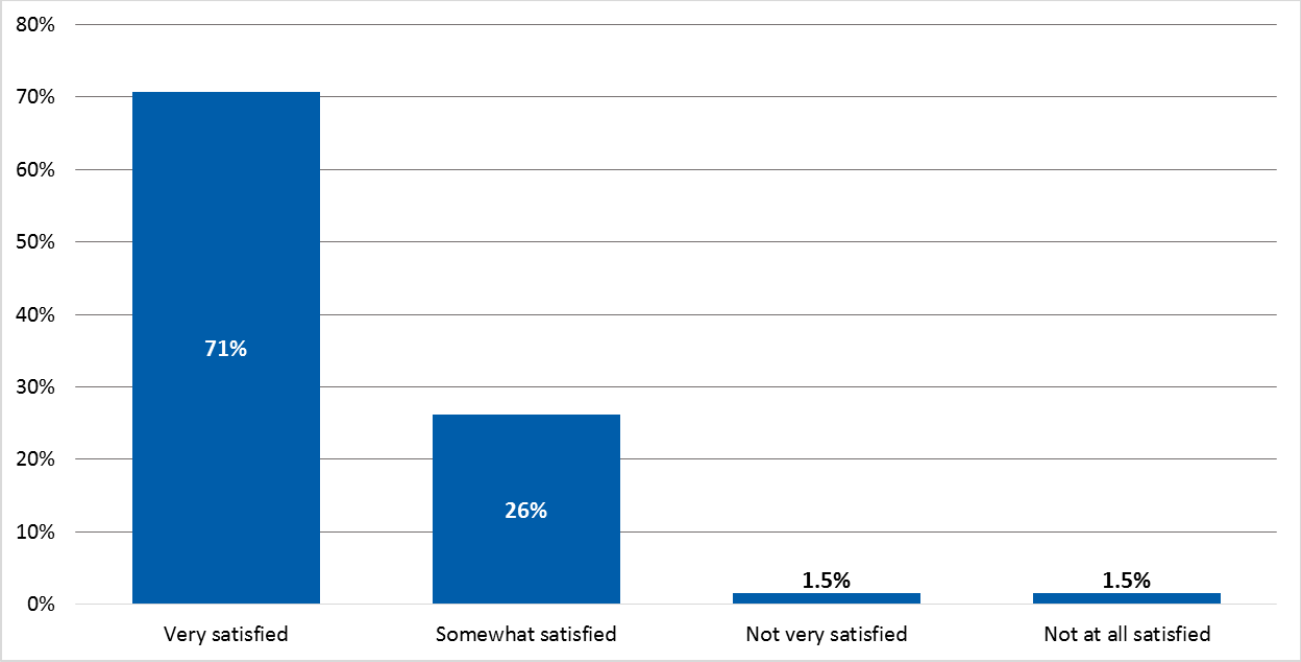
Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=128).
Don't know responses were removed.

Satisfaction with Kit Measures

Kit recipients also reported high levels of satisfaction with the kit components. Because Rocky Mountain Power offered eight kit variations with either CFLs or LEDs and water measures (depending on whether the customer had electric water hearing), survey respondents answered questions that pertained only to their specific kit's contents.

Seventy-one percent of CFL kit respondents said they were very satisfied with the CFLs they received, and 26% said they were somewhat satisfied (Figure 28).

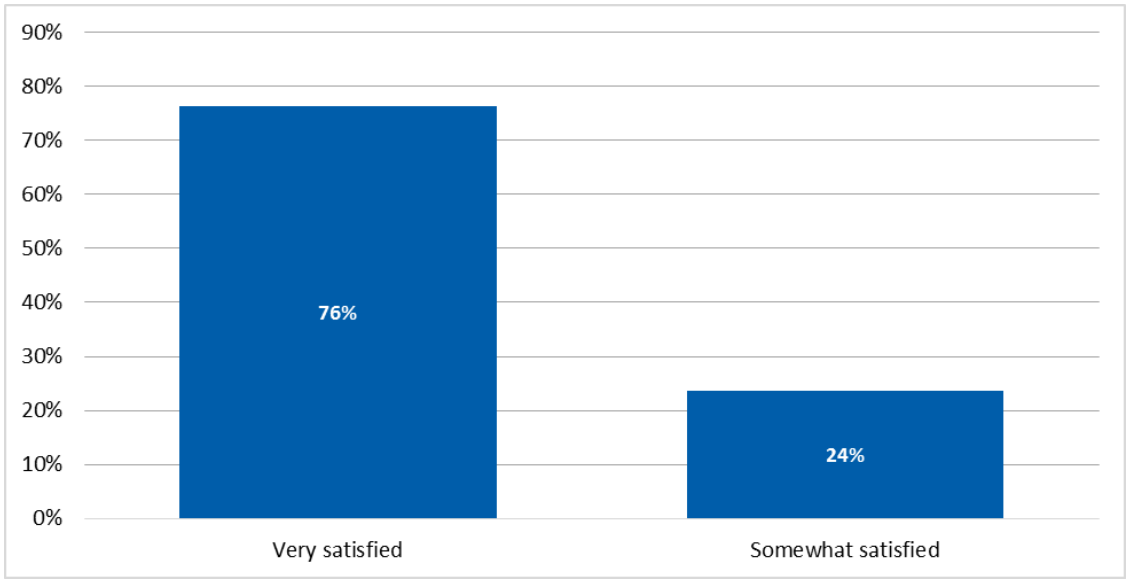
Figure 28. Satisfaction with CFLs in Energy Efficiency Kit



Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=65)

Customers also expressed high levels of satisfaction with the LEDs in their kit. Seventy-six percent were very satisfied, 24% were somewhat satisfied (Figure 29).

Figure 29. Satisfaction with LEDs in Energy Kits

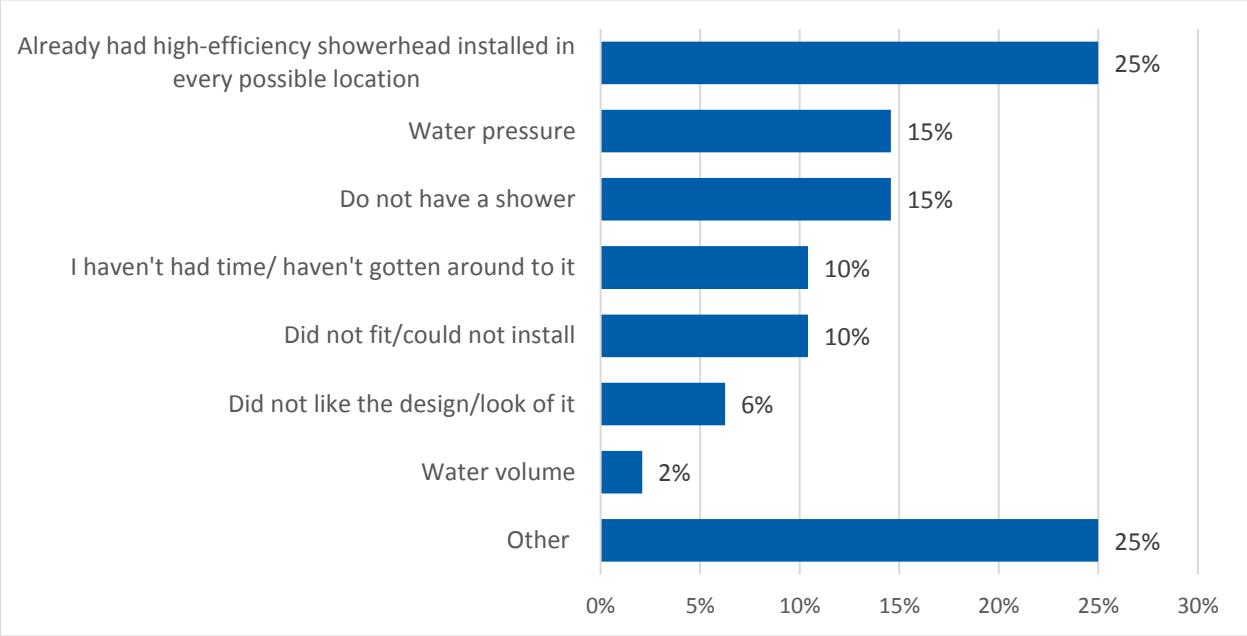


Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=55)

Energy kit participants expressed satisfaction for the number for CFL and LED bulbs provided. Seventy-one percent of customers who received a CFL kit and 69% of customers who received an LED kit said they were very satisfied with the number of bulbs in the kit.

Less than half (44%) of customers chose to install both of the high-efficiency showerheads provided. Of the customers who said they did not install all of the units provided, 25% already had a high-efficiency showerhead, 15% did not have a shower, and 15% did not like the water pressure of the provided showerhead (Figure 30). The majority (77%) of these customers put the unused showerheads in storage.

Figure 30. Reasons for Not Installing Both High-Efficiency Showerheads



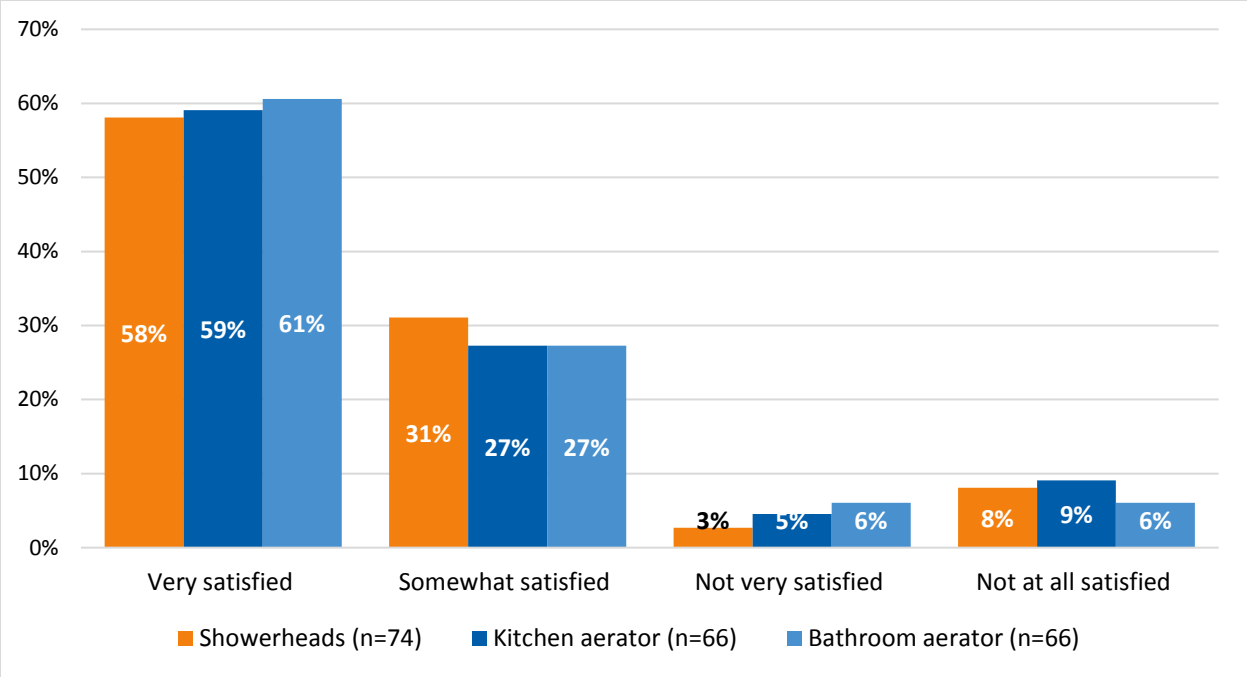
Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (n=48)

Despite the low installation rate, customers expressed satisfaction with the showerheads received. Fifty-eight percent of respondents said they were very satisfied with the showerhead, and 31% said they were somewhat satisfied. Seventy-three percent also noted that it was very easy to install the showerheads.

Customers also reported lower installation rates of the kitchen and bathroom faucet aerators than the CFL or LEDs. Only 49% of respondents said the kitchen faucet aerator was installed in their home. Nearly one-third (32%) of respondents who had not installed the measure said they could not install the kitchen faucet aerator or that it did not fit; 25% cited this reason for bathroom faucet aerators. Nearly a quarter (24%) said they simply had not gotten around to installing the kitchen aerator, and 16% said that they had already installed faucet aerators in every possible location. Ninety-five percent of respondents who had not installed the kitchen aerator said the kitchen aerator was in storage.

Kit recipients expressed similar levels of satisfaction with the aerators as with the showerheads; 59% of respondents were very satisfied with the measure, and 27% were somewhat satisfied. Figure 31 shows the satisfaction with each water measure.

Figure 31. Water Measure Satisfaction



Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A)

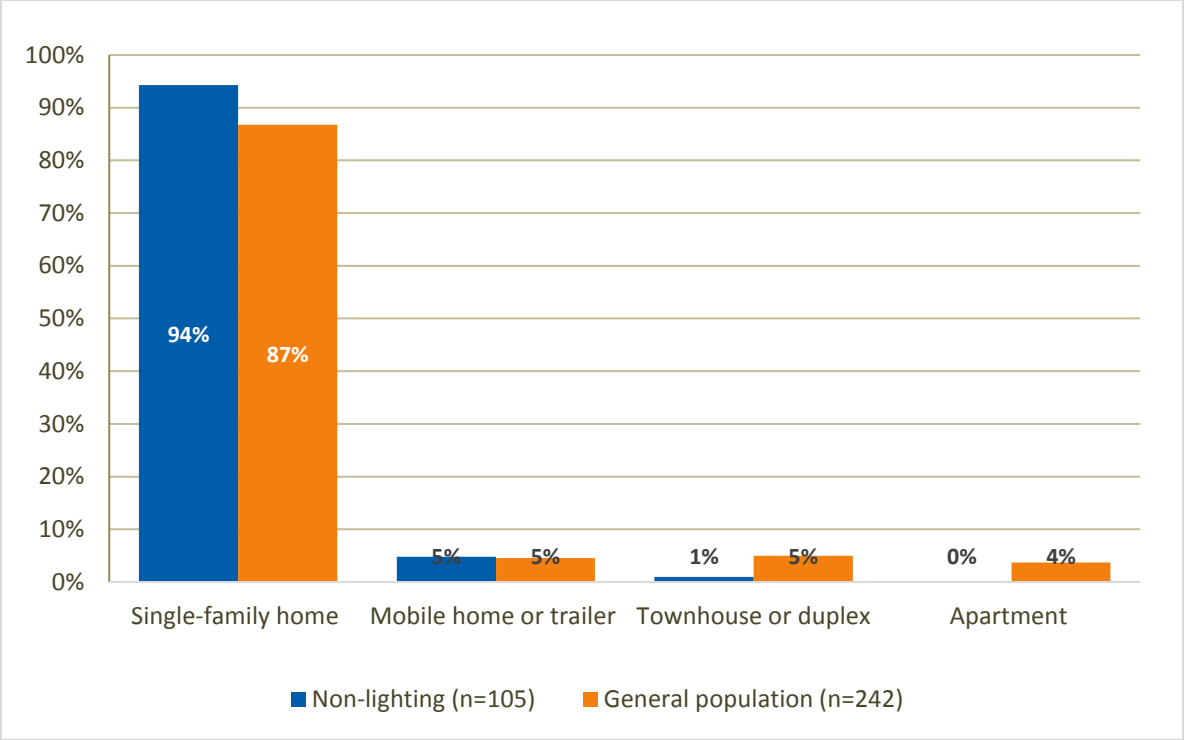
Customers also found the application easy to fill out, with 87% of respondents reporting it very easy to fill out and 11% reporting it somewhat easy. Participants experiencing difficulty with filling out the application noted the following challenges:

- "The first three times that I tried [the website], it told me that they were out of stock on both CFLs and LEDs."
- "It was my first time filling out."
- "It seems like it kicked me out for not having certain things, several parameters."

Customer Demographics

As shown in Figure 32, most of the general population and non-lighting participants surveyed lived in single-family homes, with a small percentage of customers residing in condominiums, townhomes, apartments, or mobile homes.

Figure 32. General Population and Non-Lighting Residence Types

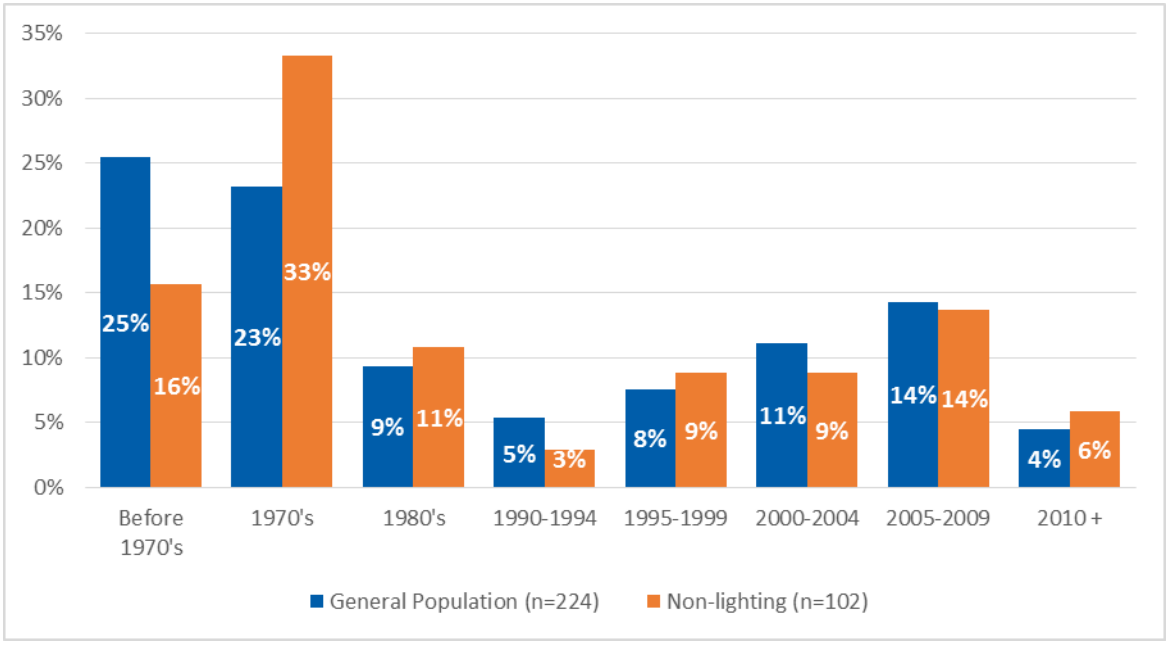


Source: Rocky Mountain Power Idaho HES Residential General Population and Non-lighting Surveys (Appendix A).

Don't know and refused responses removed.

Eighty-nine percent of the general population surveyed and 97% of non-lighting participants reported owning their own homes. Figure 33 shows that survey respondents in both groups reported similar home vintages. Non-lighting participants most frequently reported living in larger homes, with 43% of participants reporting they lived in a home of 2,500 square feet or greater.

Figure 33. General Population and Non-Lighting Home Age



Source: Rocky Mountain Power Idaho HES Residential General Population and Non-lighting Surveys (Appendix A).

Don't know and refused responses removed.

Cost-Effectiveness

In assessing HES program cost-effectiveness, Cadmus analyzed program benefits and costs from five different perspectives, using Cadmus' DSM Portfolio Pro model.[47] The California Standard Practice Manual for assessing demand-side management (DSM) program cost-effectiveness describes the benefit-cost ratios Cadmus used for the following five tests:

- **PacifiCorp Total Resource Cost (PTRC) Test:** This test examined program benefits and costs from Rocky Mountain Power's and Rocky Mountain Power customers' perspectives (combined). On the benefit side, it included avoided energy costs, capacity costs, and line losses, plus a 10% adder to reflect non-quantified benefits. On the cost side, it included costs incurred by both the utility and participants.
- **Total Resource Cost (TRC) Test:** This test also examined program benefits and costs from Rocky Mountain Power's and Rocky Mountain Power customers' perspectives (combined). On the benefit side, it included avoided energy costs, capacity costs, and line losses. On the cost side, it included costs incurred by both the utility and participants.
- **Utility Cost Test (UCT):** This test examined program benefits and costs solely from Rocky Mountain Power's perspective. The benefits included avoided energy, capacity costs, and line losses. Costs included program administration, implementation, and incentive costs associated with program funding.
- **Ratepayer Impact Measure (RIM) Test:** All ratepayers (participants and nonparticipants) may experience rate increases designed to recover lost revenues. The benefits included avoided energy costs, capacity costs, and line losses. Costs included all Rocky Mountain Power program costs and lost revenues.
- **Participant Cost Test (PCT):** From this perspective, program benefits included bill reductions and incentives received. Costs included a measure's incremental cost (compared to the baseline measures), plus installation costs incurred by the customer.

Table 77 summarizes the five tests' components.

[47] DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and a number of regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

Table 77. Benefits and Costs Included in Various Cost-Effectiveness Tests

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs,* with a 10% adder for non-quantified benefits	Program administrative and marketing costs, and costs incurred by participants
TRC	Present value of avoided energy and capacity costs*	Program administrative and marketing costs, and costs incurred by participants
UCT	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive costs
RIM	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive costs, plus the present value of lost revenues
PCT	Present value of bill savings and incentives received	Incremental measure and installation costs

*Includes avoided line losses.

Table 78 provides selected cost analysis inputs for each year, including evaluated energy savings, discount rate, line loss, inflation rate, and total program costs. Rocky Mountain Power provided all of these values, except for energy savings and the discount rate, which Cadmus derived from Rocky Mountain Power's 2013 *Integrated Resource Plan*.

Table 78. Selected Cost Analysis Inputs

Input Description	2013	2014	Total
Evaluated Gross Energy Savings (kWh/year)*	2,689,263	4,031,004	6,720,267
Discount Rate	6.88%	6.88%	N/A
Line Loss	11.47%	11.47%	N/A
Inflation Rate**	1.9%	1.9%	N/A
Total Program Costs	**$825,450**	**$922,206**	**1,747,656**

*Savings are realized at the meter, while benefits account for line loss.

**Future retail rates determined using a 1.9% annual escalator.

HES program benefits included energy savings and their associated avoided costs. For the cost-effectiveness analysis, Cadmus used this study's evaluated energy savings and measure lives from sources such as the RTF.[48] For all analyses, Cadmus used avoided costs associated with Rocky Mountain Power's 2013 *IRP Eastside Class 2 DSM Decrement Values*.[49]

[48] See Appendix G for detailed cost-effectiveness inputs and results at the measure category level.

[49] Appendix N of PacifiCorp's *2013 Integrated Resource Plan, Volume II - Appendices* details the IRP decrements. April 20, 2013. Available online: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol2-Appendices_4-30-13.pdf

Cadmus analyzed HES program cost-effectiveness for net savings with evaluated freeridership and spillover incorporated.

Table 79 presents the 2013–2014 program cost-effectiveness analysis results, including the evaluated NTG (but not accounting for non-energy benefits [except those represented by the 10% conservation adder included in the PTRC]). For this scenario, the HES program proved cost-effective from all perspectives, except the RIM test. The primary criterion for assessing cost-effectiveness in Idaho is the PTRC, which achieved a 1.88 benefit-cost ratio for the combined years' net savings.

The RIM test measures program impacts on customer rates. Many programs do not pass the RIM test because, while energy efficiency programs reduce costs, they also reduce energy sales. As a result, the average rate per unit of energy may increase. A passing RIM test indicates that rates, as well as costs, will go down as a result of the program. Typically, this only happens for demand response programs or programs that are targeted to the highest marginal cost hours (when marginal costs are greater than rates).

Table 79. HES Program Cost-Effectiveness Summary for 2013–2014 Net (Excluding Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.045	$1,869,230	$3,508,934	$1,639,704	1.88
TRC No Adder	$0.045	$1,869,230	$3,189,940	$1,320,710	1.71
UCT	$0.041	$1,688,276	$3,189,940	$1,501,664	1.89
RIM	N/A	$5,977,445	$3,189,940	($2,787,505)	0.53
PCT	N/A	$1,699,587	$6,490,287	$4,790,700	3.82
Lifecycle Revenue Impacts ($/kWh)	$0.000057179				
Discounted Participant Payback (years)	1.75				

Table 80 presents the 2013 program cost-effectiveness analysis results, including the evaluated NTG, but not accounting for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC). For this scenario, the HES program proved cost-effective from all perspectives except for RIM.

Table 80. HES Program Cost-Effectiveness Summary for 2013 Net (Excluding Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.066	$994,398	$1,315,522	$321,124	1.32
TRC No Adder	$0.066	$994,398	$1,195,929	$201,531	1.20
UCT	$0.054	$825,450	$1,195,929	$370,479	1.45
RIM	N/A	$2,434,716	$1,195,929	($1,238,787)	0.49
PCT	N/A	$930,209	$2,678,842	$1,748,633	2.88
Lifecycle Revenue Impacts ($/kWh)					$0.000025698
Discounted Participant Payback (years)					1.47

Table 81 presents the 2014 program cost-effectiveness analysis results, including evaluated NTG, but not accounting for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC). For this scenario, again, the HES program proved cost-effective from all perspectives except the RIM test.

Table 81. HES Program Cost-Effectiveness Summary for 2014 Net (Excluding Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.033	$935,038	$2,344,363	$1,409,325	2.51
TRC No Adder	$0.033	$935,038	$2,131,239	$1,196,201	2.28
UCT	$0.033	$922,206	$2,131,239	$1,209,033	2.31
RIM	N/A	$3,786,540	$2,131,239	($1,655,301)	0.56
PCT	N/A	$822,327	$4,073,749	$3,251,422	4.95
Lifecycle Revenue Impacts ($/kWh)					$0.000034143
Discounted Participant Payback (years)					0.83

Table 82 provides the annual program non-energy benefits (NEBs) from the appliance, lighting, and kit measures categories.

Table 82. HES Annual Non-Energy Benefits

Measure	Annual Value	Perspective Adjusted	NEBs	Source
Clothes Washer - 2013	$20,445.24	PTRC, TRC, PCT	Water, Detergent, and Sewer	RTF Residential Clothes Washer workbook version 3.5
CFL General Purpose - 2013	$58,020.27	PTRC, TRC, PCT	O&M	RTF Residential Lighting CFL workbook version 3.0
CFL Specialty - 2013	$21,511.40	PTRC, TRC, PCT	O&M	RTF Residential Lighting CFL workbook version 3.0
Clothes Washer - 2014	$11,950.68	PTRC, TRC, PCT	Water, Detergent, and Sewer	RTF Residential Clothes Washer workbook version 3.5
CFL General Purpose - 2014	$33,572.77	PTRC, TRC, PCT	O&M	RTF Residential Lighting CFL workbook version 3.0
CFL Specialty - 2014	$12,137.48	PTRC, TRC, PCT	O&M	RTF Residential Lighting CFL workbook version 3.0
LED General Purpose - 2014	$177.45	PTRC, TRC, PCT	O&M	RTF Residential Lighting LED workbook version 3.0
LED Specialty - 2014	$963.24	PTRC, TRC, PCT	O&M	RTF Residential Lighting LED workbook version 3.0
Kits - 2014	$186,469.44	PTRC, TRC, PCT	Water, Sewer, and O&M	RTF Residential Lighting CFL workbook version 3.0, RTF Residential Lighting LED workbook version 3.0, and RTF Residential DHW Showerheads workbook version 2.1

Table 83 presents the 2013–2014 program cost-effectiveness analysis results, including the evaluated NTG, and accounting for non-energy. For this scenario, the HES program proved cost-effective from all perspectives, except the RIM test, and achieved a 2.87 benefit-cost ratio for the combined years' net savings.

Table 83. HES Program Cost-Effectiveness Summary for 2013–2014 Net (Including Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.045	$1,869,230	$5,360,906	$3,491,676	2.87
TRC No Adder	$0.045	$1,869,230	$4,873,551	$3,004,321	2.61
UCT	$0.041	$1,688,276	$3,189,940	$1,501,664	1.89
RIM	N/A	$5,977,445	$3,189,940	($2,787,505)	0.53
PCT	N/A	$1,699,587	$8,671,378	$6,971,791	5.10
Lifecycle Revenue Impacts ($/kWh)					$0.000057179
Discounted Participant Payback (years)					1.52

Table 84 presents the 2013 program cost-effectiveness analysis results, including the evaluated NTG, and accounting for non-energy benefits. For this scenario, the HES program proved cost-effective from all perspectives except for RIM.

Table 84. HES Program Cost-Effectiveness Summary for 2013 Net (Including Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.066	$994,398	$1,676,042	$681,644	1.69
TRC No Adder	$0.066	$994,398	$1,523,675	$529,276	1.53
UCT	$0.054	$825,450	$1,195,929	$370,479	1.45
RIM	N/A	$2,434,716	$1,195,929	($1,238,787)	0.49
PCT	N/A	$930,209	$3,220,951	$2,290,742	3.46
Lifecycle Revenue Impacts ($/kWh)	$0.000025698				
Discounted Participant Payback (years)	1.07				

Table 85 presents the 2014 program cost-effectiveness analysis results, including evaluated NTG, and accounting for non-energy benefits. For this scenario, again, the HES program proved cost-effective from all perspectives except the RIM test.

Table 85. HES Program Cost-Effectiveness Summary for 2014 Net (Including Non-Energy Benefits)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.033	$935,038	$3,938,456	$3,003,418	4.21
TRC No Adder	$0.033	$935,038	$3,580,415	$2,645,377	3.83
UCT	$0.033	$922,206	$2,131,239	$1,209,033	2.31
RIM	N/A	$3,786,540	$2,131,239	($1,655,301)	0.56
PCT	N/A	$822,327	$5,825,526	$5,003,199	7.08
Lifecycle Revenue Impacts ($/kWh)	$0.000033955				
Discounted Participant Payback (years)	0.66				

Conclusions and Recommendations

Based on the findings previously presented, Cadmus offers the following conclusions and recommendations.

Measure Categorization

Some measure categories were assigned based on delivery channels rather than end uses (e.g., light fixtures were assigned as appliances in the downstream delivery channel). For cost-effectiveness purposes, measure categories should be allocated by end use to ensure application of the most appropriate load shape.

Recommendation

Assign measure categories by end use to ensure use of the most appropriate cost-effectiveness results. Ensure consistent applications of measure categories in all data tracking and reporting efforts (including annual reports, evaluations, and participant databases).

Clothes Washers Reported Savings

Cadmus estimated clothes washer energy savings using the same approach described in the ENERGY STAR calculator from April 2013 (which incorporates the federal standard baseline). Reported savings were consistent with the RTF values, which had been calculated using a current practice baseline, not a federal standard baseline, thus the reported savings tended to decrease savings because the current practice baseline was more efficient than the federal standard. These findings led to the high realization rate of 288%.

Recommendation

Use the federal standard baseline when calculating reported clothes washer energy savings.

Upstream Lighting Tracking Database

Although Cadmus was able to match the quantities and savings in the lighting tracking database to annual reports, the data proved challenging to use for evaluation purposes. Specifically, Cadmus encountered difficulties mapping the lighting tracking database to the price scheduling database.

The tracking database contained several inconsistences. Bulb types were inconsistently defined for each SKU, SKUs and model numbers were used interchangeably, and reconciled quantities were inconsistently labeled. The program administrator also could not provide detailed tracking information on product merchandising or promotional events. Data tracking, however, improved significantly between 2013 and 2014.

Many of the inconsistencies were changes because manufacturers updated descriptions between price schedules (the negotiated period for which prices and incentives are agreed upon between manufacturers/retailers and the program implementer). The 2014 tracking data included the schedule name in both the pricing data as well as the sales data, which improved the accuracy in matching prices

to sales rather than having to rely on inconsistent secondary descriptions. If the data continue to be collected in the same way for 2015–2016 as they were in 2014, Cadmus will not face as many challenges in the next evaluation.

Recommendation

Track all data in a consistent manner across each program period. This specifically includes the following:

- Provide consistently defined bulb types for each SKU
- Provide consistent SKUs or model numbers
- Provide tracking data with final and reconciled quantities
- Track all product merchandising and promotional events (were not tracked in either 2013 or 2014)

Lighting Cross-Sector Sales

Cadmus estimated that 3.9% of efficient bulbs purchased at retail store ultimately would be installed in commercial applications, which is a similar result to findings in other jurisdictions that also implement upstream lighting programs. Bulbs installed in commercial spaces produce more first-year savings than bulbs installed in a residential space because commercial locations typically have a higher daily use of bulbs than residential locations (i.e., higher HOU). Currently, Rocky Mountain Power does not account for cross-sector sales from the upstream lighting incentives.

Recommendation

Other jurisdictions around the country increasingly have accommodated cross-sector sales factors in calculating reported lighting savings. Cadmus recommends that Rocky Mountain Power explore accounting for commercial installation of upstream bulbs in the reported savings.

Accounting for these installations can be complex because of the split between residential and nonresidential programs in the wattsmart portfolio. One option would be to calculate savings values for each bulb, accounting for the different HOUs for residential and nonresidential installations weighted by the cross-sector sales factor. This option would also require calculating a lower measure life to account for commercial bulbs burning out faster. Rocky Mountain Power would then need to decide if all of the lighting savings from the program would fall under the residential wattsmart portfolio or if some of the savings would be transferred onto the nonresidential side.

Nonparticipant Spillover

Nonparticipant spillover results in energy savings caused by, but not rebated through, utilities' DSM activities. Effective program marketing and outreach generates program participation and increases general energy efficiency awareness among customers. The cumulative effect of sustained utility program marketing can affect customers' perceptions of their energy usage and, in some cases, motivate customers to take efficiency actions outside of the utility's program.

Through responses to the general population survey, Cadmus estimated nonparticipant spillover as 5% of HES program savings. Cadmus did not apply this adjustment to 2013-2014 savings, but would encourage continued conversations of if this should be applied in future evaluations.

Recommendation

Consider allowing nonparticipant spillover to be an integral component of NTG estimations for all programs.

Lighting Leakage

Through intercept surveys conducted with customers purchasing light bulbs at five participating retail stores, Cadmus found that lighting leakage rates averaged roughly 2.5 percentage points higher than predicted by the RSAT, with a confidence level of 90% and precision of ±2.0%, indicating that the RSAT is performing well as a predictor of bulb leakage.

Cadmus estimated a leakage rate of 23.1% across all surveyed stores outside of (but bordering) Rocky Mountain Power's territory, indicating that about one-quarter of the bulbs purchased at these stores likely were installed within Rocky Mountain Power's territory. These stores did not have RSAT scores to compare against.

Customers were more likely to purchase CFLs and LEDs at participating stores (67% of bulbs purchased were CFLs or LEDs) than at nonparticipating stores (27% of bulbs purchased were CFLs; no LEDs were purchased) in Idaho.

Recommendation

The RSAT allocation score appears to predict well in Idaho. Rocky Mountain Power should continue using the RSAT to determine which stores in its territory should be included as participating stores in the program.

Customer Awareness

Retailers and bill inserts constituted the most commonly cited program awareness sources for non-lighting participants, while bill inserts were the most frequently cited source of general wattsmart awareness among the general population. Bill inserts and the program website were the most commonly cited sources of energy kit awareness.

Recommendation

Continue to pursue a multi-touch marketing strategy, using a mix of bill inserts and retailer/contractor training. Given the large percentage of customers who learned of wattsmart offerings through bill inserts, examine the proportion of customers selecting to receive online bills and ensure these online channels advertise the programs with the messages that motivated customers to participate, such as promoting long-lasting products, saving energy, replacing inefficient equipment, and reducing costs.

Satisfaction with Program Experience

Customers generally expressed satisfaction with their program experiences, including high satisfaction levels with contractors. Although Cadmus was not able to verify the efficacy of the program administrator's efforts to reach out to non-registered contractors who worked with rebate-seeking participants, the program's efforts to mitigate contractor confusion regarding tariff changes appeared to support the customers' reported satisfaction.

Recommendation

Continue regular training sessions with trade allies (e.g., distributors, retailers, sales associates, contractors), updating them on tariff changes and, where appropriate, supporting them with sales and marketing training. Assess the success of efforts to enroll non-registered contractors who worked with rebate participants within 90 days to determine whether the additional outreach mitigated the number of rejected applications due to non-qualified contractors.

Energy Efficiency Kits

The kit rollout in 2014 proved successful, with over 7,500 kits distributed. Participants generally expressed satisfaction with the ordering process and the equipment in the kit; however, installation of the water saving measures was limited, with many participants storing extra faucet aerators or showerheads because the measure did not fit, they had trouble installing it, they already had it, or they did not have a shower.

Recommendation

To reduce unnecessary program cost, consider offering an opt-out for the water saving measures if the customer does not have a shower or already has efficient showerheads of faucet aerators.

Appendices

A separate volume contains the following appendices:

Appendix A. Survey and Data Collection Forms

Appendix B. Lighting Impacts

Appendix C. Billing Analysis

Appendix D. Self-Report NTG Methodology

Appendix E. Nonparticipant Spillover

Appendix F. Lighting Retailer Allocation Review

Appendix G. Measure Category Cost-Effectiveness

Appendix H. Logic Model

Appendix A. Survey Instruments and Data Collection Tools

CADMUS

PacifiCorp HES Program PM Staff Interview Guide
PY 2013 - 2014

Name:

Title:

Interviewer:

Date of Interview:

Introduction

The purpose of the interview is to explore your experience with the HES Program. We use input from a variety of staff involved with the program to describe how the program worked during 2013 and 2014, what made it successful, and where there may be opportunities for improvement. Please feel free to let me know if there are questions that may not apply to your role so that we can focus on the areas with which you have worked most closely.

Program Overview, Management Roles and Responsibilities:

1. To start, please tell me about your role and associated responsibilities with the HES Program.

a. How long have you been involved?

b. Who are the other key PacifiCorp staff involved in the 2013 and 2014 program period and what are their roles?

Program Goal and Objectives:

2. How would you describe the main objective of the 2013 and 2014 HES Program?

3. What were the savings and participation goals of the program for 2013 and 2014? How did the program do with respect to those goals?

4. Did the program have any informal or internal goals/Key Performance Indicators for this year, such as level of trade ally engagement, participant satisfaction, participation in certain regions, etc.?

a. How or why were these goals developed?

b. How did the program perform in terms of reaching the internal goals (for each state)?

5. Please walk me through how the program worked from a customer perspective. For example, how would a customer hear about the program, how would participation be initiated, and what steps would I go through as a customer? (for all delivery channels – upstream, rebate and kits).

6. How did this customer experience differ among the five states?

7. [If not covered above] Please tell me about how the program worked with trade allies. What types of trade allies did you work with? What are their roles and responsibilities?

Program Design:

Thank you. Now I'd like to ask you about the program design.

8. [If not answered above] Who is your target market for this program?

9. How well did the current program design meet customer needs? (Probe: measures, incentive levels, documentation required, etc.)

10. Were any major changes made to the program since 2012? (incentives, program components (kits), etc) [Probe: Simple Steps, kits]?

a. What was the reason kits were introduce to ID, CA and WA? Are there plans to provide the kits in UT and WY too?

b. Are the kits a standard set of measures or can customers choose which components they want? How is this tracked? [Cadmus will request the specifications for each kit item during a follow-up data request]

c. Were any changes made to the rebate application forms (recommendation from last evaluation)?

d. Have there been any tariff changes since 2012?

11. What worked well in the 2013-2014 period?

12. Conversely, what was not working as well as anticipated?

13. What barriers or challenges did the program face in 2013-2014? What was done/what is planned to address them?

14. What changes are planned or now in place for the HES program (by state)?

15. What was the program's QA/QC process like in 2013-2014? Would you please describe that?

16. In your opinion, what other ways can the program design be improved? (Probe: What? Why?)

Program Marketing

17. [If not covered above] Please describe how the program was marketed (through the website, one-on-one outreach, through trade allies, etc.)?

18. Do you have a marketing plan from 2013-2014 you could share with me? What were the primary marketing activities during that time period?

a. Did all five states use the same marketing plan and tactics?

b. How did the messaging differ in the five states?

c. How much of the marketing is wattsmart vs program specific (HES)?

d. Who is the primary target audience for the program?

19. Did you track marketing effectiveness? What did you track?

a. What was the most effective marketing approach? (Why do you say this?)

Customer Experience:

20. Did you have a process by which you receive customer feedback about the program? (Probe: What is that process and how frequently does it happen, what happens to the information, if a response is required who does that?)

21. What feedback did you receive from customers about the program? What did they say? (Probe: incentive levels, timing for project approvals, incentive payments, satisfaction with studies, trade allies, etc.)

Trade Ally Experience:

22. How did the program recruit trade allies (contractors and retailers)?

23. Do you feel you had sufficient trade allies to support the program? Why or why not?

24. What barriers have the trade allies said they encounter with the program?

    a. What steps have been taken to address these?

    b. What remains to be done to remove these barriers?

25. What kind of training was required and/or offered for trade allies? How frequently and on what topics?

26. Did the program provide marketing resources or sales training to trade allies?

Data Tracking and Savings

27. Please tell us about program data tracking and reporting. How were rebate forms processed? (Probe: What systems did they use, how well did systems communicate, how did trade allies and other stakeholders submit information to the program?). Please describe for all delivery mechanisms (rebates, upstream, kits).

28. Did the data tracking systems in place meet your needs? Why or why not?

29. How were savings deemed for each program measure? How often were the unit energy savings values updated? [Cadmus will request unit energy saving calculators/assumptions during a follow-up data request]

Closing

30. Are there specific topics you are interested in learning more about from our evaluation this year?

31. For the purposes of our customer survey, what should we call the program? Will customers recognize Home Energy Savings, or should we use wattsmart/bewattsmart?

Thank you very much for your time today!

CADMUS

PacifiCorp Home Energy Savings Participant Survey

[UTILITY]

Washington: Pacific Power

Utah, Wyoming, and Idaho: Rocky Mountain Power

Audience: This survey is designed for PacifiCorp residential customers in Utah, Idaho, Washington, and Wyoming that applied for an incentive through the incentive application process in 2013 or 2014. The primary purpose of this survey is to collect information on measure installation, program awareness, motivations to participate, satisfaction, freeridership and spillover effects. This survey will be administered through telephone calls.

Quota: 204 completed surveys for each state (UT, ID, WA, and WY)

Topics	Researchable Questions	Survey Questions
Measure Verification	Did program measure(s) get installed in the household?	Section B
Program Awareness and Purchase Decisions	How did the customer learn about the program? Has the customer been to the wattsmart website (feedback)? Why did the customer purchase the program measure?	Section C
Measure Usage	How is the customer using certain common household appliances and equipment? What was replaced when the new measure was installed?	Section D
Satisfaction	How satisfied is the customer with the measure? With the contractor? With the incentive amount and time it took to receive it? With the overall application process? With the program overall?	Section E
Net-to-Gross	Self-reported freeridership and spillover batteries	Section F and G
Demographics	Customer household information for statistical purposes	Section H

- Interviewer instructions are in green.
- CATI programming instructions are in red.

[MEASURE]

["MEASURE TYPES" TO BE USED IN THE INTERVIEWER INSTRUCTIONS/SKIP PATTERN ARE INCLUDED IN GREEN FONT IN THE TABLE OF MEASURES]

Measure Name	Measure Type for Interviewer Instructions/ Skip Pattern
Air sealing	SEALING
Duct Sealing	SEALING
Duct Sealing and Insulation	SEALING
Ceiling Fan	OTHER
Central Air Conditioner	COOLING
Central Air Conditioner Best Practice Installation	SERVICE
Central Air Conditioner Proper Sizing	SERVICE
Clothes Washer	CLOTHES WASHER
Computer Monitor	OTHER
Desktop Computer	OTHER
Dishwasher	OTHER
Ductless Heat Pump	HEATING/COOLING
Evaporative Cooler	COOLING
Portable Evaporative Cooler	COOLING
Flat Panel TV	OTHER
Freezer	OTHER
Furnace	HEATING
Ground Source Heat Pump	HEATING/COOLING
Heat Pump	HEATING/COOLING
Heat Pump Service	SERVICE
Heat Pump Water Heater	OTHER
Light Fixture	LIGHTING
Refrigerator	OTHER
Room Air Conditioner	ROOM AC
Electric Water Heater	OTHER
Attic Insulation	INSULATION
Wall Insulation	INSULATION
Floor Insulation	INSULATION
Windows	WINDOWS

A. Introduction

A1. **[TO RESPONDENT]** Hello, I'm **[INSERT FIRST NAME]** I am calling from **[INSERT SURVEY FIRM]** on behalf of **[INSERT UTILITY].** We are exploring the impacts of energy efficiency programs offered in your area. I'm not selling anything; I just want to ask you some questions about your energy use and the impact of promotions that have been run by **[INSERT UTILITY]**.

Responses to Customer Questions [IF NEEDED]

(**Timing**: This survey should take about 15 minutes of your time. Is this a good time for us to speak with you?

(**Who are you with**: I'm with **[INSERT SURVEY FIRM]**, an independent research firm that has been hired by **[INSERT UTILITY]** to conduct this research. I am calling to learn about your experiences with the **[INSERT MEASURE]** that you received through **[INSERT UTILITY]**'s wattsmart Home Energy Savings program. [IF NEEDED] You may have received other equipment or benefits through **[INSERT UTILITY]**'s wattsmart Home Energy Savings program, however, we are interested in focusing on the **[INSERT MEASURE]** that you received.

(**Sales concern**: I am not selling anything; we would simply like to learn about your experience with the products you bought and received an incentive for through the program. Your responses will be kept confidential. If you would like to talk with someone from the wattsmart Home Energy Savings Program about this study, feel free to call 1-800-942-0266, or visit their website: http://www.homeenergysavings.net)

(**Who is doing this study: [INSERT UTILITY]**, your electric utility, is conducting evaluations of several of its efficiency programs, including the Home Energy Savings program.)

(**Why you are conducting this study:** Studies like this help **[INSERT UTILITY]** better understand customers' needs and interests in energy programs and services.)

A2. Our records show that in **[INSERT YEAR]** your household received an incentive from **[INSERT UTILITY]** for purchasing **[IF QUANTITY =1; "A OR AN"] [INSERT MEASURE NAME]** through the wattsmart Home Energy Savings program. We're talking with customers about their experiences with the incentive program. Are you the best person to talk with about this?

1. Yes
2. No, not available **[SCHEDULE CALLBACK]**
3. No, no such person **[THANK AND TERMINATE]**

98. Don't Know **[TRY TO REACH RIGHT PERSON; OTHERWISE TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A3. Were you the primary decision-maker when deciding to purchase the **[INSERT MEASURE](S)]**?

1. Yes
2. No **[REQUEST TO SPEAK TO THE PRIMARY DECISION MAKER, IF AVAILABLE START OVER, IF NOT, SCHEDULE TIME TO CALL BACK]**
98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A4. Have you, or anyone in your household, ever been employed by with **[INSERT UTILITY]** or any of its affiliates?

1. Yes **[THANK AND TERMINATE]**
2. No **[CONTINUE]**
98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

B. Measure Verification

Now I have a few questions to verify my records are correct.

[FOR SECTION B "MEASURE VERIFICATION, FOLLOW THE RULES BELOW TO DETERMINE WHICH QUESTIONS TO ASK BEFORE CONTINUING TO SECTION C:
IF MEASURE TYPE = SEALING OR SERVICE SKIP TO B7 AND ASK QUESTIONS B7 TO B8;
IF MEASURE TYPE = INSULATION OR WINDOWS SKIP TO B9 AND ASK QUESTIONS B9 TO B14;
ALL REMAINING MEASURE TYPES, CONTINUE TO B1 AND ASK QUESTIONS B1 TO B6]

B1. **[INSERT UTILITY]** records show that you applied for an incentive for **[IF MEASURE QUANTITY = 1 SAY "A"] [IF MEASURE QUANTITY >1 INSERT MEASURE QUANTITY] [INSERT MEASURE](S)** in **[YEAR OF PARTICIPATION]**. Is that correct? **[DO NOT READ RESPONSES]**

[IF NEEDED SAY: "WE KNOW YOU MAY HAVE APPLIED FOR OTHER INCENTIVES, BUT FOR THIS SURVEY, WE'D LIKE TO FOCUS ON JUST THIS ONE TYPE OF EQUIPMENT."]

1. Yes **[SKIP TO B4]**
2. No, quantity is incorrect **[CONTINUE TO B2]**
3. No, measure is incorrect **[SKIP TO B3]**
4. No, both quantity and measure are incorrect **[SKIP TO B3]**
98. Don't Know **[SKIP TO B3]**
99. Refused **[TERMINATE]**

B2. **[ASK IF B1 = 2]** For how many **[INSERT MEASURE](S)** did you apply for an incentive? **[NUMERIC OPEN ENDED. DOCUMENT AND USE AS QUANTITY FOR REMAINDER OF SURVEY]**

1. **[RECORD] [SKIP TO B4]**
98. Don't Know **[SKIP TO B4]**
99. Refused **[SKIP TO B4]**

B3. **[ASK IF B1 = 3 OR 4 OR 98]** Please tell me for what type of equipment you applied for an incentive? **[PROBE FOR MEASURE AND QUANTITY THEN SAY: "Thanks for your time, but unfortunately you do not qualify for this survey." THEN THANK AND TERMINATE]**

1. **[RECORD VERBATIM] [IF RESPONSE = SAME MEASURE, GO BACK TO B1]**
98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

B4. Did **[IF MEASURE QUANTITY >1 SAY "ALL OF"]** the **[INSERT MEASURE](S)** get installed in your home? **[DO NOT READ RESPONSES]**

1. Yes **[SKIP TO C1]**
2. No **[CONTINUE TO B5]**
98. Don't know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

[ASK B5 IF B4 = 2 AND MEASURE QUANTITY > 1 OTHERWISE SKIP TO B6]

B5. How many **[INSERT MEASURE](S)** were installed?

1. **[RECORD # 1-100] [CONTINUE TO B6]**
98. Don't Know **[CONTINUE TO B6]**
99. Refused **[CONTINUE TO B6]**

B6. **[ASK IF B4 = 2]** Why haven't you installed the **[INSERT MEASURE](S)** **[MULTIPLE RESPONSE UP TO 3; DO NOT READ, THEN SKIP TO C1]**

1. Failed or broken unit **[SKIP TO C1]**
2. Removed because did not like it **[SKIP TO C1]**
3. Have not had time to install it yet **[SKIP TO C1]**
4. In-storage **[SKIP TO C1]**
5. Back up equipment to install when other equipment fails **[SKIP TO C1]**
6. Have not hired a contractor to install it yet **[SKIP TO C1]**
7. Purchased more than was needed **[SKIP TO C1]**
8. Other **[RECORD]** **[SKIP TO C1]**

98. Don't Know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

B7. **[INSERT UTILITY]** records show that you applied for an incentive for **[INSERT MEASURE]** in **[YEAR OF PARTICIPATION]**. Is that correct? **[DO NOT READ RESPONSES]**

[IF NEEDED SAY: "WE KNOW YOU MAY HAVE APPLIED FOR OTHER INCENTIVES, BUT FOR THIS SURVEY, WE'D LIKE TO FOCUS ON JUST THIS ONE TYPE OF EQUIPMENT."]

1. Yes **[SKIP TO C1]**
2. No, measure is incorrect **[SKIP TO B8]**

98. Don't Know **[SKIP TO B8]**
99. Refused **[TERMINATE]**

B8. **[ASK IF B7 = 2 OR 98]** Please tell me for what type of equipment you applied for an incentive? **[PROBE FOR MEASURE AND QUANTITY THEN SAY: "Thanks for your time, but unfortunately you do not qualify for this survey." THEN THANK AND TERMINATE]**

1. **[RECORD VERBATIM]** **[IF RESPONSE =SAME MEASURE, GO BACK TO B7]**

98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

B9. **[INSERT UTILITY]** records show that you applied for an incentive for **[INSERT MEASURE QUANTITY]** square feet of **[INSERT MEASURE](S)** in **[YEAR OF PARTICIPATION]**. Is that correct? **[DO NOT READ RESPONSES; IF CORRECTED YEAR IS NOT 2013 OR 2014, THANK AND TERMINATE,]**

[IF NEEDED SAY: "WE KNOW YOU MAY HAVE APPLIED FOR OTHER INCENTIVES, BUT FOR THIS SURVEY, WE'D LIKE TO FOCUS ON JUST THIS ONE TYPE OF EQUIPMENT."]

1. Yes **[SKIP TO B12]**
2. No, quantity is incorrect **[CONTINUE TO B10]**
3. No, measure is incorrect **[SKIP TO B11]**
4. No, both quantity and measure are incorrect **[SKIP TO B11]**

98. Don't Know **[SKIP TO B11]**
99. Refused **[TERMINATE]**

B10. **[ASK IF B9 = 2]** How many square feet of **[INSERT MEASURE](S)** did you apply for an incentive? **[NUMERIC OPEN ENDED. DOCUMENT AND USE AS QUANTITY FOR REMAINDER OF SURVEY]**

1. **[RECORD] [SKIP TO B12]**

98. Don't Know **[SKIP TO B12]**
99. Refused **[SKIP TO B12]**

B11. **[ASK IF B9 = 3 OR 4 OR 98]** Please tell me for what type of equipment you applied for an incentive? **[PROBE FOR MEASURE AND QUANTITY THEN SAY: "Thanks for your time, but unfortunately you do not qualify for this survey." THEN THANK AND TERMINATE]**

1. **[RECORD VERBATIM] [IF RESPONSE = SAME MEASURE, GO BACK TO B9]**

98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

B12. Did all of the **[INSERT MEASURE QUANTITY]** square feet of **[INSERT MEASURE](S)** get installed in your home? **[DO NOT READ RESPONSES]**

1. Yes **[SKIP TO C1]**
2. No **[CONTINUE TO B13]**

98. Don't know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

B13. What percentage of the **[INSERT MEASURE](S)** was installed?

1. **[RECORD 0-100%] [CONTINUE TO B14]**

98. Don't Know **[CONTINUE TO B14]**
99. Refused **[CONTINUE TO B14]**

B14. Why haven't you had a chance to install all **[INSERT MEASURE QUANTITY]** square feet of **[INSERT MEASURE] (S)**? **[MULTIPLE RESPONSE UP TO 3; DO NOT READ, THEN SKIP TO C1]**

1. Failed or broken unit **[SKIP TO C1]**
2. Removed because did not like it **[SKIP TO C1]**
3. Have not had time to install it yet **[SKIP TO C1]**
4. In-storage **[SKIP TO C1]**
5. Back up equipment to install when other equipment fails **[SKIP TO C1]**
6. Have not hired a contractor to install it yet **[SKIP TO C1]**
7. Purchased more than was needed **[SKIP TO C1]**
8. Other **[RECORD]** **[SKIP TO C1]**

98. Don't Know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

C. Program Awareness & Purchase Decisions

C1. How did you first hear about **[INSERT UTILITY]**'s wattsmart Home Energy Savings program? **[DO NOT PROMPT. RECORD ONLY THE FIRST WAY HEARD ABOUT THE PROGRAM.]**

1. Bill Inserts
2. Billboard/outdoor ad
3. Family/friends/word-of-mouth
4. Home Energy Reports
5. Home Shows/Trade Shows (Home and Garden Shows)
6. Internet Advertising/Online Ad
7. Newspaper/Magazine/Print Media
8. Northwest Energy Efficiency Alliance (NEEA)
9. Other website
10. Radio
11. Retailer/Store
12. Rocky Mountain Power/Pacific Power Representative
13. Rocky Mountain Power/Pacific Power website
14. Social Media
15. Sporting event
16. TV
17. wattsmart Home Energy Savings website
18. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C2. **[ASK IF C1 <> 13 0R 17, OTHERWISE SKIP TO C3]** Have you been to the **[INSERT UTILITY]** wattsmart Home Energy Savings program website? **[DO NOT READ RESPONSES]**

1. Yes
2. No

C3. **[ASK IF C1 = 13 OR 17, OR IF C2 = 1, OTHERWISE SKIP TO C5]** Was the website… **[READ]**

1. Very helpful **[SKIP TO C5]**
2. Somewhat helpful
3. Somewhat unhelpful
4. Very unhelpful
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C4. **[ASK IF C3= 2, 3, OR 4. OTHERWISE SKIP TO C5]** What would make the website more helpful for you? **[DO NOT READ RESPONSES, MARK ALL THAT APPLY]**

1. Nothing, it is already very helpful for me.
2. Make the website easier to navigate or more user-friendly (clear hierarchy)
3. Make program information more clear and concise
4. Incorporate more visual information (charts, graphs, images) and less text
5. Provide easier access to customer service or FAQs
6. Other **[RECORD]**

C5. Please think back to the time when you were deciding to buy the energy saving **[INSERT MEASURE](S)**. What factors motivated you to purchase the **[INSERT MEASURE](S)? [DO NOT READ. INDICATE ALL THAT APPLY. ONCE THEY RESPONDENT HAS FINISHED, SAY: "ARE THERE ANY OTHER FACTORS?"]**

1. Old equipment didn't work
2. Old equipment working poorly
3. The program incentive
4. A program affiliated contractor
5. Wanted to save energy
6. Wanted to reduce energy costs
7. Environmental concerns
8. Recommendation from other utility **[PROBE: "WHAT UTILITY?" RECORD]**
9. Recommendation of dealer/retailer **[PROBE: "FROM WHICH STORE?" RECORD]**
10. Recommendation from friend, family member, or colleague
11. Recommendation from a contractor
12. Advertisement in newspaper **[PROBE: "FOR WHAT PROGRAM?" RECORD]**
13. Radio advertisement **[PROBE: "FOR WHAT PROGRAM?" RECORD]**
14. Health or medical reasons
15. Maintain or increase comfort of home
16. Interested in new/updated technology
17. Other **[RECORD]**
98. Don't Know
99. Refused

D. Measure Usage

[SAY "I HAVE SOME QUESTIONS ABOUT YOUR GENERAL HOUSEHOLD ENERGY USE AND COMMON HOUSEHOLD APPLIANCES"]

D1. **[IF MEASURE TYPE = CLOTHES WASHER, SKIP TO D2]** Do you have a clothes washer installed in your home?

1. Yes
2. No **[SKIP TO D9]**
98. Don't Know **[SKIP TO D9]**
99. Refused **[SKIP TO D9]**

D2. Approximately how many loads of clothes does your household wash in a typical week?

1. **[RECORD]**
98. Don't Know
99. Refused

D3. **[ASK IF MEASURE TYPE = CLOTHES WASHER, OTHERWISE SKIP TO D5]** How does the number of wash loads you do now compare to the number that you did with your old clothes washer? **[DO NOT READ RESPONSES]**

1. Same **[SKIP TO D5]**
2. Different **[CONTINUE TO D4]**
98. Don't Know **[SKIP TO D5]**
99. Refused **[SKIP TO D5]**

D4. **[ASK IF D3 = 2]**Do you do more or fewer loads now than you did before? Could you estimate a percentage?

1. More loads now, Record percentage **[MUST BE GREATER THAN 100%, EG 125% FOR 25% MORE]**
2. Fewer loads now, Record percentage **[MUST BE LESS THAN 100%, EG 75% FOR 25% LESS THAN BEFORE]**
98. Don't Know
99. Refused

D5. On what percentage of loads do you use a high-speed spin cycle? **[IF NEEDED: HIGH-SPEED SPIN CYCLES REMOVE MORE WATER FROM THE LOAD, RESULTING IN SHORTER DRYING TIMES]**

1. Never
2. LESS THAN 25%
3. 25-50%
4. 50-75%
5. 75-99%
6. Always or 100% **[SKIP TO D7]**
98. **[DO NOT READ]** Don't know **[SKIP TO D7]**
99. **[DO NOT READ]** Refused **[SKIP TO D7]**

D6. **[ASK IF D5 = 1-5]** When you do not use the high spin cycle, what is your reason? **[DO NOT READ. INDICATE ALL THAT APPLY]**

1. Noise/vibration
2. Impact on clothing
3. Always use high spin
4. Other **[RECORD]**
98. **[DO NOT READ]**Don't know
99. **[DO NOT READ]** Refused

D7. What percentage of your loads do you dry using a clothes dryer? **[READ CATEGORIES IF NEEDED]**

1. Never **[SKIP TO D9]**
2. LESS THAN 25%
3. 25-50%
4. 50-75%
5. 75- 99%
6. Always or 100%
98. Don't know **[SKIP TO D9]**
99. Refused **[SKIP TO D9]**

D8. When you dry your clothes do you… **[READ]**

1. Use a timer to determine drying times.
2. Use the dryer's moisture sensor to determine when the load is dry.
3. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't know
99. **[DO NOT READ]** Refused

D9. How many times a week do you use a dishwasher?

1. **[RECORD]**
2. Don't have a dishwasher
98. Don't Know
99. Refused

[IF MEASURE TYPE= HEATING SKIP TO D13 OR HEATING/COOLING SKIP TO D20]

D10. What type of heating system do you primarily use… **[READ]**

1. Furnace
2. Boiler
3. Air Source Heat Pump
4. Ground Source Heat Pump
5. Ductless Heat Pump
6. Stove
7. Baseboard
8. No heating system **[SKIP TO D13]**
9. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D11. How many years old is the heating system?

1. **[RECORD]**
98. Don't Know
99. Refused

D12. What type of fuel does the heating system use… **[READ]**

1. Gas
2. Electric
3. Oil
4. Propane
5. Coal
6. Wood
7. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D13. **[IF MEASURE TYPE= COOLING SKIP TO D23]** What type of cooling system do you primarily use **[IF MEASURE TYPE = ROOM AC THEN SAY "BESIDES THE ROOM AIR CONDITIONER"]**? A… **[READ, MULTIPLE CHOICES ALLOWED]**

1. Central Air Conditioner
2. Evaporative Cooler
3. Air Source Heat Pump
4. Ground Source Heat Pump
5. Ductless heat pump
6. Whole house fan
7. No central cooling system **[SKIP TO D15]**
8. Other **[SPECIFY]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D14. How many years old is your current cooling system?

1. **[RECORD]**

98. Don't Know
99. Refused

D15. **[ASK IF MEASURE TYPE = LIGHTING]** in which room(S) [is/are] the lighting fixture(s) installed? **[MULTIPLE RESPONSES ALLOWED]**

1. Living/family room
2. Bedroom
3. Unoccupied bedroom
4. Bathroom
5. Kitchen
6. Garage
7. Office
8. Attic
9. Closet/storage
10. Hallway
11. Exterior

98. Don't Know
99. Refused

[FOR QUESTIONS D16 - D24 USE THE FOLLOWING SKIP PATTERN
FOR MEASURE TYPES OTHER, CLOTHES WASHER, ROOM AC, AND LIGHTING: READ QUESTIONS D16 TO D17 THEN SKIP TO E1;
FOR MEASURE TYPE WINDOWS: READ QUESTIONS D18 AND D19 THEN SKIP TO E1;

FOR MEASURE TYPE HEATING: READ QUESTIONS D20 TO D22 THEN SKIP TO E1
FOR MEASURE TYPE COOLING: READ QUESTIONS D23 TO D24 THEN SKIP TO E1;
FOR MEASURE TYPE HEATING/COOLING: READ QUESTIONS D20 TO D24 THEN SKIP TO E1;
FOR MEASURE TYPES SEALING, INSULATION AND SERVICE: SKIP TO E1]

D16. Was the purchase of your new **[INSERT MEASURE](S)** intended to replace **[AN]** old **[INSERT MEASURE TYPE]**?

1. Yes **[CONTINUE TO D17]**
2. No **[SKIP TO E1]**
98. Don't Know **[SKIP TO E1]**
99. Refused **[SKIP TO E1]**

D17. **[ASK IF D16 = 1]** What did you do with the old **[INSERT MEASURE TYPE]** after you got your new **[INSERT MEASURE](S)**? **[READ CATEGORIES IF NEEDED]**

1. Sold or given away **[SKIP TO E1]**
2. Recycled **[SKIP TO E1]**
3. Installed in another location in the home **[SKIP TO E1]**
4. Still in home but permanently removed [stored in garage, etc.] **[SKIP TO E1]**
5. Thrown away **[SKIP TO E1]**
98. **[DO NOT READ]** Don't Know **[SKIP TO E1]**
99. **[DO NOT READ]** Refused **[SKIP TO E1]**

D18. **[ASK IF MEASURE TYPE= WINDOWS AND (B9 = 1 OR B13.1>0%). OTHERWISE SKIP TO E1]** What type of windows did you have before the new windows were installed?

1. Single pane **[OLDER WINDOWS]**
2. Double Pane **[NEWER WINDOWS]**
3. Triple Pane **[RARE]**
98. Don't Know
99. Refused

D19. **[ASK IF MEASURE = WINDOWS AND (B9= 1 OR B13.1>0%), OTHERWISE SKIP TO E1]** What type of window frames (not window trim, which is almost always wood) did you have before the new windows were installed?

1. Wood
2. Vinyl
3. Metal
98. Don't Know
99. Refused

[ASK D20 TO D22 IF MEASURE TYPE = HEATING OR HEATING/COOLING. OTHERWISE SKIP TO E1]

D20. What type of heating system did you have before the new **[INSERT MEASURE]** was installed?

1. Furnace
2. Boiler
3. Air Source Heat Pump
4. Ground Source Heat Pump
5. Ductless Heat Pump
6. Stove
7. Baseboard
8. No heating system before **[SKIP TO E1]**
9. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D21. How many years old was the previous heating system?

1. **[RECORD]**
98. Don't Know
99. Refused

D22. What type of fuel does the new heating system use**… [READ]**

1. Gas
2. Electric
3. Oil
4. Propane
5. Coal
6. Wood
7. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. [do not read] Refused

[ASK D23 TO D24 IF MEASURE TYPE = COOLING OR HEATING/COOLING]

D23. What type of cooling system did you have before the new **[INSERT MEASURE]** was installed? **[READ]**

1. Central Air Conditioner
2. Room Air Conditioner
3. Evaporative Cooler
4. Air Source Heat Pump
5. Ground Source Heat Pump
6. Ductless Heat Pump
7. Whole house fan
8. No cooling system before **[SKIP TO E1]**
9. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D24. How many years old was the previous cooling system?

1. **[RECORD]**
98. Don't Know
99. Refused

E. Satisfaction

E1. Overall, how satisfied are you with your **[INSERT MEASURE](S)** Would you say you are…? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E2. Did a contractor install the **[INSERT MEASURE](S)** for you?

1. Yes
2. No
98. Don't Know
99. Refused

E3. **[ASK IF E2=1]** How satisfied were you with the contractor that installed the **[INSERT MEASURE](S)** for you? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E4. **[IF E3 = 3 OR 4]** Why were you not satisfied with the contractor that installed the **[INSERT MEASURE](S)**?

1. **[RECORD]**
98. Don't know
99. Refused

E5. How easy did you find filling out the wattsmart Home Energy Savings Program incentive application? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Easy
2. Somewhat Easy
3. Not Very Easy **[PROBE FOR REASON AND RECORD]**
4. Not At All Easy **[PROBE FOR REASON AND RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E6. How satisfied were you with the amount of the incentive you received for the **[INSERT MEASURE](S)?**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
98. Don't Know
99. Refused

E7. After you submitted the incentive application for the **[INSERT MEASURE](S)**, how long did it take to receive the incentive check from **[INSERT UTILITY]**? Was it… **[READ CATEGORIES IF NEEDED, RECORD ONLY FIRST RESPONSE]**

1. Less than 4 weeks
2. Between 4 and 6 weeks
3. Between 7 and 8 weeks
4. More than 8 weeks
5. Have not received the incentive yet
98. **[DO NOT READ]** Don't Know **[SKIP TO E9]**
99. **[DO NOT READ]** Refused **[SKIP TO E9]**

E8. **[ASK IF E7<> 5]** Were you satisfied with how long it took to receive the incentive?

1. Yes
2. No **[PROBE FOR REASON AND RECORD]**
98. Don't Know
99. Refused

E9. How satisfied were you with the entire application process?

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**

E10. Overall, how satisfied are you with the wattsmart Home Energy Savings program? **[READ CATEGORIES; RECORD ONLY FIRST RESPONSE]**

1. Very Satisfied **[PROBE FOR REASON AND RECORD]**
2. Somewhat Satisfied **[PROBE FOR REASON AND RECORD]**
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E11. Did your participation in **[INSERT UTILITY]**'s wattsmart Home Energy Savings Program cause your satisfaction with **[INSERT UTILITY]** to…

1. Increase
2. Stay the same
3. Decrease
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F. Freeridership

Now I'd like to talk with you a little more about the **[INSERT MEASURE](S)** you purchased.

F1. When you first heard about the incentive from **[INSERT UTILITY]**, had you already been planning to purchase the **[INSERT MEASURE](S)**?

1. Yes
2. No **[SKIP TO F4]**
98. Don't Know **[SKIP TO F4]**
99. Refused **[SKIP TO F4]**

F2. Ok. Had you already purchased or installed the new **[INSERT MEASURE](S)** before you learned about the incentive from the wattsmart Program?

1. Yes
2. No **[SKIP TO F4]**
98. Don't Know **[SKIP TO F4]**
99. Refused **[SKIP TO F4]**

F3. Just to confirm, you learned about the **[INSERT UTILITY]** rebate program after you had already purchased or installed the **[INSERT MEASURE](S)** ?

1. Yes **[SKIP TO F13]**
2. No
98. Don't Know
99. Refused

[IF F3= 1 SKIP TO F13]

F4. Would you have purchased the same **[INSERT MEASURE](S)** without the incentive from the wattsmart Home Energy Savings program?

1. Yes **[SKIP TO F6]**
2. No
98. Don't Know
99. Refused

[IF F4 = 1 THEN SKIP TO F6]

F5. **[ASK IF F4 = 2, -98 OR -99]** Help me understand, would you have purchased something without the wattsmart Home Energy Savings program incentive? **[DO NOT READ RESPONSES]**

1. Yes, I would have purchased something
2. No, I would not have purchased anything **[SKIP TO F9]**
98. Don't Know **[SKIP TO F13]**
99. Refused **[SKIP TO F13]**

[IF F5 = 2 SKIP TO F9. IF F5 = -98 OR -99 SKIP TO F13]

F6. **[ASK IF F4= 1 OR F5 = 1]** Let me make sure I understand. When you say you would have purchased **[A] [MEASURE](S)** without the program incentive, would you have purchased **[A] [INSERT MEASURE](S)] THAT [WAS/WERE] JUST AS ENERGY EFFICIENT"**?

1. Yes
2. No
98. Don't Know
99. Refused

F7. **[ASK IF F4= 1 OR F5 = 1 AND MEASURE QUANTITY >1]** Without the program incentive would you have purchased the same amount of **[INSERT MEASURE](S)**?

1. Yes, I would have purchased the same amount
2. No, I would have purchased less
98. Don't Know
99. Refused

F8. **[ASK IF F4= 1 OR F5 = 1]** Without the program incentive would you have purchased the **[INSERT MEASURE](S)… [READ]**

1. At the same time
2. Within one year?
3. In more than one year?
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

[SKIP TO F13]

F9. **[ASK IF F5=2]** To confirm, when you say you would not have purchased the same **[INSERT MEASURE](S)** without the program incentive**,** do you mean you would not have purchased the **[INSERT MEASURE](S)** <u>at all</u>?

1. Yes
2. No
98. Don't Know
99. Refused

[IF F9 = 1 SKIP TO F13]

F10. **[ASK IF F9 = 2, -98, -99]** Again, help me understand. Without the program incentive, would you have purchased the same type of **[INSERT MEASURE](S)** but **[A] [[INSERT MEASURE](S)] THAT [WAS/WERE] NOT AS ENERGY EFFICIENT?**

1. Yes
2. No
98. Don't Know
99. Refused

F11. **[ASK IF F9= 2, -98, -99 AND QTY MEASURE>1]** Without the program incentive would you have purchased the same amount of **[INSERT MEASURE](S)**?

1. Yes, I would purchase the same amount
2. No, I would have purchased less
98. Don't Know
99. Refused

F12. **[ASK IF F9 = 2, -98, -99]**And, would you have purchased the **[INSERT MEASURE](S)… [READ]**

1. At the same time
2. Within one years?
3. In more than one year?
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F13. In your own words, please tell me the influence the Home Energy Saving incentive had on your decision to purchase **[INSERT MEASURE](S)?**

1. _____ **[RECORD RESPONSE]**

G. Spillover

G1. Since participating in the program, have you added any other energy efficient equipment or services in your home that were not incentivized through the wattsmart Home Energy Savings Program?

1. Yes
2. No
98. Don't Know
99. Refused

[IF G1 = 2, -98 OR -99 SKIP TO H1]

G2. What high-efficiency energy-saving equipment or services have you purchased since applying for the incentive, not including the **[INSERT MEASURE]** that we have been discussing today? **[LIST OF OTHER ELIGIBLE APPLIANCES AND MEASURES OTHER THAN THOSE LISTED IN PROGRAM RECORDS. PROMPT IF NEEDED]**

1. Clothes Washer **[RECORD QUANTITY]**
2. Refrigerator **[RECORD QUANTITY]**
3. Dishwasher **[RECORD QUANTITY]**
4. Windows **[RECORD QUANTITY IN SQ FT]**
5. Fixtures **[RECORD QUANTITY]**
6. Heat Pump **[RECORD QUANTITY]**
7. Central Air Conditioner **[RECORD QUANTITY]**
8. Room Air Conditioner **[RECORD QUANTITY]**
9. Ceiling Fans **[RECORD QUANTITY]**
10. Electric Storage Water Heater **[RECORD QUANTITY]**
11. Electric Heat Pump Water Heater **[RECORD QUANTITY]**
12. CFLs **[RECORD QUANTITY]**
13. LEDs **[RECORD QUANTITY]**
14. Insulation **[RECORD QUANTITY IN SQ FT]**
15. Air Sealing **[RECORD QUANTITY IN CFM REDUCTION]**
16. Duct Sealing **[RECORD QUANTITY IN CFM REDUCTION]**
17. Programmable thermostat **[RECORD QUANTITY]**
18. Other **[RECORD]** **[RECORD QUANTITY]**
19. None
98. Don't Know
99. Refused

[IF G2 = 12 (ONLY), -98 OR -99 SKIP TO H1. REPEAT G3 THROUGH G5 FOR ALL RESPONSES TO G2]

G3. In what year did you purchase **[INSERT MEASURE TYPE FROM G2]**?

1. 2013
2. 2014
3. Other **[RECORD YEAR]**
98. Don't Know
99. Refused

G4. Did you receive an incentive for **[INSERT MEASURE TYPE FROM G2]?**

1. Yes **[PROBE AND RECORD]**
2. No
98. Don't Know
99. Refused

G5. How influential would you say the wattsmart Home Energy Savings program was in your decision to add the **[INSERT MEASURE FROM G2]** to your home? Was it… **[REPEAT FOR EACH MEASURE LISTED IN G2]**

1. Highly Influential
2. Somewhat Influential
3. Not very influential
4. Not at all influential
98. Don't Know
99. Refused

H. Demographics

I have just a few more questions about your household. Again, all your answers will be strictly confidential.

H1. Which of the following best describes your house? **[READ LIST]:**

1. Single-family home
2. Townhouse or duplex
3. Mobile home or trailer
4. Apartment building with 4 or more units
5. Other **[RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** refused

H2. Do you rent or own your home?

1. Own
2. Rent
3. Other **[RECORD]**
98. Don't Know
99. Refused

H3. Including yourself and any children, how many people currently live in your home?

1. **[RECORD]**
98. Don't Know
99. Refused

H4. About when was this building first built? **[READ LIST IF NEEDED]**

1. Before 1970's
2. 1970's
3. 1980's
4. 1990-94
5. 1995-99
6. 2000-2004
7. 2005-2009
8. 2010 +
9. OTHER **[RECORD]**
98. **[DO NOT READ]** don't know
99. **[DO NOT READ]** refused

H5. What type of foundation does your home have? **[READ LIST IF NEEDED]**

1. Full finished basement
2. Unfinished Basement
3. Crawlspace
4. Slab on Grade
5. OTHER **[RECORD]**
98. **[DO NOT READ]** don't know
99. **[DO NOT READ]** refused

H6. Approximately how many square feet is the home in which the **[INSERT MEASURE](S)** was installed or purchased for? **[READ LIST IF NEEDED]**

1. Under 1,000 square feet
2. 1,000 – 1,500 square feet
3. 1,501 – 2,000 square feet
4. 2,001 – 2,500 square feet
5. Over 2,500 square feet
98. **[DO NOT READ]** don't know
99. **[DO NOT READ]** refused

H7. **[SKIP IF MEASURE = ELECTRIC WATER HEATER OR HEAT PUMP WATER HEATER]** What is the fuel used by your primary water heater?

1. Electricity
2. Natural gas
3. Fuel oil
4. Other **[RECORD]**
98. Don't know
99. refused

I. Conclusion

I1. That concludes the survey. Do you have any additional feedback or comments?

1. Yes **[RECORD VERBATIM]**
2. No
98. Don't know
99. refused

Thank you very much for your time and feedback. Have a great day.

CADMUS

PacifiCorp HES Upstream Lighting Survey

Audience: This survey is designed for PacifiCorp residential customers in Utah, Idaho, Washington, Wyoming and California (pending). The primary purpose of this survey is to collect information on awareness, satisfaction, installation of energy efficient lighting and energy efficient equipment purchases and motivations. This survey will be administered through telephone calls.

Quota: 250 completed surveys for each state (UT, ID, WA, WY and CA [pending])

Topics	Researchable Questions	Survey Questions
Awareness	Are respondents aware of CFL and LED lighting products?	B1, B2, C1
Installation	What percent of CFLs and LEDs purchased in the past 12 months were installed in the home? Where were the purchased CFLs and LEDs installed (room)?	B4, B9, C3, C8
Disposal and Storage	What percent of CFLs/LEDs purchased in the past 12 months were removed and why? What percent of CFLs/LEDs purchased in the past 12 months are in storage for future use?	**Error! Reference source not found.**-B12, C9-C11
Satisfaction with CFLs and LEDs	How satisfied are residents with their CFLs and LEDs? What do they like or dislike about them?	B8, B15, B16, C7, C14, C15
PacifiCorp Programs	Are respondents aware of the PacifiCorp programs? How did they hear about them? Have respondents visited the Home Energy Savings Website?	Section D
Participant Decisions	What actions are residents taking to save energy? Did they receive a rebate from PacifiCorp during the 2013-2014 program period? How influential were the PacifiCorp programs in their decision to install the equipment?	Section E
Demographics	How do awareness /activities/behaviors vary by demographic characteristics?	Section F

- Interviewer instructions are in green.
- CATI programming instructions are in red.

[UTILITY]

Washington and California: Pacific Power

Utah, Wyoming, and Idaho: Rocky Mountain Power

A. Introduction

A1. **[TO RESPONDENT]** Hello, I'm **[INSERT FIRST NAME]**, calling from **[INSERT SURVEY FIRM],** on behalf of **[UTILITY]**. May I please speak with **[INSERT NAME]**?

Hello, we are conducting a survey about household lighting and home energy use and would like to ask you some questions about your household's lighting and energy use. We would greatly appreciate your opinions.

[IF NOT AVAILABLE, ASK FOR AN ADULT IN THE HOUSEHOLD WHO IS RESPONSIBLE FOR PURCHASING THE LIGHT BULBS. IF NO ONE APPROPRIATE IS AVAILABLE, TRY TO RESCHEDULE AND THEN TERMINATE. IF TRANSFERRED TO ANOTHER PERSON, REPEAT INTRO AND THEN CONTINUE.]

Responses to Customer Questions [IF NEEDED]

(**Timing:** This survey should take about 10 to 15 minutes of your time. Is this a good time for us to speak with you?)

(**Who are you with**: I'm with **[INSERT SURVEY FIRM]**, an independent research firm that has been hired by **[UTILITY]** to conduct this research. I am calling to learn about your household lighting and home energy use)

(**Sales concern:** I am not selling anything; we would simply like to learn about your household lighting and home energy use. Your responses will be kept confidential. If you would like to talk with someone from the Home Energy Savings Program about this study, feel free to call 1-800-942-0266, or visit their website: http://www.homeenergysavings.net/.)

(**Who is doing this study: [INSERT UTILITY]**, your electric utility, is conducting evaluations of several of its efficiency programs.)

(**Why are you conducting this study:** Studies like this help **[INSERT UTILITY]** better understand customers' need and interest in energy programs and services.)

A2. This call may be monitored for quality assurance. First, are you the person who usually purchases light bulbs for your household?

1. Yes
2. No, but person who does can come to phone **[START OVER AT INTRO SCREEN WITH NEW RESPONDENT]**
3. No, and the person who does is not available **[SCHEDULE CALLBACK]**

98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A3. Have you, or anyone in your household, ever been employed by or affiliated with **[INSERT UTILITY]** or any of its affiliates?

1. Yes **[THANK AND TERMINATE]**
2. No **[CONTINUE]**
98. Don't Know **[CONTINUE]**
99. Refused **[THANK AND TERMINATE]**

B. CFL Awareness and Purchases

B1. Before this call today, had you ever heard of a type of energy-efficient light bulb called a "compact fluorescent light bulb", or CFL, for short?

1. Yes **[SKIP TO B3]**
2. No

B2. CFLs usually do not look like traditional incandescent light bulbs. The most common type of CFL has a spiral shape, resembling soft-serve ice cream, and it fits in a regular light bulb socket. Before today, had you heard of CFLs?

1. Yes
2. No **[SKIP TO C1]**

B3. I have some questions about your lighting purchases during the last twelve months. Did you purchase any CFLs in the last twelve months?

1. Yes
2. No **[SKIP TO C1]**
98. Don't Know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

B4. During the last twelve months, how many *CFLs* did you or your household purchase? Please try to estimate the total number of *individual CFL bulbs*, as opposed to packages. **[IF "DON'T KNOW," PROBE: "IS IT LESS THAN OR MORE THAN FIVE BULBS?" WORK FROM THERE TO GET AN ESTIMATE]**

1. **[RECORD # OF CFLS: NUMERIC OPEN END] [IF QUANTITY=0, SKIP TO C1]**
98. Don't Know **[PROBE: "IS IT LESS THAN OR MORE THAN FIVE BULBS?" WORK FROM THERE TO GET AN ESTIMATE] [IF UNABLE TO GET AN ANSWER, SKIP TO C1]**
99. Refused **[SKIP TO C1]**

B5. Where did you purchased the **[B4.1]** CFLs? **[PROBE FOR RETAIL CHAINS OR ONLINE] [DO NOT READ, MULTIPLE REPSONSES ALLOWED]**

1. Ace Hardware **[CITY, STATE, # PURCHASED]**
2. Broulim's Fresh Foods **[CITY, STATE, # PURCHASED]**
3. Barrett's Foodtown **[CITY, STATE, # PURCHASED]**
4. Batteries Plus **[CITY, STATE, # PURCHASED]**
5. Bi-Mart **[CITY, STATE, # PURCHASED]**
6. Big Lots **[CITY, STATE, # PURCHASED]**
7. Corner Grocery & Hardware **[CITY, STATE, # PURCHASED]**
8. Costco **[CITY, STATE, # PURCHASED]**
9. Delta Jubilee Foods **[CITY, STATE, # PURCHASED]**
10. Do It Best **[CITY, STATE, # PURCHASED]**
11. Dollar Tree **[CITY, STATE, # PURCHASED]**
12. Family Dollar **[CITY, STATE, # PURCHASED]**
13. Fresh Markets **[CITY, STATE, # PURCHASED]**
14. Kamas Foodtown **[CITY, STATE, # PURCHASED]**
15. Kroger – Fred Meyer **[CITY, STATE, # PURCHASED]**
16. Griffith Foodtown **[CITY, STATE, # PURCHASED]**
17. Gunnison Market **[CITY, STATE, # PURCHASED]**
18. Hess Lumber Co **[CITY, STATE, # PURCHASED]**
19. Habitat for Humanity **[CITY, STATE, # PURCHASED]**
20. Harmons **[CITY, STATE, # PURCHASED]**
21. Lowe's **[CITY, STATE, # PURCHASED]**
22. Menards **[CITY, STATE, # PURCHASED]**
23. Petersons Fresh Market **[CITY, STATE, # PURCHASED]**
24. Rancho Markets **[CITY, STATE, # PURCHASED]**
25. Ream's Foods **[CITY, STATE, # PURCHASED]**
26. Ridley's **[CITY, STATE, # PURCHASED]**
27. Safeway **[CITY, STATE, # PURCHASED]**
28. Sam's Club **[CITY, STATE, # PURCHASED]**
29. Smith's **[CITY, STATE, # PURCHASED]**
30. Stokes Market Place **[CITY, STATE, # PURCHASED]**
31. Sutherlands **[CITY, STATE, # PURCHASED]**
32. Thomas Market **[CITY, STATE, # PURCHASED]**
33. Target **[CITY, STATE, # PURCHASED]**
34. Home Depot **[CITY, STATE, # PURCHASED]**
35. The Market **[CITY, STATE, # PURCHASED]**
36. True Value Hardware **[CITY, STATE, # PURCHASED]**
37. Walgreens **[CITY, STATE, # PURCHASED]**
38. Walmart **[CITY, STATE, # PURCHASED]**

39. Winegar's Supermarkets **[CITY, STATE, # PURCHASED]**
40. Online **[WEBSITE, # PURCHASED]**
98. Other **[RECORD STORE NAME, CITY, STATE, # PURCHASED]**
98. Don't Know
99. Refused

B6. Do you recall if any of the **[B4.1]** CFLs you purchased part of a **[INSERT UTILTY]** sponsored sale?

1. Yes
2. No
98. Don't Know
99. Refused

B7. **[ASK IF B6 = 1, OTHERWISE SKIP TO B8]** Did the **[INSERT UTILTY]** discount influence your decision to purchase CFLs over another type of bulb?

1. Yes
2. No
98. Don't Know
99. Refused

B8. What **[IF B7=1 SAY "OTHER"]** factors were important for your decision to buy CFLs over other types of bulbs? **[DO NOT READ. MULTIPLE RESPONSES ALLOWED]**

1. Energy savings
2. Cost savings on electricity bill
3. Price of bulb
4. Environmental concerns
5. Quality of light
6. Lifetime of bulb
7. Other **[RECORD]**
98. Don't Know
99. Refused

B9. Now I'd like to ask you a few questions about the **[B4.1]** CFLs you purchased in the last twelve months. How many did you install in your home since you purchased them?

1. **[RECORD # OF CFLS]**
2. None **[SKIP TO B12]**
98. Don't Know **[SKIP TO B15]**
99. Refused **[SKIP TO B15]**

B10. Have you since removed any of those CFL bulbs from the sockets?

1. Yes **[ASK "HOW MANY DID YOU REMOVE?" RECORD # OF CFLS]**
2. No **[SKIP TO B12]**
98. Don't Know
99. Refused

B11. What were the reasons you removed the **[B10.1]** purchased CFLs from the sockets? **[QUANTITIES SHOULD ADD TO B10.1, IF NOT, ASK "WHAT ABOUT THE REMAINING BULBS YOU REMOVED?] [DO NOT READ, MULTIPLE RESPONSES ALLOWED]**

1. Bulb burned out **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
2. Bulbs were too bright **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
3. Bulbs were not bright enough **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
4. Delay in light coming on **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
5. Did not work with dimmer/3-way switch **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
6. Didn't fit properly **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
7. Stuck out of fixture **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
8. Light color **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
9. Concerned about mercury **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
10. Replaced with LEDs for better efficiency **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
11. Other **[RECORD VERBATIM] [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF CFLS]**
98. Don't Know
99. Refused

B12. Are any of the **[B4.1]** CFLs you purchased in the last twelve months currently in storage for later use?

1. Yes **[ASK: "HOW MANY ARE NOW IN STORAGE?" RECORD # OF CFLS]**
2. No
98. Don't Know
99. Refused

B13. **[SKIP TO C1 IF B9= 2, 98 OR 99]** Of the **[B9.1]** bulbs that you installed in your home that were purchased during the last twelve months, can you tell me how many CFLs were installed in each room in your house?

1. Bedroom **[RECORD]**
2. Bedroom (unoccupied) **[RECORD]**
3. Basement **[RECORD]**
4. Bathroom **[RECORD]**
5. Closet **[RECORD]**
6. Dining **[RECORD]**
7. Foyer **[RECORD]**
8. Garage **[RECORD]**
9. Hallway **[RECORD]**
10. Kitchen **[RECORD]**
11. Office/Den **[RECORD]**
12. Living Space **[RECORD]**
13. Storage **[RECORD]**
14. Outdoor **[RECORD]**
15. Utility **[RECORD]**
16. Other **[RECORD VERBATIM]**

98. Don't Know
99. Refused

B14. **[ASK ONLY IF TOTAL BULBS IN B13 <QUANTITY FROM B9.1 (IF TOTAL NUMBER OF BULBS LISTED IN EACH ROOM DOES NOT MATCH THE NUMBER OF BULBS INSTALLED STATED IN B9.1, OTHERWISE SKIP TO B15]** Thanks, that accounts for **[TOTAL BULBS IN B13]** of the total quantity that were installed in your home. Can you tell me where the **[B9.1 MINUS TOTAL BULBS IN B13]** other bulbs were installed?

1. **[RECORD VERBATIM]**

98. Don't Know
99. Refused

B15. How satisfied are you with the compact fluorescent light bulb(s) that you purchased during the last twelve months? Would you say you are… **[READ]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B16. **[ASK ONLY IF B15 = 3 OR 4]** Why would you say you are **[INSERT ANSWER FROM B15]** with CFLs? **[DO NOT READ LIST AND RECORD ALL THAT APPLY]**

1. Bulb burned out
2. Bulbs are too bright
3. Bulbs are not bright enough
4. Delay in light coming on
5. Did not work with dimmer/3-way switch
6. Didn't fit properly
7. Stuck out of fixture
8. Light color
9. Too expensive
10. Concerned about mercury
11. Replaced with LEDs for better efficiency
12. Other **[RECORD VERBATIM]**
98. Don't Know
99. Refused

C. LED Awareness and Purchases

C1. Another type of light bulb that is used in homes is called a light emitting diode or L-E-D **[SAY THE LETTERS L-E-D]**. These bulbs have regular screw bases that fit into most household sockets. **[IF NEEDED: LEDS HAVE HISTORICALLY BEEN USED FOR NIGHTLIGHTS, FLASHLIGHTS, AND HOLIDAY LIGHTS. HOWEVER, WE ARE NOT ASKING ABOUT THESE TYPES OF LEDS.]**. Before today, had you heard of LEDs that can be used in regular, screw based light sockets?

1. Yes
2. No **[IF ALSO B2= 2 THANK AND TERMINATE, OTHERWISE CONTINUE]**

C2. Did you purchase any LEDs in the last twelve months?

1. Yes
2. No **[THANK AND TERMINATE IF B2= 2, B3=2, OR B4.1 = 0, OTHERWISE SKIP TO SECTION D]**
98. Don't Know **[THANK AND TERMINATE IF B2= 2, B3=2, OR B4.1 = 0, OTHERWISE SKIP TO SECTION D]**
99. Refused **[THANK AND TERMINATE IF B2= 2, B3=2, OR B4.1 = 0, OTHERWISE SKIP TO SECTION D]**

C3. In the last 12 months, how many screw base *LEDs* did you or your household purchase? Please try to estimate the total number of *individual LED bulbs*, as opposed to packages. **[IF "DON'T KNOW," PROBE: "IS IT LESS THAN OR MORE THAN FIVE BULBS?" WORK FROM THERE TO GET AN ESTIMATE]**

[NUMERIC OPEN END: RECORD NUMBER OF LEDS, NOT A RANGE.] [IF QUANTITY=0 AND (IF B2= 2, B3=2, OR B4.1 = 0) THANK AND TERMINATE, OTHERWISE IF QUANTITY = 0 SKIP TO SECTION D]

1. **[RECORD # OF LEDS]**
98. Don't Know **[PROBE FOR ESTIMATES; IF UNABLE TO GET AN ANSWER, SKIP TO D1]**
99. Refused **[SKIP TO D1]**

C4. Where did you purchased the **[C3.1]** LEDs? **[PROBE FOR RETAIL CHAINS OR ONLINE] [DO NOT READ, MULTIPLE REPSONSES ALLOWED]**

1. Ace Hardware **[CITY, STATE, # PURCHASED]**
2. Broulim's Fresh Foods **[CITY, STATE, # PURCHASED]**
3. Barrett's Foodtown **[CITY, STATE, # PURCHASED]**
4. Batteries Plus **[CITY, STATE, # PURCHASED]**
5. Bi-Mart **[CITY, STATE, # PURCHASED]**
6. Big Lots **[CITY, STATE, # PURCHASED]**
7. Corner Grocery & Hardware **[CITY, STATE, # PURCHASED]**
8. Costco **[CITY, STATE, # PURCHASED]**
9. Delta Jubilee Foods **[CITY, STATE, # PURCHASED]**
10. Do It Best **[CITY, STATE, # PURCHASED]**
11. Dollar Tree **[CITY, STATE, # PURCHASED]**
12. Family Dollar **[CITY, STATE, # PURCHASED]**
13. Fresh Markets **[CITY, STATE, # PURCHASED]**
14. Kamas Foodtown **[CITY, STATE, # PURCHASED]**
15. Kroger – Fred Meyer **[CITY, STATE, # PURCHASED]**
16. Griffith Foodtown **[CITY, STATE, # PURCHASED]**
17. Gunnison Market **[CITY, STATE, # PURCHASED]**
18. Hess Lumber Co **[CITY, STATE, # PURCHASED]**
19. Habitat for Humanity **[CITY, STATE, # PURCHASED]**
20. Harmons **[CITY, STATE, # PURCHASED]**
21. Lowe's **[CITY, STATE, # PURCHASED]**
22. Menards **[CITY, STATE, # PURCHASED]**
23. Petersons Fresh Market **[CITY, STATE, # PURCHASED]**
24. Rancho Markets **[CITY, STATE, # PURCHASED]**
25. Ream's Foods **[CITY, STATE, # PURCHASED]**
26. Ridley's **[CITY, STATE, # PURCHASED]**
27. Safeway **[CITY, STATE, # PURCHASED]**
28. Sam's Club **[CITY, STATE, # PURCHASED]**
29. Smith's **[CITY, STATE, # PURCHASED]**
30. Stokes Market Place **[CITY, STATE, # PURCHASED]**
31. Sutherlands **[CITY, STATE, # PURCHASED]**
32. Thomas Market **[CITY, STATE, # PURCHASED]**
33. Target **[CITY, STATE, # PURCHASED]**
34. Home Depot **[CITY, STATE, # PURCHASED]**
35. The Market **[CITY, STATE, # PURCHASED]**
36. True Value Hardware **[CITY, STATE, # PURCHASED]**
37. Walgreens **[CITY, STATE, # PURCHASED]**
38. Walmart **[CITY, STATE, # PURCHASED]**

39. Winegar's Supermarkets **[CITY, STATE, # PURCHASED]**
40. Online **[WEBSITE, # PURCHASED]**
98. Other **[RECORD STORE NAME, CITY, STATE, # PURCHASED]**
98. Don't Know

C5. RefusedWere any of the **[C3.1]** LEDs you purchased part of a **[INSERT UTILTY]** sponsored sale?

1. Yes
2. No
98. Don't Know
99. Refused

C6. **[ASK IF C5 = 1, OTHERWISE SKIP TO C7]** Did the **[INSERT UTILTY]** discount influence your decision to purchase LEDs over another type of bulb?

1. Yes
2. No
98. Don't Know
99. Refused

C7. What **[IF C6=1 SAY "OTHER"]** factors were important for your decision to buy LEDs over other types of bulbs? **[DO NOT READ. MULTIPLE RESPONSES ALLOWED]**

1. Energy savings
2. Cost savings on electricity bill
3. Price of bulb
4. Environmental concerns
5. CFL disposal concerns
6. Quality of light
7. Lifetime of bulb
8. Interested in the latest technology
9. Other **[RECORD]**
98. Don't Know
99. Refused

C8. Now I'd like to ask you a few questions about the **[C3.1]** LED(s) you acquired in the last twelve months. How many did you install in your home since you purchased them?

1. **[RECORD # OF LEDS]**
2. None **[SKIP TO C11]**
98. Don't Know **[SKIP TO D1]**
99. Refused **[SKIP TO D1]**

C9. Have you since removed any of those LED bulbs from the sockets?

1. **YES [ASK "HOW MANY DID YOU REMOVED?" RECORD # OF LEDS]**
2. No **[SKIP TO C11]**
98. Don't Know **[SKIP TO C11]**
99. Refused **[SKIP TO C11]**

C10. What were the reasons you removed the **[C9.1]** purchased LEDs from the sockets? **[QUANTITIES SHOULD ADD TO B10.1, IF NOT, ASK "WHAT ABOUT THE REMAINING BULBS YOU REMOVED?] [DO NOT READ, MULTIPLE RESPONSES ALLOWED]**

1. Bulb burned out **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
2. Bulbs were too bright **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
3. Bulbs were not bright enough **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
4. Delay in light coming on **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
5. Did not work with dimmer/3-way switch **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
6. Didn't fit properly **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
7. Stuck out of fixture **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
8. Light color **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
9. Light is too pointed/narrow **[RECORD VERBATIM] [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
10. Other **[RECORD VERBATIM] [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF LEDS]**
98. Don't Know
99. Refused

C11. Are any of the **[C3.1]** LEDs you purchased in the last twelve months currently in storage for later use?

1. Yes **[ASK: "HOW MANY ARE NOW IN STORAGE?" RECORD # OF LEDS]**
2. No
98. Don't Know
99. Refused

C12. **[SKIP TO C14 IF C8= 2, 99, OR 98]** Of the **[C8.1]** bulbs that are currently installed in your home that were purchased during the last twelve months, can you tell me how many LEDs are installed in each room in your house?

1. Bedroom **[RECORD]**
2. Bedroom (unoccupied) **[RECORD]**
3. Basement **[RECORD]**
4. Bathroom **[RECORD]**
5. Closet **[RECORD]**
6. Dining **[RECORD]**
7. Foyer **[RECORD]**
8. Garage **[RECORD]**
9. Hallway **[RECORD]**
10. Kitchen **[RECORD]**
11. Office/Den **[RECORD]**
12. Living Space **[RECORD]**
13. Storage **[RECORD]**
14. Outdoor **[RECORD]**
15. Utility **[RECORD]**
16. Other **[RECORD VERBATIM]**
98. Don't Know
99. Refused

C13. **[ASK ONLY IF TOTAL BULBS IN C12<C8.1 (IF TOTAL NUMBER OF BULBS LISTED IN EACH ROOM DOES NOT MATCH THE NUMBER OF BULBS INSTALLED STATED IN C8.1)OTHERWISE SKIP TO C13]** Thanks, that accounts for **[TOTAL BULBS IN C12]** of the total quantity that were installed in your home. Can you tell me where the **[C8.1 MINUS TOTAL BULBS IN C12]** other bulbs were installed?

1. **[RECORD VERBATIM]**
98. Don't Know
99. Refused

C14. How satisfied are you with the LEDs that you purchased during the last twelve months? Would you say you are… **[READ]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C15. **[ASK ONLY IF C14= 3 OR 4]** Why would you say you are **[INSERT ANSWER FROM C14]** with LEDs? **[DO NOT READ LIST AND RECORD ALL THAT APPLY]**

1. Light is too pointed/narrow
2. Too expensive
3. Bulbs are too bright
4. Bulbs are not bright enough
5. Delay in light coming on
6. Did not work with dimmer/3-way switch
7. Didn't fit properly
8. Stuck out of fixture
9. Light color
10. Other **[RECORD VERBATIM]**

98. Don't Know
99. Refused

D. Program Awareness

D1. Before this call, were you aware that **[INSERT UTILITY]** offers energy-efficiency programs that provide monetary incentives to customers for installing equipment that will reduce their utility bills?

1. Yes
2. No

98. Don't Know
99. Refused

D2. One of these **[INSERT UTILITY]** programs is the "Wattsmart Home Energy Savings Program" and it provides discounts on CFLs, LEDs light fixtures and room air conditioners at participating retailers in your area as well as incentives for high-efficiency home equipment and upgrades such as appliances and insulation. Before today, were you aware of this program?

1. Yes
2. No **[SKIP TO SECTION E]**

98. Don't Know **[SKIP TO SECTION E]**
99. Refused **[SKIP TO SECTION E]**

D3. How did you first hear about **[INSERT UTILITY]'s** Wattsmart Home Energy Savings program**? [DO NOT READ LIST. RECORD FIRST RESPONSE. ONE ANSWER ONLY]**

1. Newspaper/Magazine/Print Media
2. Bill Inserts
3. Rocky Mountain Power/Pacific Power website
4. Wattsmart Home Energy Savings website
5. Other website
6. Internet Advertising/Online Ad
7. Family/friends/word-of-mouth
8. Rocky Mountain Power/Pacific Power Representative
9. Radio
10. TV
11. Billboard/outdoor ad
12. Retailer/Store
13. Sporting event
14. Home Shows/Trade Shows (Home and Garden Shows)
15. Social Media
16. Home Energy Reports (OPower)
17. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D4. **[ASK ONLY IF D3<>3 OR 4]** Have you ever visited the Wattsmart Home Energy Savings Website?

1. Yes
2. No

D5. **[ASK ONLY IF D4 = 1 OR D3=3 OR 4, OTHERWISE SKIP TO SECTION E]** Was the website… **[READ]**

1. Very helpful
2. Somewhat helpful
3. Somewhat unhelpful
4. Very unhelpful
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D6. What would make the website more helpful for you? **[DO NOT READ RESPONSES. MARK ALL THAT APPLY]**

1. Nothing, it is already very helpful for me.
2. Make the website easier to navigate or more user-friendly (clear hierarchy)
3. Make program information more clear and concise
4. Incorporate more visual information (charts, graphs, images) and less text
5. Provide easier access to customer service or FAQs
6. Other **[RECORD]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E. Nonparticipant Spillover

E1. **[INSERT UTILITY]'s** Home Energy Reporting (HER) program is designed to generate energy savings by providing residential customers with sets of information about the specific energy use and related energy conservation suggestions and tips. Were you participating in this program in 2013 or 2014?

1. Yes
2. No **[SKIP TO SECTION F]**

98. Don't Know
99. Refused

[ASK SECTION E ONLY IF D1 = 1, OTHERWISE SKIP TO F1] Now, I have a few questions about energy efficient improvements that you made or energy efficient equipment you installed specifically in either 2013 or 2014 that might affect your home's energy use.

Number	Measure	**E1.1** In 2013 and 2014, did you install any of the following items in your home? **[READ MEASURES]** Yes=measure number in far left corner	**[ASK FOR EACH ITEM WHERE E1.1=1]** **E2.1** Did you receive a rebate or discount from **[INSERT UTILITY]** for this purchase? 1=Yes 2=No 98=Don't know 99= Refused	**E3.1** How many did you install? **[RECORD QTY]**
1	High-efficiency Boiler (a)		N/A	
2	High-efficiency Water Heater (b)			
3	High-efficiency heat pump water heater (c)			
4	High-efficiency Furnace (d)			

Number	Measure	**E1.2** In 2013 and 2014, did you install any of the following items in your home? **[READ MEASURES]** Yes=measure number in far left corner	**[ASK FOR EACH ITEM WHERE E1.2=1]** **E2.2** Did you receive a rebate or discount from **[INSERT UTILITY]** for this purchase? 1=Yes 2=No 98=Don't know 99= Refused	**E3.2** How many did you install? **[RECORD QTY]**
5	High-efficiency Air Source Heat Pump (e)			
6	High-efficiency Ground Source Heat Pump (f)			
7	High-efficiency Ductless Heat Pump (g)			
8	High-efficiency Central Air Conditioner *(h)*			
9	High-efficiency Evaporative Cooler (i)			

Number	Measure	**E1.3** In 2013 and 2014, did you install any of the following items in your home? **[READ MEASURES]** Yes=measure number in far left corner	**[ASK FOR EACH ITEM WHERE E1.3=1]** **E2.3** Did you receive a rebate or discount from **[INSERT UTILITY]** for this purchase? 1=Yes 2=No 98=Don't know 99= Refused	**E3.3** How many did you install? **[RECORD QTY]**
10	ENEGY STAR Room Air Conditioner (j)			
11	ENERGY STAR Clothes Washer (k)			
12	ENERGY STAR Dishwasher (l)			
13	ENERGY STAR Freezer (m)			
14	ENERGY STAR Refrigerator (n)			

Number	Measure	**E1.4** In 2013 and 2014, did you install any of the following items in your home? **[READ MEASURES]** Yes=measure number in far left corner	**[ASK FOR EACH ITEM WHERE E1.4=1]** **E2.4** Did you receive a rebate or discount from **[INSERT UTILITY]** for this purchase? 1=Yes 2=No 98=Don't know 99= Refused	**E3.4** How many square feet did you install? **[RECORD QTY IN SQUARE FEET]**
15	Attic insulation (0)			
16	Wall insulation (p)			
17	Duct insulation (q)			
18	Duct sealing (r)			
19	Windows (s)			

Number	Measure	**E1.5** In 2013 and 2014, did you install any of the following items in your home? **[READ MEASURES]** Yes=measure number in far left corner	**[ASK FOR EACH ITEM WHERE E1.5=1]** **E2.5** Did you receive a rebate or discount from **[INSERT UTILITY]** for this purchase? 1=Yes 2=No 98=Don't know 99= Refused	**E3.5** How many did you install? **[RECORD QTY]**
20	High-Efficiency Showerhead (t)			
21	High-Efficiency Faucet aerator (u)			
22	Any other energy-efficient products? [SPECIFY] (v)			
23	Did not install anything (w)		N/A	N/A
24	Don't know (x)		N/A	N/A
25	Refused (y)		N/A	N/A

[ASK E5 SERIES FOR EACH MEASURE WITH E1 FLAGGED IN TABLES ABOVE (E1.1; E1.2; E1.3; E1.4; E1.5]

E5. On a 1 to 4 scale, with 1 meaning "not at all important", to 4, meaning the item was "very important", how important were each of the following on your decision to install energy efficient equipment or make energy-efficiency improvements?

How important was **[INSERT STATEMENT FROM TABLE BELOW]** on your decision to purchase the **[INSERT MEASURE NAME FROM E1.X]**? **[REPEAT SCALE AS NEEDED; REPEAT FOR ALL STATEMENTS AND ALL MEASURES]**

Statement	Not at all important	Not very important	Somewhat Important	Very Important	Don't know	Not applicable
	1	2	4	5	98	96
a. General information about energy efficiency provided by **[INSERT UTILITY]**.						
b. Information from friends or family members who installed energy efficient equipment and received a rebate from **[INSERT UTILITY].**						
c. Your experience with a past **[INSERT UTILITY]** energy efficiency program.						

E6. **[ASK IF E2.1-5 = 2 OTHERWISE SKIP TO SECTION 98]** What are the reasons you did not apply for a rebate from **[INSERT UTILITY]** for these energy efficiency improvements? **[DO NOT READ LIST; RECORD ALL THAT APPLY]**

1. Didn't know/wasn't aware
2. Was going to apply but forgot
3. Not interested
4. Too busy/didn't have time
5. Dollar rebate for rebate was not high enough
6. Application too difficult to fill out
7. Did apply but never received rebate
8. Other **[SPECIFY]**

98. Don't Know
99. Refused

F. Demographics

F1. Next are a few questions for statistical purposes only. Which of the following best describes your house? **[READ LIST]**

1. Single-family home
2. Townhouse or duplex
3. Mobile home or trailer
4. Apartment building with 4 or more units
5. Other **[RECORD]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F2. Do you or members of your household own this home or do you rent?

1. Own
2. Rent
3. Other **[RECORD]**

98. Don't Know
99. Refused

F3. About when was this building first built? **[READ LIST IF NEEDED]**

1. Before 1970's
2. 1970's
3. 1980's
4. 1990-94
5. 1995-99
6. 2000-2004
7. 2005-2009
8. 2010 +
9. OTHER **[RECORD]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F4. What is the primary heating source for your home? **[READ LIST IF NEEDED]**

1. Forced air natural gas furnace
2. Forced air propane furnace
3. Air Source Heat Pump **[FUEL SOURCE]**
4. Ground Source Heat Pump **[FUEL SOURCE]**
5. Electric baseboard heat
6. Gas fired boiler/radiant heat
7. Oil fired boiler/radiant heat
8. Passive Solar
9. Pellet stove
10. Wood stove
11. Other **[RECORD]**

98. Don't Know
99. Refused

F5. How old is the primary heating system? **[RECORD RESPONSE IN YEARS]**

1. **[RECORD 1-100]**

98. Don't Know
99. Refused

F6. What type of air conditioning system, if any, do you use in your home? **[INDICATE ALL THAT APPLY]**

1. Central Air Conditioner
2. Room Air Conditioner
3. Evaporative Cooler
4. Air Source Heat Pump
5. Ground Source Heat Pump
6. Whole house fan
7. No cooling system
8. Other **[SPECIFY]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F7. **[SKIP IF F6= 7,98 OR 99]** How many years old is your primary cooling system? **[RECORD RESPONSE IN YEARS]**

1. **[RECORD]**

98. Don't Know
99. Refused

F8. What type of fuel is the primary source for your water heating? **[INDICATE ALL THAT APPLY]**

1. Electricity
2. Natural Gas
3. Propane
4. Other [RECORD]
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

F9. Including yourself and any children, how many people currently live in your home?

1. **[RECORD]**
98. Don't Know
99. Refused

F10. **[ASK ONLY IF F9> 1]** Are any of the people living in your home dependent children under the age of 18?

1. Yes
2. No
98. Don't Know
99. Refused

G. Conclusion

G1. Do you have any additional feedback or comments regarding your household lighting?

1. Yes **[RECORD VERBATIM]**
2. No
98. Don't Know
99. Refused

G2. **[SEX; DO NOT READ]**

1. Female
2. Male
98. Don't Know

That concludes the survey. Thank you very much for your time and feedback.

Appendix A: Lighting Leakage Survey

A1 Hello, my name is _____, and we're doing a survey about light bulbs today. This is a short survey that will only take about five minutes to complete, and we will give you a $10 gift card that you can use in this store today for your time. You will remain completely anonymous. Do you have five minutes to answer some questions today?

- ❍ 1. (Yes) (1)
- ❍ 99. (No/Refused) (2)

If 1. (Yes) Is Selected, Then Skip To A3

If 99. (No/Refused) Is Selected

A2 OK, thanks for your consideration. Though if you don't mind answering one question for me, could you please tell me which utility provides electric service to your home? [SHOW UTILITY LOGOS IF NEEDED. THANK THE CUSTOMER AND END SURVEY AFTER THIS QUESTION]

- ❍ 1. Pacific Power (1)
- ❍ 2. Rocky Mountain Power (2)
- ❍ 91. Any other utility (specify) (3) _____
- ❍ 98. Don't know (4)
- ❍ 99. Refused (5)

Then Skip To E1 short

A3 Which utility provides electric service to your home? [SHOW UTILITY LOGOS IF NEEDED]

- ❍ 1. Pacific Power (1)
- ❍ 2. Rocky Mountain Power (2)
- ❍ 91. Any other utility (specify) (3) _____
- ❍ 98. Don't know (4)
- ❍ 99. Refused (5)

A4 Which zip code do you live in?

- ❍ Record response if given (1) _____
- ❍ 98. Don't know (2)
- ❍ 99. Refused (3)

B1 Do you plan to install the bulbs you're purchasing today in your home, at a business, or someplace else? [CHECK ALL THAT APPLY – ONLY CHECK ONE IF ALL BULBS ARE BEING INSTALLED AT THE SAME ADDRESS]

- ❑ 1. (bulbs will be installed at my home) (1)
- ❑ 2. (bulbs will be installed at my vacation home (or other personal property) (2)
- ❑ 3. (bulbs will be installed at a business / location that is not a residence, including non-profits) (3)
- ❑ 4. (purchasing bulbs for somebody else / not my home or business) (4)
- ❑ 98. (Don't know) (5)
- ❑ 99. (Refused) (6)

If (bulbs will be installed at a business / location that is not a residence, including non-profits) Is Selected

B1a What kind of business is this (what do they do)?

- ❍ A: AGRICULTURE, FORESTRY AND FISHING (VETERINARY, CROPS, HUNTING) (1)
- ❍ B: MINING (GRAVEL, COAL, OIL, METAL, CHEMICAL, NONMETALLIC MINERALS) (2)
- ❍ C: CONTRACT CONSTRUCTION (PLUMBING, PAINTING, ELECTRICAL, ROOFING) (3)
- ❍ D: MANUFACTURING (TEXTILES, FURNITURE, FABRICATED METAL, PRODUCTS) (4)
- ❍ E: TRANSPORTATION, COMMUNICATION, ELECTRIC (FREIGHT, COURIER, CABLE) (5)
- ❍ F: WHOLESALE TRADE (GROCERY SUPPLIERS, RAW MATERIALS, APPAREL) (6)
- ❍ G: RETAIL TRADE (MARKETS, CLOTHING STORES, RESTAURANTS, CAR DEALERS) (7)
- ❍ H: FINANCE, INSURANCE AND REAL ESTATE (BANKS, MORTGAGE BROKERS) (8)
- ❍ I: SERVICES (BEAUTY QUALITY) (9)
- ❍ K: NONCLASSIFIABLE ESTABLISHMENTS (OTHERS) [RECORD RESPONSE] (10) _____
- ❍ (98. don't know) (11)
- ❍ (99. refused) (12)

If (bulbs will be installed at a business / location that is not a residence, including non-profits) Is Selected

B1b What zip code or city is this business located in? [RECORD ZIP CODE IF KNOWN]

- ❍ (RECORD RESPONSE IF GIVEN) (1) _____
- ❍ (98. don't know) (2)
- ❍ (99. refused) (3)

If (bulbs will be installed at a business / location that is not a residence, including non-profits) Is Selected

B1c Do you know which utility provides power for this business? [RECORD NAME OF UTILITY IF KNOWN]

- ❍ (1. Pacific Power) (1)
- ❍ (2. Rocky Mountain Power) (2)
- ❍ (3. Any other utility - SPECIFY) (3) _____
- ❍ (98. don't know) (4)
- ❍ (99. refused) (5)

If (purchasing bulbs for somebody else / not my home or business) Is Selected

B1d Do you know where these bulbs that you are purchasing for somebody else will be installed? (Do you know the zip code or city?) [RECORD RESPONSE – ZIP CODE IS IDEAL, OR CITY AND STATE, OR JUST A VERBAL DESCRIPTION IF ADDRESS IS NOT KNOWN – for example “my mother-in-law’s house”]

- ❍ (1. RECORD RESPONSE IF GIVEN) (1) _____
- ❍ (98. don't know) (2)
- ❍ (99. refused) (3)

B2 How many minutes does it take to drive to this store from the place where you intend to install these bulbs?

- ❍ (Less than 10 minutes) (1)
- ❍ (10 up to 20 minutes) (2)
- ❍ (20 up to 30 minutes) (3)
- ❍ (30 up to 40 minutes) (4)
- ❍ (40 up to 50 minutes) (5)
- ❍ (50 minutes up to an hour) (6)
- ❍ (An hour or more) (7)
- ❍ (Other response or multiple locations - record details below) (8) _____
- ❍ (98. don't know) (9)
- ❍ (99. refused) (10)

B3 What kind of light bulbs are you purchasing today? [GO OVER THE LIGHT BULBS IN THE CUSTOMER'S CART AND RECORD HOW MANY OF EACH TYPE – ONLY CONTINUE IF THERE IS AT LEAST ONE LIGHT BULB IN THEIR CART.]

- ❑ (Enter quantity of INCANDESCENT bulbs) (1) _____
- ❑ (Enter quantity of HALOGEN bulbs) (2) _____
- ❑ (Enter quantity of CFL bulbs) (3) _____
- ❑ (Enter quantity of LED bulbs) (4) _____
- ❑ (Enter quantity AND TYPE of OTHER bulbs) (5) _____

B3scan [SCAN THE BARCODES FOR THE LIGHT BULBS IN THEIR CART AND COPY-PASTE THE NUMBERS INTO THE FIELDS BELOW - ONLY NEED TO SCAN ONE PACKAGE OF EACH TYPE OR WATTAGE; DO NOT SCAN MULTIPLE PACKS OF EXACTLY THE SAME BULBS.]

- ❑ First light bulb type (1) _____
- ❑ Second light bulb type (2) _____
- ❑ Third light bulb type (3) _____
- ❑ Fourth light bulb type (4) _____
- ❑ Fifth light bulb type (5) _____
- ❑ Sixth light bulb type (6) _____
- ❑ Seventh light bulb type (7) _____
- ❑ Eighth light bulb type (8) _____

If (Enter quantity of INCANDESCENT bulbs) Is Greater Than or Equal to 1

B3i What type and wattage of light bulb will you replace with the INCANDESCENT bulbs you are purchasing today?

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (6. purchasing bulbs for general use / that will go in storage / not specifically replacing any particular bulbs) (6)
- ❑ (7. no bulbs previously installed / new fixture or previously empty sockets) (7)
- ❑ (98. don't know) (8)
- ❑ (99. refused) (9)

If (Enter quantity of HALOGEN bulbs) Is Greater Than or Equal to 1

B3h What type and wattage of light bulb will you replace with the HALOGEN bulbs you are purchasing today?

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (6. purchasing bulbs for general use / that will go in storage / not specifically replacing any particular bulbs) (6)
- ❑ (7. no bulbs previously installed / new fixture or previously empty sockets) (7)
- ❑ (98. don't know) (8)
- ❑ (99. refused) (9)

If (Enter quantity of CFL bulbs) Is Greater Than or Equal to 1

B3c What type and wattage of light bulb will you replace with the CFL bulbs you are purchasing today?

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (6. purchasing bulbs for general use / that will go in storage / not specifically replacing any particular bulbs) (6)
- ❑ (7. no bulbs previously installed / new fixture or previously empty sockets) (7)
- ❑ (98. don't know) (8)
- ❑ (99. refused) (9)

If (Enter quantity of LED bulbs) Is Greater Than or Equal to 1

B3l What type and wattage of light bulb will you replace with the LED bulbs you are purchasing today?

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (6. purchasing bulbs for general use / that will go in storage / not specifically replacing any particular bulbs) (6)
- ❑ (7. no bulbs previously installed / new fixture or previously empty sockets) (7)
- ❑ (98. don't know) (8)
- ❑ (99. refused) (9)

If (Enter quantity AND TYPE of OTHER bulbs) Is Selected

B3o What type and wattage of light bulb will you replace with the ${q://QID7/ChoiceTextEntryValue/5} you are purchasing today?

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (6. purchasing bulbs for general use / that will go in storage / not specifically replacing any particular bulbs) (6)
- ❑ (7. no bulbs previously installed / new fixture or previously empty sockets) (7)
- ❑ (98. don't know) (8)
- ❑ (99. refused) (9)

B4 Do you know if any of these bulbs are being sold at a discounted price?

- ❍ (Yes, some are discounted) (1)
- ❍ (None are discounted) (2)
- ❍ (98. don't know) (3)
- ❍ (99. refused) (4)

C1 Were you planning to purchase all of these bulbs before you arrived at this store?

- ❍ (All bulbs in their cart are planned purchases) (1)
- ❍ (Some bulbs in their cart are planned purchases, and some are not) (2)
- ❍ (Customer had planned to purchase more bulbs than are in their cart) (3)
- ❍ (Had not been intending to purchase any bulbs before arriving at the store) (4)
- ❍ (98. don't know) (5)
- ❍ (99. refused) (6)

If (Some bulbs in their cart are planned purchases, and some are not) Is Selected Or (Had not been intending to purchase any bulbs before arriving at the store) Is Selected

C2 What made you decide to purchase these bulbs after you got to the store? [CHECK ALL THAT APPLY]

- ❑ (did not know this type of bulb was available / have not seen these bulbs before) (1)
- ❑ (better value of buying in bulk / buying a larger package size) (2)
- ❑ (regular prices were lower than expected – but not "on sale") (3)
- ❑ (in-store promotional price / these bulbs are "on sale") (4)
- ❑ (in-store advertising / displays) (5)
- ❑ (in-store coupon) (6)
- ❑ (rebate offer) (7)
- ❑ (recommendation of store employee) (8)
- ❑ (other reason given) [RECORD RESPONSE] (9) _____
- ❑ (98. don't know) (10)
- ❑ (99. refused) (11)

If (Customer had planned to purchase more bulbs than are in their cart) Is Selected

C3 What kind of bulbs had you been planning to purchase before you got to the store, but then decided not to purchase? [CHECK ALL THAT APPLY - INCLUDING BULBS THAT THEY ARE PURCHASING IF THEY HAD BEEN INTENDING TO PURCHASE MORE OF THAT TYPE THAN THEY DID]

- ❑ (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN (1) _____
- ❑ (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN (2) _____
- ❑ (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN (3) _____
- ❑ (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN (4) _____
- ❑ (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN (5) _____
- ❑ (98. don't know) (6)
- ❑ (99. refused) (7)

If (Customer had planned to purchase more bulbs than are in their cart) Is Selected

C4 How many of these bulbs that you were planning to purchase before you got to the store did you end up not purchasing? [CHECK ALL THAT APPLY - INCLUDING BULBS THAT THEY ARE PURCHASING IF THEY HAD BEEN INTENDING TO PURCHASE MORE OF THAT TYPE THAN THEY DID]

If (1. Incandescent bulbs) RECORD WATTAGE(S) IF KNOWN Is Selected

- ❑ (1. Incandescent bulbs) RECORD QUANTITY (1) _____

If (2. Halogen bulbs) RECORD WATTAGE(S) IF KNOWN Is Selected

- ❑ (2. Halogen bulbs) RECORD QUANTITY (2) _____

If (3. CFL bulbs) RECORD WATTAGE(S) IF KNOWN Is Selected

- ❑ (3. CFL bulbs) RECORD QUANTITY (3) _____

If (4. LED bulbs) RECORD WATTAGE(S) IF KNOWN Is Selected

- ❑ (4. LED bulbs) RECORD QUANTITY (4) _____

If (5. other type of bulbs) RECORD TYPE AND WATTAGE(S) IF KNOWN Is Selected

- ❑ (5. other type of bulbs) RECORD TYPE AND QUANTITY (5) _____

❑ (98. don't know) (6)

❑ (99. refused) (7)

If (Customer had planned to purchase more bulbs than are in their cart) Is Selected

C5 Why didn’t you purchase these bulbs that you had been planning to buy? [CHECK ALL THAT APPLY]

❑ (the type of bulb was not available / could not find them) (1)

❑ (found a better value) (2)

❑ (saw the deal on the program bulbs) (3)

❑ (saw a deal with different bulbs) (4)

❑ (prices were higher than expected) (5)

❑ (found bulbs that were a better deal) (6)

❑ (found bulbs that were better suited for my purpose) (7)

❑ (decided to go with more efficient bulbs) (8)

❑ (in-store coupon for other bulbs) (9)

❑ (rebate offer for other bulbs) (10)

❑ (recommendation of store employee) (11)

❑ (other) [RECORD RESPONSE] (12) _____

❑ (98. don't know) (13)

❑ (99. refused) (14)

C6 What factors led you to purchase these light bulbs? [CHECK ALL THAT APPLY]

- ❑ 1. (low bulb price / reduced price / on sale) (1)
- ❑ 2. (information in the store / store display or advertising) (2)
- ❑ 3. (information from a utility) (3)
- ❑ 4. (advertising, online or elsewhere) - SPECIFY SOURCE OF AD (radio, TV, online, etc.) (4) _____
- ❑ 5. (someone made a recommendation) - SPECIFY WHO RECOMMENDED (5) _____
- ❑ 6. (energy efficiency / saving energy) (6)
- ❑ 7. (saving money on utility bills) (7)
- ❑ 8. (good for the environment / "green" reasons) (8)
- ❑ 9. (bulb color / light quality) (9)
- ❑ 10. (appearance of the bulb / looks good in my fixtures) (10)
- ❑ 11. (hard to find bulb for a unique fixture) (11)
- ❑ 12. (these are the bulbs I always buy / I am used to) (12)
- ❑ 13. (I needed bulbs right away) (13)
- ❑ 14. (just stocking up / these are spare bulbs) (14)
- ❑ 15. (other reasons given) [RECORD RESPONSE] (15) _____
- ❑ 98. (Don't know) (16)
- ❑ 99. (Refused) (17)

D1 Are you going to purchase any other energy-saving items such as power strips, low-flow showerheads, or any Energy Star products while you are at this store today? [INCLUDING ITEMS THEY INTEND TO PURCHASE WHICH ARE NOT IN THEIR CART YET]

- ❍ (Yes) (1)
- ❍ (No) (2)
- ❍ (98. Don't know) (3)
- ❍ (99. Refused) (4)

If “Are you going to purchase any other energy-saving items such as power strips, low-flow showerheads, or any Energy Star products while you are at this store today?” [INCLUDING ITEMS THEY INTEND... (Yes) Is Selected

D1b What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY (showerhead, insulation, thermostat, etc.)]

- ❑ Record name of first item (1) _____
- ❑ Record name of second item (2) _____
- ❑ Record name of third item (3) _____
- ❑ Record name of fourth item (4) _____
- ❑ Record name of fifth item (5) _____
- ❑ Record name of sixth item (6) _____
- ❑ (99. Refused) (7)

If “What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY” ... Record name of first item Selected

D1b1 How much/many of [D1b] do you plan to use/install right away?

- ❍ (All of it will be installed/used right away) (1)
- ❍ (Some of it will be installed/used right away) - RECORD QUANTITY THAT WILL BE USED RIGHT AWAY (2) _____
- ❍ (None of it will be installed/used right away) (3)
- ❍ (98. Don’t know) (4)
- ❍ (99. Refused) (5)

If What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY” … Record name of first item Is Selected

D2.1 Do you have any rebates or coupons for [D1b]?

- ❍ (Yes) - SPECIFY WHO IS OFFERING REBATE OR COUPON BELOW (1) _____
- ❍ (No) (2)
- ❍ (98. Don’t know) (3)
- ❍ (99. Refused) (4)

If “What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY” ... Record name of second item Is Selected

D1b2 How much/many of [D1b] do you plan to use/install right away?

- ❍ (All of it will be installed/used right away) (1)
- ❍ (Some of it will be installed/used right away) - RECORD QUANTITY THAT WILL BE USED RIGHT AWAY (2) _____
- ❍ (None of it will be installed/used right away) (3)
- ❍ (98. Don’t know) (4)
- ❍ (99. Refused) (5)

If “What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY” ... Record name of second item Is Selected

D2.2 Do you have any rebates or coupons for [DB1]?

- ❍ (Yes) - SPECIFY WHO IS OFFERING REBATE OR COUPON BELOW (1) _____
- ❍ (No) (2)
- ❍ (98. Don’t know) (3)
- ❍ (99. Refused) (4)

If “What energy-saving items are you going to purchase today? [RECORD A BRIEF DESCRIPTION OF UP TO SIX TYPES OF "ENERGY-SAVING" ITEMS BEING PURCHASED AT THE STORE TODAY” ... Record name of second item Is Selected

D1b3 How much/many of [DB1] do you plan to use/install right away?

- ❍ (All of it will be installed/used right away) (1)
- ❍ (Some of it will be installed/used right away) - RECORD QUANTITY THAT WILL BE USED RIGHT AWAY (2) _____
- ❍ (None of it will be installed/used right away) (3)
- ❍ (98. Don’t know) (4)
- ❍ (99. Refused) (5)

[REPEAT FOR UP TO SIX ITEMS]

If What energy-saving items are you going to purchase today? Is Selected

D3.1 Please tell me how important your experience purchasing efficient light bulbs was in your decision to purchase [db1] Would you say it was . . .

- ❍ Very important (1)
- ❍ Somewhat important (2)
- ❍ Not very important, or (3)
- ❍ Not important at all? (4)
- ❍ 98. (Don't know) (5)
- ❍ 99. (Refused) (6)

[REPEAT FOR UP TO SIX ITEMS]

E1 Thank you for your time and feedback today! [GIVE CUSTOMER THE GIFT CARD]

- ❍ ENTER YOUR INITIALS AND CLICK NEXT TO CONFIRM SURVEY COMPLETED _____

E1short Thank you for your time! [DO NOT GIVE CUSTOMER A GIFT CARD]

- ❍ ENTER YOUR INITIALS AND CLICK NEXT TO CONFIRM SURVEY COMPLETED _____

CADMUS

PacifiCorp Home Energy Savings wattsmart Starter Kit Survey

Audience: This survey is designed for PacifiCorp residential customers in Idaho and Washington. The primary purpose of this survey is to collect information on receipt of the kit, installation and satisfaction of kit items, wattsmart/Homes Energy Savings Program awareness and satisfaction. This survey will be administered through telephone calls.

Quota: 70 completed surveys for CFLs and 60 for LEDs for each state (ID and WA) (260 total)

Topics	Researchable Questions	Survey Questions
Receipt of kit	Did the customer receive (or recall receiving) the wattsmart Home Energy Savings starter kit?	A3-A6
Installation of kit measures	How many of each kit item did the customer install? How many items were removed? How many items remain in storage?	B1, B2, B5, B15, B16, B19, C1, C3, C5, D1, D4, D10,D13
Reasons for removal or non-installation	Why were items removed? Why were items never installed? Where are the items now?	B3-B5,B17-B19, C2-C3,D3, D4
Satisfaction with kit items	How satisfied are customers with the kit items and overall kit? How easy was it to install the water items? How easy was it to fill out online request form? Why did the customer request the kit?	B6, B7, B20-B22, C4-C5,D5-D6,E1-E4,E10
Program awareness	How did the customer hear about the wattsmart Home Energy Savings Starter Kit? Are kit recipients familiar with Home Energy Savings program (Home Energy Savings)? Have they received other incentives from wattsmart?	E5, E6, E7
NTG	What is the freeridership and spillover associated with this program.	B8-B14, B23-B26, C6-C8, D7-D9, D16-D18, Section F
Household Characteristics	What are some general household characteristics (used to inform engineering review)?	Section G

- Interviewer instructions are in green.
- CATI programming instructions are in red.

[UTILITY]

Washington: Pacific Power

Idaho: Rocky Mountain Power

[KIT TYPE]

Kit Name	Kit Type	Quantity CFLs	Quantity LEDs	Quantity Kitchen Aerators	Quantity Bath Aerators	Quantity Showerheads
Basic 1	1	4	0	1	1	1
Basic 2	2	4	0	1	2	2
Better 1	3	4	0	1	1	1
Better 2	4	4	0	1	2	2
Best 1	5	0	4	1	1	1
Best 2	6	0	4	1	2	2
CFL Only	7	4	0	0	0	0
LED Only	8	0	4	0	0	0

A. Introduction

A1. **[TO RESPONDENT]** Hello, I'm **[INSERT FIRST NAME]**, calling from **[INSERT SURVEY FIRM],** on behalf of **[INSERT UTILITY]**. May I please speak with **[INSERT NAME]**?

1. Yes
2. No, the person is not available **[SCHEDULE CALLBACK]**
98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A2. **[INSERT UTILITY]** is sponsoring additional research about their energy efficiency programs. Our records indicate that you requested a free wattsmart Home Energy Savings starter kit online. Would you be willing to participate in a very quick 5 to 10 minute survey to talk about the kit?

1. Yes
2. No **[THANK AND TERMINATE]**
98. Don't know **["IS THERE SOMEONE ELSE THAT WOULD BE ABLE TO ANSWER?" IF YES, START AGAIN, IF NO, THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

Responses to Customer Questions [IF NEEDED]

(Timing: This survey should take about 5-10 minutes of your time. Is this a good time for us to speak with you?)

(**Who are you with**: I'm with **[INSERT SURVEY FIRM],** an independent research firm that has been hired by **[INSERT UTILITY]** to conduct this research. I am calling to learn about the wattsmart Home Energy Savings starter kit that you received from **[INSERT UTILITY]**)

(Sales concern: I am not selling anything; we would simply like to learn about the wattsmart Home Energy Savings starter kit you received and hear your feedback on the items included. Your responses

will be kept confidential. If you would like to talk with someone from the Home Energy Savings Program about this study, feel free to call 1-800-942-0266, or visit their website: http://www.homeenergysavings.net/.)

(Who is doing this study: **[INSERT UTILITY],** your electric utility, is conducting evaluations of several of its efficiency programs.)

(Why are you conducting this study: Studies like this help **[INSERT UTILITY]** better understand customers' need and interest in energy programs and services?)

A1. Have you, or anyone in your household, ever been employed by or affiliated with **[INSERT UTILITY]** or any of its affiliates?

1. Yes **[THANK AND TERMINATE]**
2. No **[CONTINUE]**
98. Don't Know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A2. Thank you. To confirm, did you receive a kit containing energy-saving items from **[INSERT UTILITY]** by mail?

1. Yes **[SKIP TO A5]**
2. No **[CONTINUE TO A3]**
98. Don't know **["THE WATTSMART HOME ENERGY SAVINGS STARTER KIT WAS A BOX THAT CONTAINED ENERGY EFFICIENT HOUSEHOLD ITEMS THAT WAS MAILED TO YOU BY [INSERT UTILITY]. IT CONTAINED FOUR CFLS OR LED LIGHT BULBS AND ALSO MAY HAVE CONTAINED FAUCET AERATORS AND HIGH-EFFICIENT SHOWERHEADS. DO YOU RECALL WHETHER YOUR HOUSEHOLD RECEIVED ONE OR MORE OF THESE KITS?" IF YES, ADJUST RESPONSE AND SKIP TO A5, IF NO, SKIP TO A4]**

A3. Did you or a member of your household request a wattsmart Home Energy Savings Starter Kit?

1. Yes **["WE APPOLOGIZE THAT YOU DID NOT RECEIVE YOUR REQUESTED KIT. WOULD YOU LIKE US TO NOTIFY [INSERT UTILITY] ON YOUR BEHALF?" IF YES, ASK FOR NAME AND PHONE NUMBER, THANK AND TERMINATE]**
2. No **[THANK AND TERMINATE]**
98. Don't know **[THANK AND TERMINATE]**

A4. Is there anyone else in your household who would recall if you received a wattsmart Home Energy Savings starter kit from **[INSERT UTILITY]**?

1. Yes **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN, IF UNAVAILBLE, UPDATE SAMPLE LIST WITH NEW CONTACT AND CALL BACK ANOTHER TIME]**
2. No **[THANK AND TERMINATE]**
98. Don't know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A5. **[ASK ONLY IF KIT TYPE = 7 OR 8, OTHERWISE SKIP TO A6]** My records show that you received a wattsmart Home Energy Savings Starter Kit that contained **[IF KIT TYPE = 7, "FOUR CFL LIGHT BULBS", IF KIT TYPE = 8, "FOUR LED LIGHT BULBS"],** is that correct?

1. Yes
2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**

   A5a. (Specify_____) **[ADJUST QUANTITY OF MEASURES AND KIT TYPE AS APPROPRIATE]**

98. Don't know **[THANK AND TERMINATE]**
99. Refused **[THANK AND TERMINATE]**

A6. **[ASK ONLY IF KIT TYPE = 1-6]** My records show that you received a wattsmart Home Energy Savings Starter Kit that contained several items such as energy efficient light bulbs, faucet aerators and showerheads. I'd like to confirm the number of each item that you received in your kit. I will read the quantity of each item, please confirm if they are correct. My records show that you received **[READ A-D AND USE RESPONSE OPTIONS BELOW FOR EACH]**:

A6a. **[IF KIT TYPE = 1-4, "FOUR CFL LIGHT BULBS", IF KIT TYPE = 5 OR 6, "FOUR LED LIGHT BULBS"]**

1. Yes
2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**

98. Don't Know
99. Refused

A6b. One kitchen faucet aerator

1. Yes
2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**

98. Don't Know
99. Refused

A6c. **[BATHROOM FAUCET AERATOR QUANTITY]** bathroom faucet aerator(s)

1. Yes
2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**

98. Don't Know
99. Refused

A6d. **[SHOWERHEAD QUANTITY]** showerhead (s)

1. Yes
2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**

   A6b. (Specify_____) **[ADJUST QUANTITY OF MEASURES AS APPROPRIATE]**

98. Don't know
99. Refused **[THANK AND TERMINATE]**

A7. **[THANK AND TERMINATE IF PARTICIPANT ANSWERS "DON'T KNOW" OR "REFUSED" TO ALL QUESTIONS A6. A-D]**

B. Light Bulbs

[ASK B1 TO B14 IF KIT TYPE = 1 --4 OR 7, OTHERWISE SKIP TO B15]

[IF A6.A6A = 98 OR 99, OR IF A6.A6A = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO SECTION C]

B1. Of the four CFL bulbs you received in the kit, how many are currently installed in your home?

1. _____ **[RECORD # OF BULBS FROM 0-4 RANGE] [IF=4 SKIP TO B6]**
98. (Don't know) **[SKIP TO B6]**

B2. Of the **[4-B1.1]** CFL bulb(s) that is/are not currently installed, "was this"/"were any of these" bulb(s) ever installed in your home and then removed?

1. Yes _____ **["HOW MANY WERE REMOVED?" RECORD # OF BULBS]**
2. No **[SKIP TO B4]**
98. (Don't know) **[SKIP TO B5]**

B3. And why were the **[INSERT B2.1 QUANTITY]** CFL bulb(s) removed? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Burned out
2. Quality of light
3. Mercury content
4. Requires special disposal/must be recycled
5. Fire hazard
6. Replaced with new technology (LEDs)
7. Other **[OPEN ENDED, WRITE RESPONSE]**
98. (Don't know)

[SKIP TO B5, UNLESS 4-B1.1– B2.1>0 (CONTINUE)]

B4. Why wasn't/weren't the **[QUANTITY NEVER INSTALLED: 4-B1.1– B2.1]** CFL bulb(s) ever installed? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Quality of light
2. Mercury content
3. Requires special disposal/must be recycled
4. Fire hazard
5. Already had CFL bulbs (or LEDs) installed in every possible location
6. Waiting for a bulb to burn out
7. I haven't had time/ haven't gotten around to it
8. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

B5. What did you do with the bulbs that are not currently installed in your home? **[DO NOT READ, MULTIPLE RESPONSES ALLOWED]**

1. Put into storage
2. Gave Away
3. Sold it
4. Threw it away in trash
5. Recycled it

6. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

B6. Overall, how satisfied are you with the CFLs you received in the kit? Please choose from one of these options: **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B7. And how satisfied were you with the number of CFLs you received in the wattsmart Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. Don't Know
99. Refused

B8. Before you signed up for the kit, did you already have CFLs installed in your home?

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

B9. **[ASK IF B8 = 1]** How many CFLs were you using in your home at the time you signed up for the kit?

1. (# of Bulbs): _____
98. (DON'T KNOW)
99. (REFUSED)

B10. At the time you signed up for the kit, were you already planning to purchase CFLs?

1. (Yes)
2. (No)
3. (No, I already had them installed in all available sockets)
98. (DON'T KNOW)
99. (REFUSED)

B11. **[ASK IF B10 = 1]** In terms of timing, when would you have purchased the CFLs?

1. (Around the same time I received the kit)
2. (Later but within the same year)
3. (In one year or more)
98. (Don't know)
99. (REFUSED)

B12. Were you aware of the option to upgrade your kit from CFLs to LED bulbs for $19.99?

1. (Yes) **[CONTINUE TO B13]**
2. (No) **[SKIP TO B14]**
98. Don't Know **[SKIP TO B14]**
99. Refused **[SKIP TO B14]**

B13. **[ASK IF B12 = 1]** Why did you decide not to upgrade to LEDs? [do not read, multiple responses allowed]

1. The cost/too expensive **[SKIP TO C1]**
2. Not familiar with LEDs **[SKIP TO C1]**
3. Prefer CFLs **[SKIP TO C1]**
4. Other **[RECORD]** **[SKIP TO C1]**
98. Don't Know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

B14. **[ASK IF B12 = 2, 98, OR 99]** If you knew about the option to upgrade from CFLs to LEDs at a cost of $19.99, would you have upgraded to the LED kit?

1. (Yes) **[SKIP TO C1]**
2. (No) **[SKIP TO C1]**
98. Don't Know **[SKIP TO C1]**
99. Refused **[SKIP TO C1]**

[ASK B15 THROUGH B26 IF KIT TYPE = 5, 6 OR 8, OTHERWISE SKIP TO SECTION ERROR! REFERENCE SOURCE NOT FOUND.**]**

B15. Of the four LED bulbs you received in the kit, how many are currently installed in your home?

1. _____ **[RECORD # OF BULBS FROM 0-4 RANGE]** **[IF=4 SKIP TO B20]**
98. Don't know **[SKIP TO B20]**

B16. Of the **[4-B15.1]** **[OR IF A6.A6A = 2, USE THE REVISED NUMBER OF BULBS - B15.1]** LED bulb(s) that is/are not currently installed, "was this"/"were any of these" bulb(s) ever installed in your home and then removed?

1. Yes _____ **["HOW MANY WERE REMOVED?" RECORD # OF BULBS]**
2. No **[SKIP TO B18]**

98. (Don't know) **[SKIP TO B19]**

B17. And why was/were the **[INSERT B16.1 QUANTITY]** LED bulb(s) removed? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Burned out
2. Quality of light
3. Requires special disposal/must be recycled
4. Other **[OPEN ENDED, WRITE RESPONSE]**

98. Don't know)

[SKIP TO B19 UNLESS 4 - B15.1- B16 >0 (CONTINUE)]

B18. Why wasn't/weren't the **[QUANTITY NEVER INSTALLED: 4 - B15.1-B16.1] [OR IF A6.A6A = 2, USE THE REVISED NUMBER OF BULBS - B15.1 - B16.1]** LED bulb(s) ever installed? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Quality of light
2. Requires special disposal/must be recycled
3. Fire hazard
4. Already had LEDs bulbs (or CFLs) installed in every possible location
5. Waiting for a bulb to burn out
6. I haven't had time/ haven't gotten around to it
7. Other **[OPEN ENDED, WRITE RESPONSE]**

98. Don't know

B19. What did you do with the bulbs that are not currently installed in your home? **[DO NOT READ, MULTIPLE RESPONSES ALLOWED]**

1. Put into storage
2. Gave Away
3. Sold it
4. Threw it away in trash
5. Recycled it
6. Other **[OPEN ENDED, WRITE RESPONSE]**

98. Don't know

B20. Why did you choose to spend the extra $19.99 to have LEDs included in your kit instead of CFLs?

1. _____ **[OPEN RESPONSE, RECORD VERBATIM]**

98. **[DO NOT READ]** Don't Know

99. **[DO NOT READ]** Refused

B21. Overall, how satisfied are you with your LEDs? Please choose from one of these options: **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B22. How satisfied were you with the number of LEDs you received in the kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. Don't Know
99. Refused

B23. Before you signed up for the kit, did you already have LEDs installed in your home?

1. (Yes)
2. (No)
3. (DK/NS)

B24. **[ASK IF B23 = 1]** How many LEDs were you using in your home at the time you signed up for the kit?

1. (# of Bulbs): _____
2. (DK/NS)

B25. At the time you signed up for the kit and agreed to pay the additional $19.99 for the 4 LEDs, were you already planning on buying the same kind of LEDs you received in the kit? **[IF NEEDED: WERE YOU PLANNING ON BUYING THE SAME WATTAGE OF LED BULB?]**

1. (Yes)
2. (No)
3. (No, already had them installed in all available sockets)
4. (DK/NS)

B26. **[ASK IF B25 = 1]** In terms of timing, when would you have purchased the LEDs on your own if they were not offered through the kit?

1. (Around the same time I received the kit)
2. (Later but within the same year)
3. (In one year or more)

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

[ASK SECTION ERROR! REFERENCE SOURCE NOT FOUND. **AND D IF KIT TYPE = 1-6, OTHERWISE SKIP TO SECTION E]**

C. *High-Efficiency Showerheads*

[IF A6DA6B = 98 OR 99, OR IF A6D = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO SECTION D]

C1. **HOW MANY OF THE** [SHOWERHEAD QUANTITY] **HIGH-EFFICIENCY SHOWERHEAD(S) YOU RECEIVED ARE CURRENTLY INSTALLED IN YOUR HOME?**

1. Record _____ **[IF RESPONSE = SHOWERHEAD QUANTITY, SKIP TO C4]**
98. Don't know **[SKIP TO C5]**

C2. **[IF KIT TYPE = 2, 4 OR 6 AND C1.1C1 = 0 SAY "WHY ARE THE HIGH-EFFICIENCY SHOWERHEADS NOT CURRENTLY IN USE"; IF KIT TYPE = 2, 4 OR 6 AND C1.1 = 1 SAY "WHY IS ONE OF THE HIGH-EFFICIENCY SHOWERHEADS NOT CURRENTLY IN USE"; IF KIT TYPE = 1, 3 OR 5 AND C1.1 C1 = 0 SAY "WHY IS THE HIGH-EFFICIENCY SHOWERHEAD NOT CURRENTLY IN USE"]**? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Water volume
2. Water temperature
3. Water pressure
4. Did not like the design/look of it
5. Did not fit/could not install
6. Already had high-efficiency showerhead installed in every possible location
7. Do not have a shower
8. I haven't had time/ haven't gotten around to it
9. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

C3. What did you do with the high-efficiency showerhead(s) that is/are not installed? **[DO NOT READ, SINGLE RESPONSE]**

1. Put into storage
2. Gave Away
3. Sold it
4. Threw it away in trash
5. Recycled it
6. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

C4. Overall, how satisfied are you with the high-efficiency showerhead(s) you received in the kit? Please choose from one of these options: **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C5. **[IF C1.1 = 0 OR C1 = 98 SAY "IF YOU ATTEMPTED TO INSTALL IT,"]**How easy was it to install your high-efficiency showerhead(s)? Please choose from one of these options: **[READ]**

1. Very Easy
2. Somewhat Easy
3. Somewhat Difficult **[PROBE FOR REASON AND RECORD]**
4. Very Difficult **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
6. **[DO NOT READ]** Did not attempt to install it
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C6. Did you have any **other** high-efficiency showerheads installed in your home at the time you signed up the kit?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

C7. At the time you signed up for the kit, were you already planning on buying a high-efficiency showerhead for your home?

1. (Yes)
2. (No)
3. (No, I already have them installed in all showers)
4. (Maybe)
98. (Don't know)
99. (Refused)

C8. **[ASK IF C7=1]** In terms of timing, when would you have purchased the showerhead?

1. (Around the same time I received the kit)

2. (Later but within the same year)
3. (In one year or more)
98. (Don't know)
99. (Refused)

D. Faucet Aerators

D1. **[IF A6B = 98 OR 99, OR IF A6B = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO D11]**

D2. Is the kitchen faucet aerator you received in the kit currently installed in your home?

1. Yes **[SKIP TO D5]**
2. No **[CONTINUE]**
98. Don't know **[SKIP TO D6]**

D3. Why is the kitchen faucet aerator not currently in use? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]**

1. Water volume
2. Water temperature
3. Water pressure
4. Did not like the design/look of it
5. Did not fit/could not install
6. Already had faucet aerators installed in every possible location
7. I haven't had time/ haven't gotten around to it
8. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

D4. What did you do with the kitchen faucet aerator that is not installed? **[DO NOT READ, SINGLE RESPONSE]**

1. Put into storage
2. Gave Away
3. Sold it
4. Threw it away in trash
5. Recycled it
6. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

D5. Overall, how satisfied are you with the kitchen faucet aerator you received in the kit? Please choose from one of these options: **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D6. **[IF D1= 2 OR 98 SAY "IF YOU ATTEMPTED TO INSTALL IT,"]**How easy was it to install the kitchen faucet aerator? please choose from one of these options: **[READ]**

1. Very Easy
2. Somewhat Easy
3. Somewhat Difficult **[PROBE FOR REASON AND RECORD]**
4. Very Difficult **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
6. **[DO NOT READ]** Did not attempt to install it
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D7. Did you have any **other** high-efficiency kitchen faucet aerators installed in your home before you signed up for the kit?

3. (Yes)
4. (No)
98. (Don't know)
99. (Refused)

D8. At the time you signed up for the kit, were you already planning on buying a high-efficiency kitchen faucet aerator for your home?

1. (Yes)
2. (No)
3. (No, I already have them installed on all faucets)
4. (Maybe)
98. (Don't know)
99. (Refused)

D9. **[ASK IF D8 = 1 OR 4]** In terms of timing, when would you have purchased the kitchen faucet aerators?

1. (Around the same time I received the kit)
2. (Later but within the same year)
3. (In one year or more)
98. (Don't know)
99. (Refused)

D10. **[IF A6C = 98 OR 99, OR IF A6C = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO SECTION E**

D11. How many of the [BATHROOM FAUCET AERATOR QUANTITY] **BATHROOM FAUCET AERATOR**(s) you received are currently installed in your home?

1. Record_____
98. Don't know **[SKIP TO D15]**

D12. **[IF KIT TYPE = 2, 4 OR 6 AND D11.1 = 0 SAY "WHY ARE THE BATHROOM FAUCET AERATORS NOT CURRENTLY IN USE"; IF KIT TYPE = 2, 4, OR 6 AND D11.1 = 1 SAY "WHY IS ONE OF THE BATHROOM FAUCET AERATORS NOT CURRENTLY IN USE"; IF KIT TYPE = 1, 3 OR 5 AND D11.1 = 0 SAY "WHY IS THE BATHROOM FAUCET AERATOR NOT CURRENTLY IN USE"]**? **[DO NOT READ, MULTIPLE RESPONSE ALLOWED]?**

1. Water volume
2. Water temperature
3. Water pressure
4. Did not like the design/look of it
5. Did not fit/could not install
6. Already had faucet aerators installed in every possible location
7. I haven't had time/ haven't gotten around to it
8. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

D13. What did you do with the bathroom faucet aerator(s) not installed? **[DO NOT READ, SINGLE RESPONSE]**

1. Put into storage
2. Gave Away
3. Sold it
4. Threw it away in trash
5. Recycled it
6. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know

D14. Overall, how satisfied are you with the bathroom faucet aerator(s) you received in the kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)] [RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D15. **[IF D11.1 = 0 OR D10 = 98 SAY "IF YOU ATTEMPTED TO INSTALL IT,"]**How easy was it to install the faucet aerator? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)]**

1. Very Easy
2. Somewhat Easy
3. Somewhat Difficult **[PROBE FOR REASON AND RECORD]**
4. Very Difficult **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
6. **[DO NOT READ]** Did not attempt to install it
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D16. Did you have any **other** high-efficiency bathroom faucet aerators installed in your home before you signed up for the kit?

5. (Yes)
6. (No)
98. (Don't know)
99. (Refused)

D17. At the time you signed up for the kit, were you already planning on buying a high-efficiency bathroom faucet aerator for your home?

1. (Yes)
2. (No)
3. (No, I already have them installed on all faucets)
4. (Maybe)
98. (Don't know)
99. (Refused)

D18. **[ASK IF D17 = 1 OR 4]** In terms of timing, when would you have purchased the bathroom faucet aerators?

1. (Around the same time I received the kit)
2. (Later but within the same year)
3. (In one year or more)
98. (Don't know)
99. (Refused)

E. Satisfaction and Program Awareness

E1. How easy was it to fill out the online request for the wattsmart Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)] [RECORD FIRST RESPONSE ONLY]**

1. Very Easy
2. Somewhat Easy
3. Not Very Easy **[PROBE FOR REASON AND RECORD]**
4. Not At All Easy **[PROBE FOR REASON AND RECORD]**
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E2. After you submitted the request for the wattsmart Home Energy Savings Starter Kit how long did it take to receive the kit from **[INSERT UTILITY]**? Please choose from one of these options: **[READ CATEGORIES IF NEEDED, RECORD ONLY FIRST RESPONSE]**

1. Less than 4 weeks
2. Between 4 and 8 weeks
3. More than 8 weeks
98. **[DO NOT READ]** Don't Know **[SKIP TO E4]**
99. **[DO NOT READ]** Refused **[SKIP TO E4]**

E3. Were you satisfied with how long it took to receive the wattsmart Home Energy Savings Starter Kit?

1. Yes
2. No **[PROBE FOR REASON AND RECORD]**
98. Don't Know
99. Refused

E4. Overall, how satisfied are you with your wattsmart Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)] [READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E5. How did you first hear about **[INSERT UTILITY]**'s wattsmart Home Energy Savings Starter Kits? **[DO NOT PROMPT. RECORD ONLY THE FIRST WAY HEARD ABOUT THE PROGRAM]**

1. Newspaper/Magazine/Print Media
2. Bill Inserts
3. Rocky Mountain Power/Pacific Power website
4. Home Energy Savings website
5. Other website
6. Internet Advertising/Online Ad
7. Family/friends/word-of-mouth
8. Rocky Mountain Power/Pacific Power Representative
9. Radio
10. TV
11. Billboard/outdoor ad
12. Retailer/Store
13. Sporting event
14. Home Shows/Trade Shows (Home and Garden Shows)
15. Social Media
16. Northwest Energy Efficiency Alliance (NEEA)
17. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E6. **[INSERT UTILITY]** also provides incentives for high-efficiency home equipment and upgrades such as appliances and insulation through the wattsmart Home Energy Savings program. Before today, were you aware of these offerings?

1. Yes
2. No **[SKIP TO E8]**
98. Don't Know **[SKIP TO E8]**
99. Refused **[SKIP TO E8]**

E7. Have you ever received an incentive from **[INSERT UTILITY]**'s wattsmart Home Energy Savings program?

1. Yes **["WHAT DID YOU RECEIVE AN INCENTIVE FOR?" RECORD]**
2. No
98. Don't Know
99. Refused

E8. **[INSERT UTILITY]** also provides a Home Energy Reports Web portal to provide you with detailed information about your home's energy use and help you discover ways to save money. Before today, were you aware of this offering?

1. Yes
2. No **[SKIP TO E10]**
98. Don't Know **[SKIP TO E10]**
99. Refused **[SKIP TO E10]**

E9. Have you ever participated in the Home Energy Reports web portal?

1. Yes
2. No
98. Don't Know
99. Refused

E10. Please think back to the time when you were deciding to apply for the wattsmart Home Energy Savings Starter Kit. What were the reasons why you decided to request the kit? **[DO NOT READ. INDICATE ALL THAT APPLY. ONCE THEY RESPONDENT HAS FINISHED, SAY: "ARE THERE ANY OTHER FACTORS?"]**

1. Household bulbs had burned out
2. Low on storage of household bulbs
3. Did not have any CFLs or LEDs in my home prior
4. Was interested in emerging technology
5. The kit was free
6. Wanted to save energy
7. Wanted to reduce energy costs
8. Environmental concerns
9. Recommendation from friend, family member, or colleague
10. Advertisement in newspaper **[PROBE: "FOR WHAT PROGRAM?" RECORD]**
11. Radio advertisement **[PROBE: "FOR WHAT PROGRAM?" RECORD]**
12. Health or medical reasons
13. Maintain or increase comfort of home
14. Influenced by the Home Energy Reports the customer receives
15. Influenced by the wattsmart Home Energy Savings Program
16. Other **[RECORD]**
98. Don't Know
99. Refused

F. Spillover

F1. Since receiving the wattsmart Home Energy Savings Starter Kit have you added any other energy efficient equipment or services in your home that were not incentivized through the wattsmart Home Energy Savings Program?

1. Yes
2. No
98. Don't Know
99. Refused

[IF F1 = 2, -98 OR -99 SKIP TO G1]

F2. What high-efficiency energy-saving equipment or services have you purchased since applying for the incentive, not including the **[INSERT MEASURE]** that we have been discussing today? **[LIST OF OTHER ELIGIBLE APPLIANCES AND MEASURES OTHER THAN THOSE LISTED IN PROGRAM RECORDS. PROMPT IF NEEDED]**

1. Clothes Washer **[RECORD QUANTITY]**
2. Refrigerator **[RECORD QUANTITY]**
3. Dishwasher **[RECORD QUANTITY]**
4. Windows **[RECORD QUANTITY IN SQ FT]**
5. Fixtures **[RECORD QUANTITY]**
6. Heat Pump **[RECORD QUANTITY]**
7. Central Air Conditioner **[RECORD QUANTITY]**
8. Room Air Conditioner **[RECORD QUANTITY]**
9. Ceiling Fans **[RECORD QUANTITY]**
10. Electric Storage Water Heater **[RECORD QUANTITY]**
11. Electric Heat Pump Water Heater **[RECORD QUANTITY]**
12. CFLs **[RECORD QUANTITY]**
13. LEDs **[RECORD QUANTITY]**
14. Insulation **[RECORD QUANTITY IN SQ FT]**
15. Air Sealing **[RECORD QUANTITY IN CFM REDUCTION]**
16. Duct Sealing **[RECORD QUANTITY IN CFM REDUCTION]**
17. Programmable thermostat **[RECORD QUANTITY]**
18. Other **[RECORD]** **[RECORD QUANTITY]**
19. None
98. Don't Know
99. Refused

[IF F2 = 12 (ONLY), -98 OR -99 SKIP TO G1. REPEAT F3 THROUGH F5 FOR ALL RESPONSES TO F2]

F3. In what year did you purchase **[INSERT MEASURE TYPE FROM F2]**?

1. 2013
2. 2014
3. Other **[RECORD YEAR]**
98. Don't Know
99. Refused

F4. Did you receive an incentive for **[INSERT MEASURE TYPE FROM F2]?**

1. Yes **[PROBE AND RECORD]**
2. No
98. Don't Know
99. Refused

F5. How influential would you say the wattsmart Home Energy Savings program was in your decision to add the **[INSERT MEASURE FROM F2]** to your home? Please choose from one of these options: **[REPEAT FOR EACH MEASURE LISTED IN F2]**

1. Highly Influential
2. Somewhat Influential
3. Not very influential
4. Not at all influential
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

G. Household Characteristics

Before we conclude the survey, I have a few more questions regarding some information about your household. Please be advised that responses to these questions will be kept strictly confidential and you may opt to refuse to answer any proceeding question.

G1. What is the fuel used by your primary water heater?

1. Electric
2. Natural Gas
3. Fuel oil
4. Other **[OPEN ENDED, WRITE RESPONSE]**
98. Don't know
99. Refused

G2. Approximately how many square feet is your home? **[READ LIST IF NEEDED]**

1. Under 1,000 square feet
2. 1,000 – 1,500 square feet
3. 1,501 – 2,000 square feet
4. 2,001 – 2,500 square feet
5. Over 2,500 square feet
98. **[DO NOT READ]** don't know
99. **[DO NOT READ]** refused

G3. How many showers are in your home?

1. _____ **[RECORD]**
98. (Don't know)
99. (Refused)

G4. How many bathroom sinks are in your home?

1. _____ **[RECORD]**
98. (Don't know)
99. (Refused)

G5. Including yourself and any children, how many people currently live in your home?

1. _____ **[RECORD]**
98. Don't Know
99. Refused

G6. **[ASK ONLY IF G5.1> 1]** Are any of the people living in your home dependent children under the age of 18?

1. Yes
2. No
98. Don't Know
99. Refused

H. Conclusion

H1. That concludes the survey. Do you have any additional feedback or comments?

1. Yes **[RECORD VERBATIM]**
2. No
98. Don't know
99. refused

Thank you very much for your time and feedback. Have a great day.

CADMUS

Appendix B. Lighting Impacts

This appendix contains further details on the following lighting topics that are introduced in the main body of the report:

1. Hours of Use (HOU)
2. Delta Watts
3. Cross-Sector Sales
4. Demand Elasticity Modeling

Where applicable, Cadmus followed the Uniform Methods Protocol for lighting impact evaluations.[1]

HOU

Cadmus estimated CFL and LED HOU using a multistate modeling approach, built on light logger data collected from two states: Missouri and Maryland. Missouri and Maryland metering data were also employed in the previous 2011-2012 evaluation, however, since both states continued to meter since the prior evaluation, Cadmus used the most recent data available from these states. The metering dataset consisted of a total of 2,274 loggers.

Cadmus chose these studies for the following reasons:

- The majority of the data used in the 2011-2012 evaluation was collected in 2010. Upstream lighting programs feature customer engagement and educational components as well as providing incentives for efficient lighting products. Updating data sources captures changes in behaviors over time as a result of these components.
- These extended studies also accounted for CFLs and LEDs separately, which allows Cadmus to estimate HOU for each lighting technology. Prior metering data did not account for this breakout as LEDs were much rarer a few years ago.
- These two studies employed a sampling strategy that prioritized rooms where efficient lighting is most likely to be installed.
- The total number of loggers was greater than the five combined studies from the previous evaluation (2,274 compared to 2,106 in 2011-2012). This allowed Cadmus to choose the most recent and representative studies without sacrificing precision with smaller numbers of loggers.

Missouri and Maryland Metering Protocol

Following whole-house lighting audits, Cadmus installed up to 10 light meters on randomly selected lighting fixture groups, targeting incandescents, CFLs, and medium screw-based LEDs. To ensure unbiased installations, Cadmus used an iPad tool to randomly select fixtures receiving the meters. The iPad tool assigned meter installations based on room priorities, with the first five meters assigned to

[1] Available online at: http://www1.eere.energy.gov/wip/pdfs/53827-6.pdf

each of five priority room types (e.g., living area, dining room, kitchen, master bedroom, bathroom). The remaining five meters were randomly assigned to any fixture in any non-priority room (e.g., secondary bedrooms, closet, hall, basement, office, laundry, mechanical). Randomly assigning meters in this manner sought to improve precision around priority rooms (where most lamps are installed).

Data from the removal site visits were incorporated into the iPad tool and database to augment the installation information for each site and meter. As part of the lighting logger removal process, technicians conducted a series of pre-removal meter diagnostics, which included the following:

- Completing a logger state test (which determined if the meter functioned properly and whether ambient light affected the meter's operation);
- A visual review of the total time the logger recorded the fixture switched to on;
- Verbal verification from the customer that they used the light fixture;
- Verbal verification from the customer that the logger remained in place for the study's duration; and
- Recording the condition of the logger and battery status.

Model Specification

To estimate HOU, Cadmus determined the total "on" time for each individual light logger per day, using the following guidelines:

- If a light logger did not record any light for an entire day, the day's HOU was set to zero.
- If a light logger registered a light turned on at 8:30 p.m. on Monday and turned off at 1:30 a.m. on Tuesday morning, 3.5 hours were added to Monday's HOU and 1.5 hours to Tuesday's HOU.

Cadmus modeled daily HOU as a function of room type using an analysis of covariance (ANCOVA) model.

ANCOVA models are regression models that model a continuous variable as a function of a single, continuous, explanatory variable and a set of binary variables. This way, an ANCOVA model simply serves as an analysis of variance (ANOVA) model with a continuous explanatory variable added.

Cadmus chose this specification due to its simplicity, making it suitable in a wide variety of contexts. Though the model lacked the specificity of other methods, it offered estimates not nearly as sensitive to small differences in explanatory variables (compared to more complex methods). Therefore, these models could produce consistent estimates of average daily HOU for a given region, using the specific distribution of bulbs by room.

Cadmus specified final models as cross-sectional, ANCOVA regressions:

$$Average\ Daily\ HOU = \beta_1 * \text{Basement} + \beta_2 * \text{Bathroom} + \beta_3 * \text{Bedroom} + \beta_4 * \text{Closet} + \beta_5 * \text{Dining} + \beta_6 * \text{Foyer} + \beta_7 * \text{Garage} + \beta_8 * \text{Hallway} + \beta_9 * \text{Kitchen} + \beta_{10} * \text{Living Space} + \beta_{11} * \text{Office} + \beta_{12} * \text{Outdoor} + \beta_{13} * \text{Storage} + \beta_{14} * \text{Utility} + \beta_{15} * \text{Other} + \beta_{16} * \text{SinHOU}$$

Where:

Basement	=	a dummy variable equal to 1, if the bulb is in the basement, and 0 otherwise;
Bathroom	=	a dummy variable equal to 1, if the bulb is in the bathroom, and 0 otherwise;
Bedroom	=	a dummy variable equal to 1, if the bulb is in a bedroom, and 0 otherwise;
Closet	=	a dummy variable equal to 1, if the bulb is in the closet, and 0 otherwise;
Dining	=	a dummy variable equal to 1, if the bulb is in the dining room, and 0 otherwise;
Foyer	=	a dummy variable equal to 1, if the bulb is in the foyer, and 0 otherwise;
Garage	=	a dummy variable equal to 1, if the bulb is in the garage, and 0 otherwise;
Hallway	=	a dummy variable equal to 1, if the bulb is in the hallway, and 0 otherwise;
Kitchen	=	a dummy variable equal to 1, if the bulb is in the kitchen, and 0 otherwise;
Living Space	=	a dummy variable equal to 1, if the bulb is in the living space, and 0 otherwise;
Office	=	a dummy variable equal to 1, if the bulb is in an office, and 0 otherwise;
Outdoor	=	a dummy variable equal to 1, if the bulb is outdoors, and 0 otherwise;
Storage	=	a dummy variable equal to 1, if the bulb is in a storage room, and 0 otherwise;
Utility	=	a dummy variable equal to 1, if the bulb is in the utility room, and 0 otherwise;
Other	=	a dummy variable equals to 1, if the bulb is in a low-use room (such as a utility room, laundry room, or closet), and 0 otherwise; and
SinHOU	=	amplitude of sinusoid function.

As not all loggers collected a full year of data, Cadmus estimated an annual average HOU for all lamps, fitting the data to a sinusoidal curve that represented changes in the hours of available daylight per day.[2]

Cadmus tested the potential influences of other demographic and day type variables in model specifications, such as: home characteristics and weekend/weekday. These variables, however, were not included as their estimated coefficients did not differ significantly from zero or produced signs inconsistent with expectations.

Final Estimates and Extrapolation

Cadmus used these model parameters to predict average daily use by taking the sum of the product of each coefficient shown in Table B1 and its corresponding average independent variable.

[2] Page 15 of the Uniform Methods Protocol for lighting impact evaluations recommends using the sinusoidal annualization approach due to the strong relationship between daylight hours and lighting usage observed in a large number of studies. Available online at: http://www1.eere.energy.gov/wip/pdfs/53827-6.pdf

Table B1. HOU Model Coefficients and Significance

Parm	Estimate	Stderr	LowerCL	UpperCL	Z	ProbZ
Basement	2.01	0.46	1.10	2.93	4.33	<.0001
Bathroom	1.38	0.12	1.14	1.62	11.08	<.0001
Bedroom	1.28	0.08	1.13	1.43	16.42	<.0001
Closet	0.49	0.08	0.34	0.63	6.46	<.0001
Dining	1.40	0.16	1.09	1.71	8.92	<.0001
Foyer	2.02	1.35	-0.63	4.68	1.49	0.1352
Garage	1.47	0.48	0.52	2.41	3.03	0.0024
Hallway	1.21	0.17	0.87	1.55	6.99	<.0001
Kitchen	3.25	0.26	2.74	3.76	12.56	<.0001
Living_Space	2.21	0.16	1.89	2.52	13.64	<.0001
Office_Den	1.36	0.21	0.95	1.77	6.44	<.0001
Other	1.12	0.37	0.40	1.84	3.07	0.0022
Outdoor	2.39	0.43	1.55	3.23	5.58	<.0001
Storage	0.07	0.02	0.03	0.11	3.42	0.0006
Utility	0.95	0.25	0.46	1.43	3.79	0.0001

Table B2 shows independent variables used, calculated from participant survey responses when asked which rooms respondents' installed bulbs in.

Table B2. HOU Estimation Input Values

Variable	CFL Value	LED Value
Bedroom	17%	17%
Basement	5%	2%
Bathroom	14%	13%
Closet	7%	1%
Dining	6%	5%
Foyer	0%	0%
Garage	4%	6%
Hallway	4%	5%
Kitchen	12%	18%
Office/Den	2%	3%
Living Space	19%	20%
Storage	0%	1%
Outdoor	4%	5%
Utility	1%	0%
Other	6%	4%

Using these values, the equation calculated a 1.73 average daily HOU for CFLs and 1.90 for LEDs.

The lower HOU values for 2013–2014 likely resulted from increased saturations of efficient bulbs. As the efficient lighting market matures and the saturation increases within the average home, efficient lamps become installed in lower-use sockets, whether in rooms with lower usage or in supplemental lighting (such as desk lamps).

The survey responses indicated changes in the proportion of bulbs installed in various rooms between the 2011-2012 cycle and the current evaluation. The proportion of bulbs installed in outdoor fixtures dropped in 2013 and 2014 as compared to 2011-2012, from 30% to 4% for CFLs and 5% for LEDs. This drop is significant because the average HOU for outdoor fixtures was 2.39 hours per day, which is higher than any room other than kitchens.

Conversely, the "Other" category (e.g., closets, hallways, garages, dining, home office, and utility or storage rooms) exhibited a large increase, to 30% in 2013-2014 compared to 7% in previous evaluations. As many rooms types in the "Other" category include those with a lower average HOU, an increase in the proportion of bulbs installed in these room types lowers the overall average HOU.

Delta Watts Lumen Bins

Table B3 through Table B11 provide lumen bins by lamp types applied in the gross evaluated lighting evaluation (CFLs, LEDs, and light fixtures). The tables include evaluated baseline wattages by year and total lamp quantities sold in 2013–2014.

Table B3. Lumen Bins and Quantities for Standard Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Estimated CFL Efficient Wattage	Estimated LED Efficient Wattage	Lamp Quantity
0–309	25	25	1–5	1-4	0
310–449	25	25	6–7	5-6	112
450–799	40	29	8–12	7-10	5,429
800–1,099	60	43	13–17	11-14	95,282
1,100–1,599	53	53	18–24	15-20	15,916
1,600–1,999	72	72	25–30	21-24	19,482
2,000–2,600	72	72	31–38	25-32	1

Table B4. Lumen Bins and Quantities for Globe Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity*
250–349	25	25	9
350–499	40	29	597
500–574	60	43	273
575–649	53	53	623
650–1099	72	72	2,057
1100–1300	72	72	0

*Cadmus was unable to evaluate 150 globe lamps with less than 250 lumens

Table B5. Lumen Bins and Quantities for Decorative Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
70–89	10	10	0
90–149	15	15	0
150–299	25	25	22
300–499	40	29	811
500–699	60	43	0

Table B6. Lumen Bins and Quantities for EISA-Exempt Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
310–449	25	25	0
450–799	40	40	0
800–1099	60	60	0
1100–1599	75	75	0
1600–1999	100	100	31
2000–2600	150	150	62

Table B7. Lumen Bins and Quantities for D > 20 Reflector Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
300–639	30	30	421
640–739	40	40	3,777
740–849	45	45	1,649
850–1179	50	50	63
1180–1419	65	65	936
1420–1789	75	75	0
1790–2049	90	90	0
2050–2579	100	100	0
2580–3429	120	120	0

Table B8. Lumen Bins and Quantities for BR30, BR40, ER40 Reflector Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
300–399	30	30	0
400–449	40	40	0
450–499	45	45	0
500–649	50	50	0
650–1179	65	65	523
1180–1419	65	65	0
1420–1789	75	75	0
1790–2049	90	90	0
2050–2579	100	100	0
2580–3429	120	120	0

Table B9. Lumen Bins and Quantities 20 ≥ D > 18 Reflector Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
300–539	20	20	3
540–629	30	30	0
630–719	40	40	0
720–999	45	45	0
1000–1199	50	50	0
1200–1519	65	65	0
1520–1729	75	75	0
1730–2189	90	90	0
2190–2899	100	100	0

Table B10. Lumen Bins and Quantities for R20 Reflector Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
300–399	30	30	0
400–449	40	40	8
450–719	45	45	3
720–999	50	50	0
1000–1199	65	65	0
1200–1519	75	75	0
1520–1729	90	90	0
1730–2189	100	100	0
2190–2899	120	120	0

Table B11. Lumen Bins and Quantities for 18 ≥ D Reflector Lamps

Lumen Bin	2013 Baseline Wattage	2014 Baseline Wattage	Lamp Quantity
200-299	20	20	0
300-399	30	30	0
400-449	40	40	0
450-499	45	45	0
500-649	50	50	0
650-1199	65	65	0

Figure B1 displays 2014 baseline wattage plotted as a function of lumen output for standard, globe, decorative, and EISA-exempt lamps, as well as the three most common reflector types. This figure shows this correlation up to 2000 lumens (only 0.03% of lamps had lumen output greater than 2000 lm).

Figure B1: Plot of 2014 Baseline Wattage vs. Lamp Lumens for Various Lamp Types

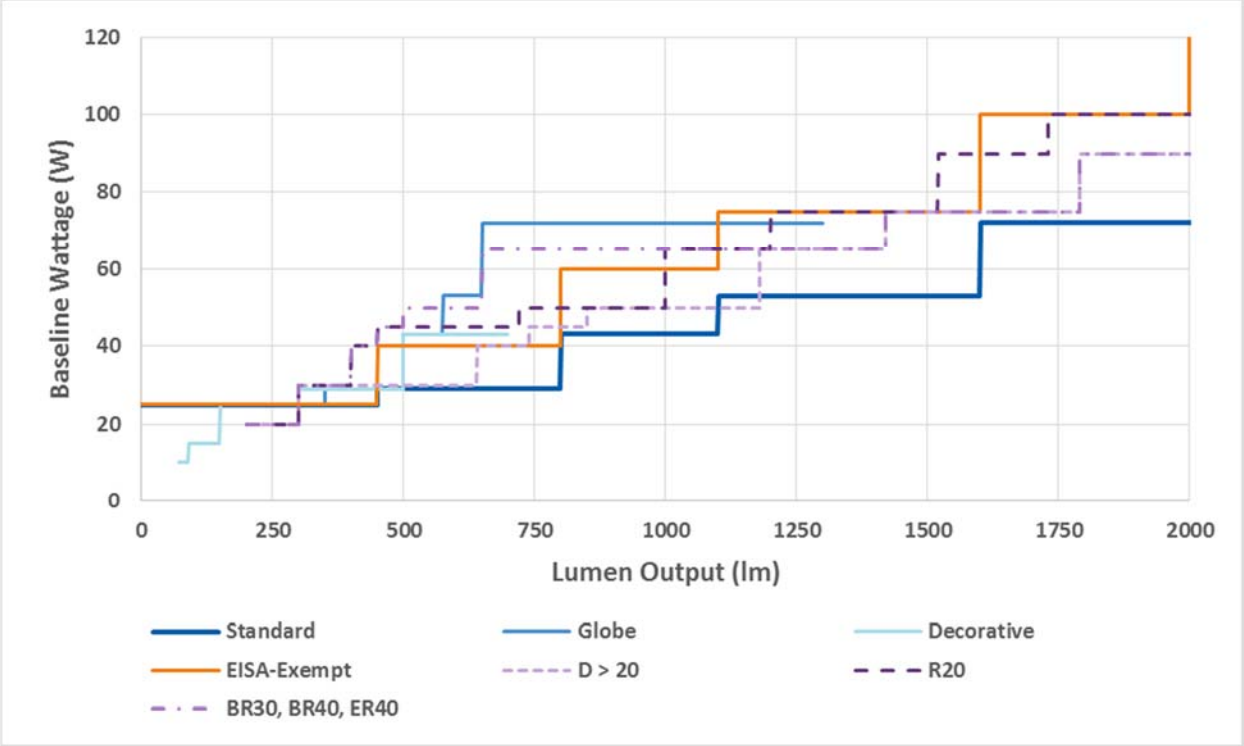
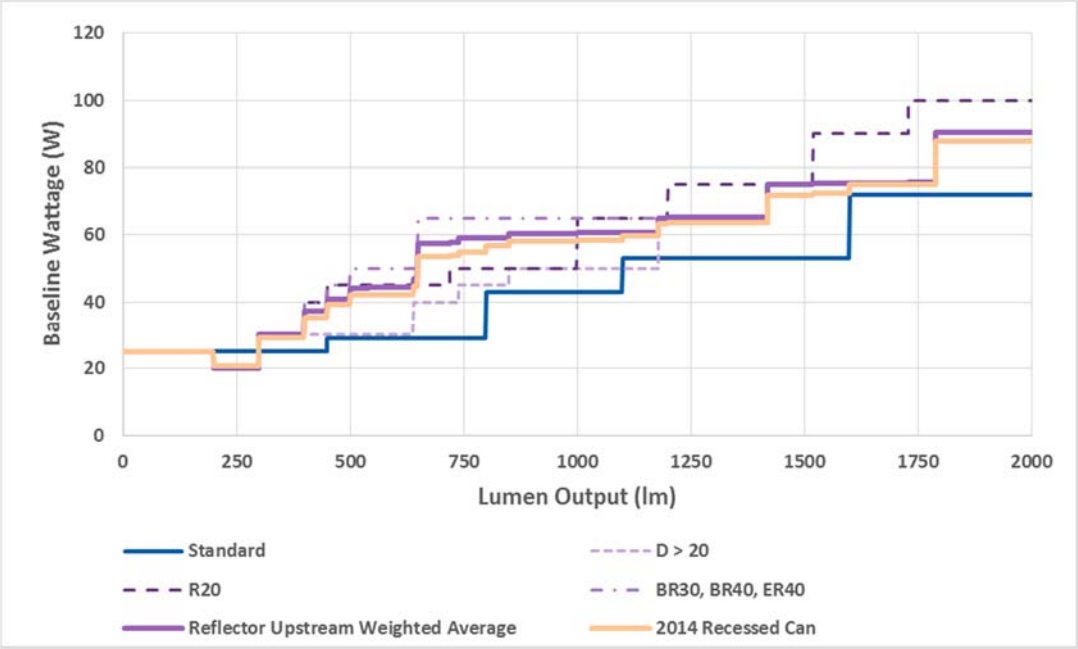


Figure B2 also displays lumen bins and baseline wattages for standard bulbs and the three most common reflector types. It also displays the average combined reflector lumen bins, weighted by quantities, and the average recessed can lumen bins, weighted by bulb type saturation in recessed can receptacles. Standard and recessed can baseline wattages reflect 2014 values.

Figure B2: Plot of Cadmus-created Weighted Reflector and 2014 Recessed Can Baseline Wattages



Watts vs. Lumen ENERGY STAR Linear Fits

Figure B3 through Figure B10 show watts versus lumens from the ENERGY STAR database for eight different lamp categories. Standard, reflector, and specialty LED and CFL lamps are represented. When lumens could not be determined for a particular model of bulb, these linear fits were used to obtain that bulb's lumen output.

Figure B3: Median Lumens vs. Wattage for ENERGY STAR-Qualified Standard CFLs

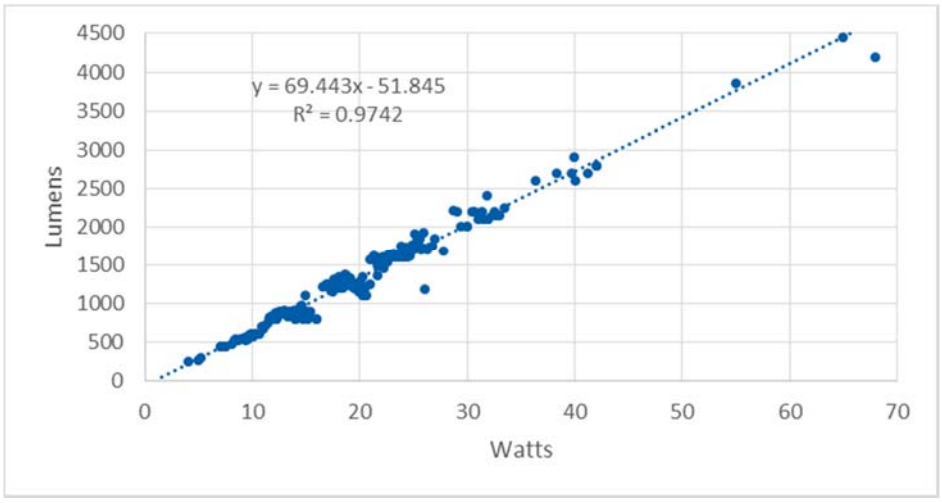


Figure B4: Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector CFLs

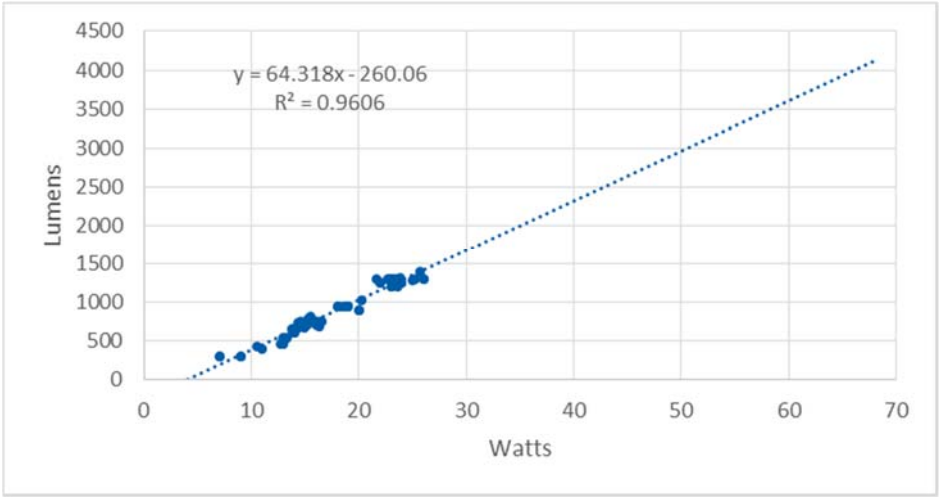


Figure B5: Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty CFLs

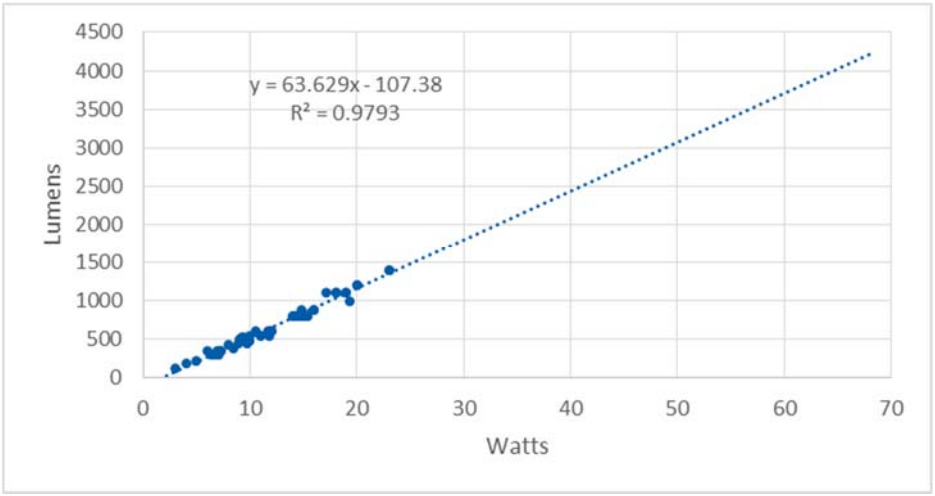


Figure B6: Median Lumens vs. Wattage for ENERGY STAR-Qualified CFL Fixtures

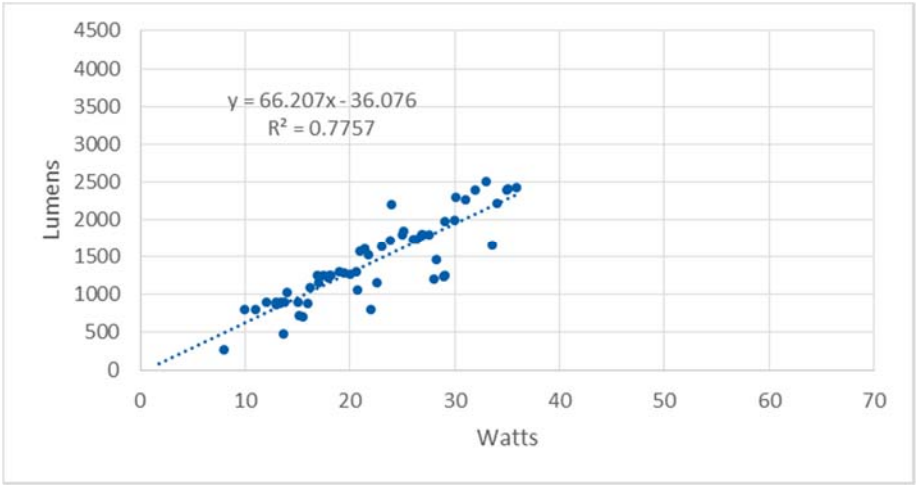


Figure B7: Median Lumens vs. Wattage for ENERGY STAR-Qualified Standard LEDs

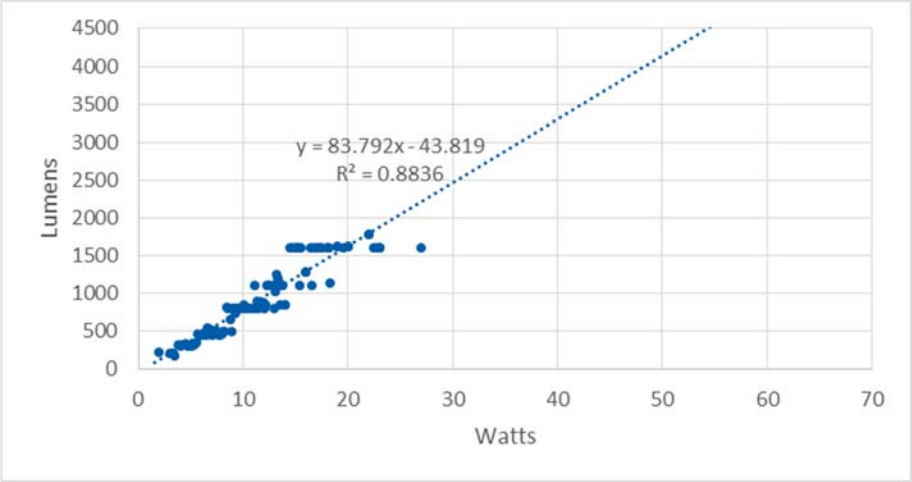


Figure B8: Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector LEDs

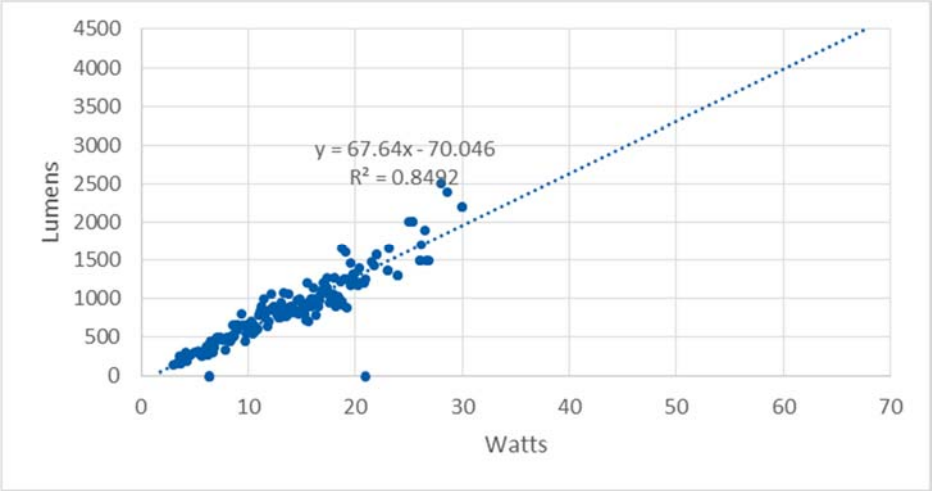


Figure B9: Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty LEDs

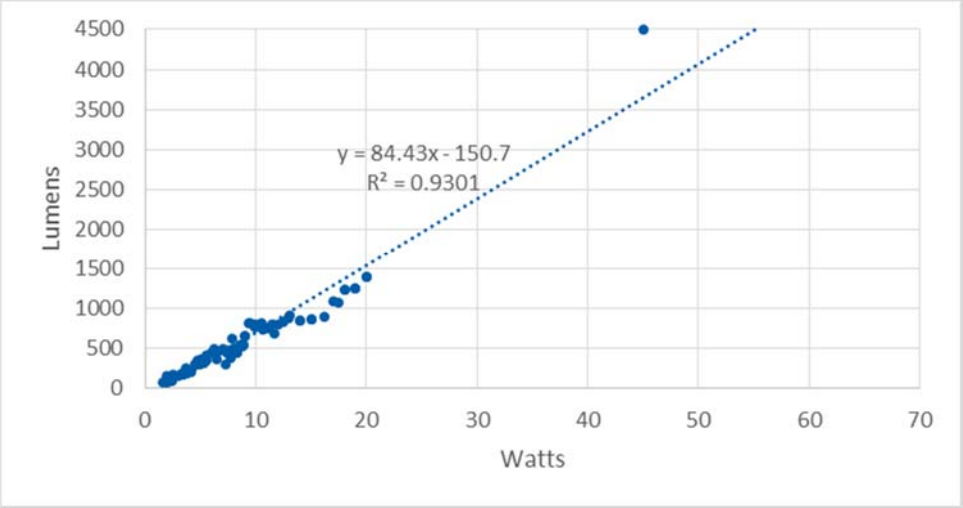
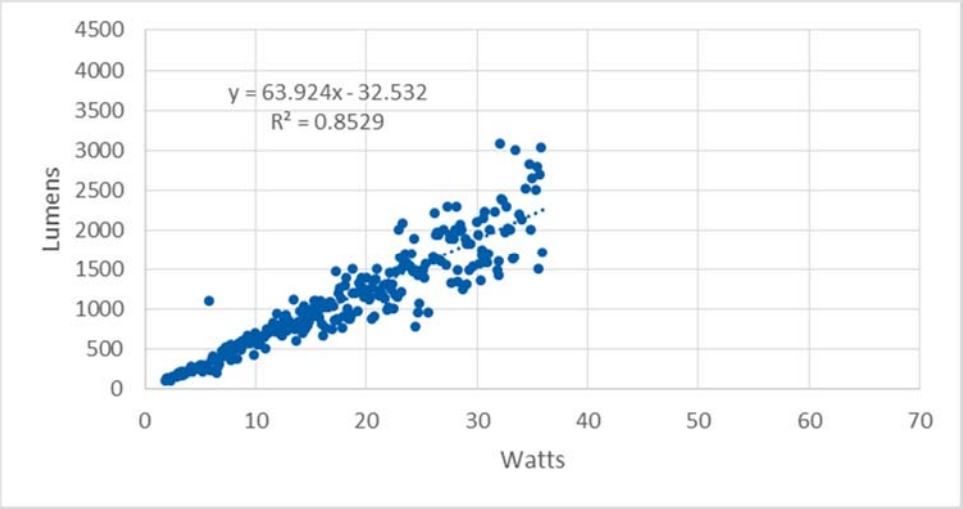


Figure B10: Median Lumens vs. Wattage for ENERGY STAR-Qualified LED Fixtures



Cross-Sector Lighting Sales

Cadmus performed intercept surveys in Utah, Washington, and Idaho to collect information from customers about efficient bulb purchases and whether they intended to install these bulbs in residential or commercial applications, then using these data to calculate a cross-sector sales percentage. Cadmus combined the data from the three states to maximize the confidence and precision around the estimate. The estimated cross-sector lighting sales factor not applied to the gross savings analysis for this evaluation.

During these surveys, field staff intercepted customers as they left stores if they purchased lighting products from a participating retail; staff asked customers questions addressing their efficient bulb purchases. For cross-sector sales purposes, staff asked customers about their intentions to install the purchased bulbs in residential or commercial applications. Table B12 summarizes respondent results. In total, Cadmus completed 630 surveys, and 363 of the respondents purchased one or more efficient bulbs. Of all respondents, 347 said they intended to install their bulbs in residential applications and 16 intended to install them in commercial applications.

Table B12. Cross-Sector Respondent Counts

Respondent Count	Application	
	Residential	Commercial
CFL	125	10
LED	227	6
CFL or LED	347	16
Total Respondents*		**363**

*Results aggregated across three states: interviews were conducted in Utah, Washington, and Idaho, but only one respondent intended to install bulbs in commercial applications in Washington and Idaho.

Table B13 summarizes the quantity of bulbs purchased by respondents. In total, respondents intended to install 1,536 CFLs and LEDs in residential applications and 62 in commercial applications.

Table B13. Cross-Sector Bulb Counts

Bulb Count	Application	
	Residential	Commercial
CFLs	632	50
LEDs	904	12
Total Bulbs	**1,536**	**62**

Cadmus used the bulb quantities shown in Table B13 to calculate a cross-sector sales percentage of 3.9% using the following equation:

$$\frac{Commercial\ CFLs\ \&\ LEDs}{All\ CFLs\ \&\ LEDs} = \frac{62}{1{,}598} = 3.9\%$$

The denominator in the equation represents the total number of efficient bulbs installed in residential and commercial facilities (1,536 + 62 = 1,598). Cadmus determined a 90% confidence interval of 2.2%–5.5% for the cross-sector sales percentage of 3.9%.

Demand Elasticity Modeling

As lighting products incur price changes and promotion over the program period, they provide valuable information regarding the correlation between sales and prices. Cadmus developed a demand elasticity model to estimate freeridership for the upstream markdown channel in program years 2013 and 2014. A description follows detailing the methodology and analysis results.

Because of the relatively small size of the programs in Rocky Mountain Power's Idaho service territory, Cadmus combined the data from all Rocky Mountain Power states when estimating the price elasticity model (Idaho, Utah, and Wyoming). This increased the number of observations with which to estimate price elasticities and the representativeness of the mix of bulbs and retailers with observed price variation. This was especially important for Idaho, as the observations with price variation were limited to only CFL bulbs.

The modeling process is described below that was used to estimate price elasticities. The elasticity estimates from the overall model are then applied to the average markdown levels observed in the Idaho sales by bulb technology. Using the formula for a price elasticity:

$$Elasticity = \frac{\Delta Quantity\%}{\Delta Price\%}$$

The net sales lift (ΔQuantity%) is equal to Elasticity times the markdown (ΔPrice%).

Demand Elasticity Methodology

Demand elasticity modeling draws upon the same economic principle that drives program design: changes in price and promotion generate changes in quantities sold (i.e., the upstream buy-down approach). Demand elasticity modeling uses sales and promotion information to achieve the following:

- Quantify the relationship of price and promotion to sales;
- Determine likely sales levels without the program's intervention (baseline sales); and
- Estimate freeridership by comparing modeled baseline sales with actual sales.

After estimating variable coefficients, Cadmus used the resulting model to predict the following:

- Sales that would occur *without* the program's price impact; and
- Sales that would occur *with* the program (and should be close to actual sales with a representative model).

Once the model predicted sales that would occur with and without the program, Cadmus applied evaluated savings values, calculated as part of this evaluation.

Input Data

As the demand elasticity approach relies exclusively on program data, a model's robustness depends on data quality. Though, overall, available data achieved a sufficient quality to support the analysis, the data also presented several issues of note:

1. Inconsistent model numbers between 2013 and 2014.
2. Lack of schedule ID number in 2013 data.
3. Inconsistent bulb type designations within each model number (e.g., spiral and candelabra, reflector and general purpose spiral/a-line).
4. Inconsistent reported quantities within a given sales period.

Cadmus had to make the most reasonable assumptions possible when preparing the data to support the analysis (e.g., assessing whether two model numbers with different formats and detail levels were the same).

Price Variation

As desired for analysis, sales data displayed relatively high amounts of price variations. Variation was measured within unique part number/retailer location combinations: that is, a given bulb model within a unique retail location.

Promotional Displays

The program administrator, did not collect and could not provide detailed data on product merchandising (e.g., clip strips, end caps, pallet displays). Therefore, the model may not have captured all program impacts.[3]

Evaluations in other jurisdictions have found that product merchandising can generate sales lift between 60% and 120%. Capturing and providing this level of detail ensures that the program is credited for all activities.

Stocking Patterns

In preparing to model the sales data, Cadmus observed dramatic sales drops that did not correspond to programmatic activity or to expected seasonal variation. Cadmus' model implicitly assumed supply would meet demand at the given price. Analysis included screening the data for instances where this assumption appeared untrue.

Cadmus looked for patterns in these drops that suggested changes in stocking patterns or retailers temporarily unable to stock certain products. The following criteria served to flag changes in stocking patterns:

1. **Average monthly sales for a product were greater than 10 packs**. For those fewer than 10 packs per month, Cadmus assumed it would be more likely that some months would have zero sales.[4]
2. **Two-thirds of monthly observations of the same product across multiple store locations proved less than one pack.**[5] For example, if a 13-watt GE spiral CFL was sold at 18 different store locations, and 14 locations had sales of less than one pack during the month of June.

If products met both criteria, Cadmus flagged them as out of stock and included a binary variable in the model to control for such drops and to separate this effect from price changes. Not doing so could have biased elasticity estimates.

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[3] To the degree that product merchandising and prices co-vary, elasticity estimates may capture some sales lift generated by merchandising. However, as data were not available to incorporate into the model, it impossible to estimate separate impacts.

[4] The 10 packs cutoff assumed that products with average monthly sales fewer than 10 would be more likely to have months with zero sales due to naturally occurring variability.

[5] Because the sales data are reported at intervals that do not follow regular calendar months, the sales are transformed to daily sales and then aggregated by calendar month. This leads to fractional package sales within a given month though overall quantities remain the same.

Seasonality Adjustment

In economic analysis, it proves critical to separate data variations resulting from seasonality from those resulting from relevant external factors. For example, suppose prices had been reduced on umbrellas at the beginning of the rainy season. Any estimate of this price shift's impact would be skewed if the analysis did not account for the natural seasonality of umbrella sales.

To adjust for seasonal variations in sales, Cadmus used a monthly seasonal trend provided by an evaluation partner. This represented national sales from a major lighting products manufacturer. Ideally, a trend would derive from historical data on aggregate sales of lighting products (e.g., inefficient and efficient, program and non-program). Such data would represent overall trends in lighting product sales and would not suffer from potential confounding with programmatic activity to the same degree as CFL sales.[6] The trend, however, indicated aggregated, nationwide CFL sales for a specific manufacturer.

Presumably, the trend included some activity from programs across the nation, which could affect the sales trend, potentially leading to underestimated program impacts. Cadmus assumed, however, that program activity would be somewhat random across all programs that could be included in the sales data used to develop the trend. In that case, program activity would be spread through the year, and the variation between months would be driven primarily by non-program factors.

Nevertheless, not controlling for seasonal variations could lead to program impacts overestimated by falsely attributing seasonal trends to price impacts (to the degree that they co-varied) or vice versa.

For example, sales in July tend to be lower (presumably due to longer daylight hours); so if program activity increased sales in July, not controlling for seasonal variation would underestimate the program's impact. October, on the other hand, sees higher sales, and no control for seasonality would likely overestimate program activity impacts occurring in that month.

The trend, given the national aggregation level, covered non-program products and areas without programs, therefore limiting the degree that the trend correlated with program activity. Absent primary seasonal data from Idaho's territory, Cadmus estimated model and subsequent freeridership ratios using the CFL trend.

Model Specification

Cadmus modeled bulb, pricing, and promotional data using an econometric model, addressing these data as a panel, with a cross-section of program package quantities modeled over time as a function of prices, promotional events, and retail channels. This involved testing a variety of specifications to

[6] This assumes aggregate lighting sales did not change due to promotions; that is, customers simply substituted an efficient product for an inefficient one. While bulb stockpiling could occur during programmatic periods, this should smooth out over time, as the program would not affect the number of sockets in the home.

ascertain price impacts—the main instrument affected by the program—on bulb demand. Cadmus estimated the following equation for the model (for bulb model *i*, in month *t*):

$$\ln(Q_{it}) = \sum_{\pi}(\beta_{\pi} ID_{\pi,\mathrm{i}}) + \sum_{\theta}(\beta_{\theta 1}[ln(P_{it}) * (Retail\ Channel_{\theta,\mathrm{i}})]) + \sum_{\theta}(\beta_{\theta 2}[ln(P_{it}) * (Bulb\ Type_{\theta,\mathrm{i}})]) + \beta_{\theta 3} ln(P_{it}) * (Specialty_{\theta,\mathrm{i}}) + \beta_{\theta 4}(Out\ of\ Stock_{\theta,\mathrm{i}}) + \alpha Seasonal\ Trend_{t} + \varepsilon_{i}$$

Where:

ln	=	Natural log
Q	=	Quantity of bulb packs sold during the month
P	=	Retail price (after markdown) in that month
Retail Channel	=	Retail category (Club or non-Club store)
Bulb Type	=	Product category (CFL or LED)
Specialty	=	Dummy variable equaling 1 for specialty bulbs and 0 for standard
Out of Stock	=	Dummy variable equaling 1 if a given product was assumed to have been out of stock in month t and 0 otherwise
ID	=	Dummy variable equaling 1 for each unique retail channel and SKU; 0 otherwise
Seasonal Trend	=	Quantitative trend representing the impact of secular trends not related to the program[7]
ε_{it}	=	Cross-sectional random-error term

The model specification assumed a negative binomial distribution, which served as the best fit of the plausible distributions (e.g., lognormal, poisson, negative binomial, gamma). The negative binomial distribution provided accurate predictions for a small number of high-volume sale bulbs, while the other distributions under predicted sales for those bulbs.

Cadmus adjusted the model to correct for the two factors discussed earlier:

- **Seasonality**: To account for baseline lighting sales tending to follow a seasonal pattern, unrelated to price or promotion, by inserting a seasonal trend into the model.
- **Stocking Patterns**: The model assumed supply would always meet demand; after investigating situations where this did not occur, Cadmus controlled for instances where two-thirds or more of monthly observations for the same product with less than one package within a given month.

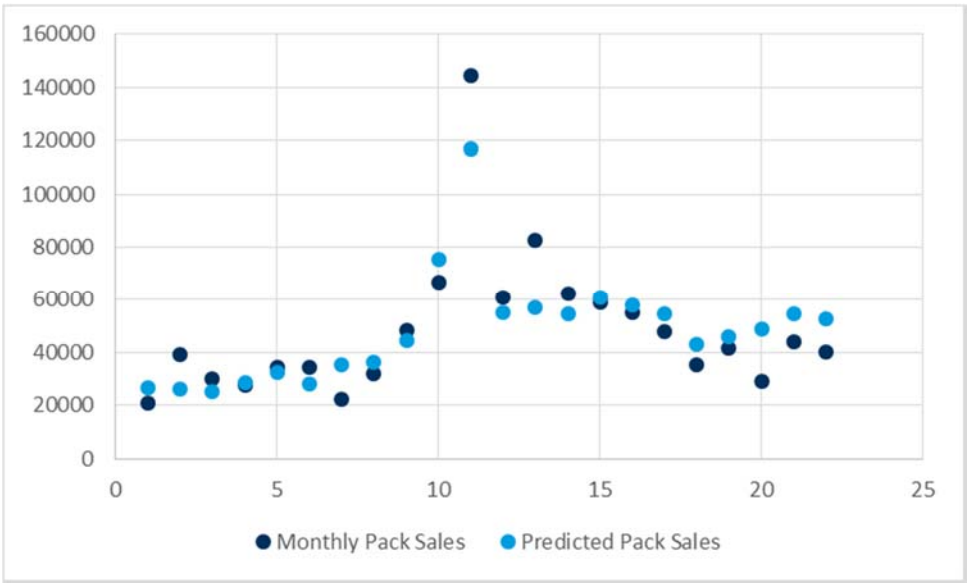
[7] The time trend for this analysis represented shifts in sales due to non-program-related seasonality.

Using the following criteria, Cadmus ran numerous model scenarios to identify the one with the best parsimony and explanatory power:

- Model coefficient p-values (keeping values less than <0.1);[8]
- Explanatory variable cross-correlation (minimizing where possible);
- Model Akaike's Information Criteria (AIC) (minimizing between models);[9]
- Minimizing multicollinearity; and
- Optimizing model fit.

The model's fit can be examined by comparing model-predicted sales with actual sales. As shown in Figure B11, the model-predicted sales matches very closely with actual sales. The model under predicted a couple of months, but it also over predicted a couple of months without persistent bias in a single direction (over- or under-predicting), indicating the model fit the data well. Overall, the model fell within 0.4% of actual sales.

Figure B11. Predicted and Actual Sales



Findings

Cadmus estimated a combined CFL and LED net of freeridership of 54%. Table B14 shows the estimated freeridership ratio by bulb type. LEDs have higher freeridership than CFLs.

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[8] Where a qualitative variable had many states (such as bulb types), Cadmus did not omit variables if one state's was insignificant; rather, the analysis considered the joint significance of all states.

[9] The Team used AIC to assess model fit, as nonlinear models do not define the R-square statistic. AIC also offers a desirable property in that it penalizes overly complex models, similarly to the adjusted R-square.

Table B14. Modeling Results by Bulb Type

Bulb Type	Freeridership
CFL	45%
LED	69%

Table B15 shows the incentive as a share of the original retail price and the estimated net of freeridership ratio by utility and bulb type. Typically, the proportional price reduction and the net of freeridership trend correlate: the higher the incentive, the lower the freeridership. This is particularly apparent in this case. The average markdown for LED bulbs was only 21% which results in an estimated freeridership ratio of 69%. Because of the low markdown for LEDs, the program only generated a net sales lift of 31% for LEDs.

Table B15. Modeling Results by Bulb Type

Bulb Type	Final Price per Bulb	Original Price per Bulb	Markdown %	Net of FR
CFL	$ 0.98	$ 2.09	53%	55%
LED	$ 8.63	$10.93	21%	31%

Elasticities

The net of freeridership ratios derived from the estimate of a price elasticity of demand. Price elasticity of demand measures the percent change in the quantity demanded, given a percent change in price. Due to the model's logarithmic functional form, these simply represented the coefficients for each price variable. In previous, similar analyses, Cadmus had seen elasticities range from -1 to -3 for CFLs, meaning a 10% drop in price led to a 10% to 30% increase in the quantity sold. As shown in Table B16, non-club elasticity estimates fell a bit below the expected ranges, with some estimates less than one, but, on average, estimates fell within the expected range.

Table B16. Elasticity Estimates by Retail Channel and Bulb Type

Store Type	Bulb Type	Elasticity
Club Store	CFL-Specialty	-1.15
Club Store	CFL-Standard	-1.00
Club Store	LED-Specialty	-1.86
Club Store	LED-Standard	-1.71
Non-Club	CFL-Specialty	-0.92
Non-Club	CFL-Standard	-0.76
Non-Club	LED-Specialty	-0.90
Non-Club	LED-Standard	-0.74

Net of Freeridership Comparisons

Table B17 compares CFL net of freeridership estimates from several recent evaluations using the elasticity model approach. The table also shows the average, sales-weighted, original retail price of

program bulbs and the incentive as a share of the original price, as the percent of markdown serves as a large driver to freeridership estimates.

Though the net of freeridership estimates for Rocky Mountain Power fell within the range of those observed in other programs, they decreased since the 2011–2012 modeling effort, though markdown levels were down to 53%, from 63% in the prior evaluation cycle. Another potential factor in the decline may be from the maturation of the efficient lighting market. As CFLs become a more familiar and accepted technology, demand may become less elastic—that is, for consumers willing to substitute CFLs for less-efficient bulbs, their willingness to buy CFLs will become less variable. For those less inclined to substitute CFLs, their decision may remain the same, regardless of price changes.

A lack of merchandising data could present another potential factor. Without data to explicitly control for sales lift due to merchandising, price elasticity estimates may absorb some impacts of product merchandising to a degree that merchandising and price changes co-vary. This could lead to larger elasticity estimates when merchandising and prices positively correlate or lower elasticity estimates when they negatively correlate.

Table B17. Comparisons of CFL Net of Freeridership and Incentive Levels

Utility	Bulb Type	Original Price per bulb	Markdown per bulb	Markdown %	Net of Freeridership
Rocky Mountain Power Idaho 2011-2012	Standard	$2.27	$1.43	63%	66%
Mid-Atlantic Utility 1	Standard	$1.97	$1.41	72%	73%
Mid-Atlantic Utility 3	Standard	$2.10	$1.59	76%	73%
New England	Standard	$2.11	$1.00	47%	68%
Mid-Atlantic Utility 2	Standard	$2.14	$1.43	67%	65%
Mid-Atlantic Utility 4	Standard	$2.22	$1.46	66%	65%
Rocky Mountain Power Idaho 2013-2014	**Standard**	**$2.09**	**$1. 11**	**53%**	**55%**
Midwest Utility	Standard	$1.82	$1.13	62%	57%
Southeast	Standard	$2.15	$1.09	51%	52%

CADMUS

Appendix C. HES Billing Analysis

Cadmus conducted three billing analyses to estimate gross and net savings for the following measures:

- Insulation (attic, wall, or floor)
- Ductwork (duct sealing and/or duct insulation)[1]

The following sections outline the methodology and results for each effort.

Insulation Billing Analysis

Cadmus conducted billing analysis to assess actual net energy savings associated with insulation measure installations.[2] Cadmus determined the savings estimate using a pooled, conditional savings analysis (CSA) regression model, which included the following groups:

- 2013–2014 insulation participants (combined attic, wall, and floor insulation); and
- Nonparticipant homes, serving as the comparison group.

The billing analysis resulted in a 102% net realization rate for insulation measures (a net result rather than gross as it compares participant usage trends to a nonparticipant group, accounting for market conditions outside of the program).

Insulation Program Data and Billing Analysis Methodology

Cadmus used the following sources to create the final database for conducting the billing analysis:

- ***Participant program data,*** collected and provided by the program administrator (including account numbers, measure types, installation dates, square footage of insulation installed, heat sources, and expected savings for the entire participant population).
- ***Control group data,*** which Cadmus collected from a census of approximately 45,000 nonparticipating customers in Idaho. Cadmus matched energy use for the control group to quartiles of the participants' pre-participation energy use to ensure comparability of the two groups. To ensure adequate coverage of the nonparticipating population, Cadmus included four times the number of nonparticipants than participants.
- ***Billing data***, provided by Rocky Mountain Power, which included all Idaho residential accounts. Cadmus matched the 2013–2014 participant program data to the census of Idaho's billing data for participants installing only insulation measures (i.e. did not install other measures through HES). Billing data included meter-read dates and kWh consumption from January 2012 through

[1] An Idaho specific billing analysis could not be performed because only 8 participants remained in the analysis. As a result Cadmus applied the Washington billing analysis realization rate to Idaho.

[2] Billing analysis performed for customers installing only attic, wall, or floor insulation measures.

August 2015. The final sample used in the billing analysis consisted of 39 participants and 156 control customers.

- ***Idaho weather data***, including daily average temperatures from January 2012 to August 2015 for 3 weather stations, corresponding with HES participant locations.

Cadmus matched participant program data with billing data, mapping daily heating degree days (HDDs) and cooling degree days (CDDs) to respective monthly read date periods using zip codes. Cadmus defined the billing analysis pre-period as 2012, before measure installations occurred. This meant defining the post-period as September 2014 through August 2015.[3]

Data Screening

To ensure the final model used complete pre- and post-participation and nonparticipant billing data, Cadmus selected accounts with the following:

1. Participant addresses matching to the billing data provided.
2. A minimum of 300 days in each of the pre- and post-periods (i.e., before the earliest installation, and after the latest reported installation in 2012).
3. More than 5,369 kWh per year or less than 33,310 kWh per year (the lowest and highest participant usage to remove very low- or high-usage nonparticipants).
4. Accounts showing a consumption change of less than 50% of pre-program usage, ensuring a better match between participants and the control group.
5. Expected savings under 70% of household consumption (i.e., accounts with a mismatch between participant database and billing data or with pre-period vacancies).

Cadmus also examined individual monthly billing data to check for vacancies, outliers, and seasonal usage changes. If the usage patterns remained inconsistent between pre- and post-periods, the analysis dropped accounts.

Table C1 shows participant and nonparticipant screening criteria used for the insulation billing analysis.

[3] As participants installing measures in late 2014 had less than 10 months of post-period data, the analysis excluded them. Similarly, the analysis excluded customers participating in 2013 with measure installation dates before November 2012 had less than 10 months of pre-period data.

Table C1. Screen for Inclusion in Billing Analysis

Screen	Attrition		Remaining	
	Nonparticipant	Participant	Nonparticipant	Participant
Original measures database (insulation installations only) and nonparticipant population	N/A	N/A	45,492	73
Matched billing data sample (reduced to nonparticipant, single-family residential accounts in participant zip codes; participant accounts that could be matched to the billing data addresses). Also excluded Idaho TOU rate nonparticipants.	25,924	20	19,568	53
Reject accounts with less than 300 days in pre- or post-period	5,645	11	13,923	42
Reject accounts with less than 5,369 kWh or more than 33,310 kWh in pre- or post-period	2,761	-	11,162	42
Reject accounts with consumption changing by more than 50%	518	-	10,644	42
Reject accounts with expected savings over 70% of pre-period consumption	-	-	10,644	42
Reject accounts with billing data outliers, vacancies, and seasonal usage	73	3	10,571	39
Nonparticipant sample selection (random sample of nonparticipants to match participant pre-period usage by quartile; four times more than participants)	10,415	-	156	39
Final Sample			**156**	**39**

Regression Model

After screening and matching accounts, the final analysis group consisted of 39 participants and 156 nonparticipants.

Of the final sample, 85% of participant homes installed attic insulation, 10% installed wall insulation, and 8% installed of the he participant homes installed floor insulation. As determining separate wall or floor insulation savings proved impossible, Cadmus estimated a combined realization rate for all insulation measures.

Cadmus used the following CSA regression specification to estimate HES Program insulation savings:

$$ADC_{it} = \alpha_i + \beta_1 HDD_{it} + \beta_2 CDD_{it} + \beta_3 POST_t + \beta_4 PARTPOST_{it} + \varepsilon_{it}$$

Where for customer (i) and month (t):

ADC_{it} = Average daily kWh consumption

HDD_{it} = Average daily HDDs (base 65)

CDD_{it} = Average daily CDDs (base 65)

$POST_t$ = Indicator variable of 1 in the post-period for participants and nonparticipants, 0 otherwise

$PARTPOST_{it}$ = Indicator variable of 1 in the post-period for participants, 0 otherwise

β_4 served as the key coefficient determining average insulation savings. The coefficient averaged daily insulation savings per program participant, after accounting for nonparticipant trends. Cadmus included individual customer intercepts (α_i) as part of a fixed-effects model specification to ensure no participants or nonparticipants exerted an undue influence over the final savings estimate; this resulted in a more robust model.[4]

Insulation Results

Cadmus estimated overall insulation savings of 1,402 kWh per participant. Average insulation had expected savings of 1,380 kWh, translating to a 102% net realization rate for insulation measures. With average participant pre-usage of 17,956 kWh, savings represented an 8% reduction in total energy usage from insulation measures installed. Table C2 presents the overall net savings estimate for wall, floor, and attic insulation.

Table C2. Insulation Net Realization Rates

Model	Billing Analysis Participants (n)	Reported kWh Savings per Premise	Evaluated Net kWh Savings per Premise	Net Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall	**39**	**1,380**	**1,402**	**102%**	**±48%**	**52%–151%**
Electric Heat	29	1,850	1,869	101%	±41%	59%–143%

Cadmus only used overall model results to determine the measure-level net savings, while also providing results for the electric space heating fuel.

Overall, electrically heated homes achieved insulation savings of 1,869 kWh per home. Average electrically heated expected insulation savings were 1,850 kWh, translating to a 101% realization rate.

[4] Due to the complexity of estimating the model with separate intercepts, Cadmus estimated a difference model, subtracting out the customer-specific averages for both the dependent and independent variables. This method produced results identical to the fixed effects models with separate intercepts; however, using a difference model proved simpler in estimating savings and presenting final model outputs.

With average electrically heated participant pre-usage of 18,480 kWh, savings represented a 10% reduction in energy usage from insulation measures.

Because of small sample size (n=10) Cadmus was not able to obtain reliable estimates of savings for gas heated homes.

Table C3, and Table C4, summarize model outputs for the regression models Cadmus used to determine the insulation realization rates.

Table C3. Insulation Regression Model for Idaho (Overall Model)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	330,793	82,698	352.78	<.0001
Error	4,652	1,090,515	234.41845		
Corrected Total	4,656	1,421,308			
Root MSE		15.31073	R-Square		0.2327
Dependent Mean		6.88E-16	Adj. R-Square		0.2321
Coefficient of Variation		2.22E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
Post	1	-2.1517	0.50543	-4.26	<.0001
PartPost	**1**	**-3.8404**	**1.1288**	**-3.40**	**.0007**
AvgHdd	1	0.7501	0.02103	35.66	<.0001
AvgCdd	1	1.7283	0.10408	16.60	<.0001

Table C4. Insulation Regression Model for Idaho (Electric Heat)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	331,711	82,928	350.68	<.0001
Error	4,415	1,044,053	236		
Corrected Total	4,419	1,375,764			
Root MSE		15.37786	R-Square		0.2411
Dependent Mean		6.99E-16	Adj. R-Square		0.2404
Coefficient of Variation		2.20E+18			

Source	Parameter Estimates				
	DF	Parameter Estimates	Standard Error	t value	Prob. t
Post	1	-2.1436	0.5082	-4.22	<.0001
PartPost	**1**	**-5.1206**	**1.283**	**-3.99**	**<.0001**
AvgHdd	1	0.7681	0.0218	35.31	<.0001
AvgCdd	1	1.7338	0.1109	15.64	<.0001

Manufactured Home Ductwork Billing Analysis

Cadmus was not able to conduct a separate Idaho billing analysis for manufactured homes duct sealing – because only 8 participants remained in the analysis after the billing analysis screening. Pacific Power's Washington manufactured home duct sealing realization rate was applied for Idaho. The detailed methodology, screening, and attrition results will be provided in the 2013-2014 Pacific Power Washington HES Evaluation Report. Only some selected summary results findings and their associated models are included in this appendix.

Manufactured Home Duct Work Results

For Washington, Cadmus estimated average manufactured home duct sealing and duct insulation savings of 1,825 kWh per home, translating to a 96% net realization rate for these measures. The sample size for Washington was 118, and furthermore Washington has similar weather to Idaho. As a result it is reasonable to apply the Washington results to Idaho. As with insulation results, this produced net (rather than gross) savings as it compared participant usage trends to a nonparticipant group, accounting for market conditions outside of the program.

With average participant pre-usage of 17,671 kWh, savings represented a 10% reduction in total energy usage from the manufactured homes duct measure installed. Table C5 presents the overall savings estimate for duct sealing and duct insulation from the Washington billing analysis.

Table C5. Manufactured Home Ductwork Net Realization Rates

Model	Billing Analysis Participant (n)	Reported kWh Savings per Premise	Evaluated Net kWh Savings per Premise	Net Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall	**118**	**1,910**	**1,825**	**96%**	**±16%**	**80%–111%**
Electric Heat	118	1,910	1,825	96%	±16%	80%–111%
Electric Heat (HP)	24	3,214	3,000	93%	±20%	74%-112%
Electric Heat (Non-HP)	94	1,577	1,525	97%	±21%	76%-117%
Overall	**118**	**1,910**	**1,825**	**96%**	**±16%**	**80%–111%**

Cadmus only used overall Washington model results to determine the Idaho measure-level net savings, but provided results by for heat pump and non-heat pump participants. Overall, participants with heat-pumps achieved savings of 3,000 kWh (15%), and those without heat pumps achieved 1,525 kWh (9%).

Table C6, Table C7, and Table C8 summarize model outputs for the regression models Cadmus used to determine the Washington manufactured home realization rates that were applied to Idaho.

Table C6. Manufactured Home Ductwork Regression Model for Washington (Overall + Electric Heat)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	4,292,728	1,073,182	8,037	<.0001
Error	14,131	1,886,753	133.51872		
Corrected Total	14,135	6,179,481			
Root MSE		11.55503	R-Square		0.6947
Dependent Mean		2.86E-16	Adj. R-Square		0.6946
Coefficient of Variation		4.05E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
Post	**1**	0.4156	0.21888	1.90	0.0576
PartPost	**1**	**-5.0002**	**0.48680**	**-10.27**	**<.0001**
AvgHdd	1	1.83052	0.01121	163.31	<.0001
AvgCdd	1	1.76543	0.02782	63.45	<.0001

Table C7. Manufactured Home Ductwork Regression Model for Washington (Heat Pumps)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	3,541,955	885,489	6,288	<.0001
Error	11,884	1,673,483	140.8182		
Corrected Total	11,888	5,215,438			
Root MSE		11.8667	R-Square		0.6791
Dependent Mean		2.9E-16	Adj. R-Square		0.6790
Coefficient of Variation		4.00E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
Post	1	0.31411	0.22505	1.40	0.1628
PartPost	**1**	**-8.21833**	**1.01982**	**-8.06**	**<.0001**
AvgHdd	1	1.80182	0.01241	145.16	<.0001
AvgCdd	1	1.79484	0.03128	57.38	<.0001

Table C8. Manufactured Home Ductwork Regression Model for Washington (Non-Heat Pumps)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	4,085,584	1,021,396	7,687	<.0001
Error	13,562	1,801,936	132.8665		
Corrected Total	13,566	5,887,520			
Root MSE		11.52677	R-Square		0.6939
Dependent Mean		1.38E-16	Adj. R-Square		0.6938
Coefficient of Variation		8.34E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
Post	1	0.38965	0.21841	1.78	.0744
PartPost	**1**	**-4.17586**	**0.53254**	**-7.84**	**<.0001**
AvgHdd	1	1.82036	0.01139	159.83	<.0001
AvgCdd	1	1.75465	0.02833	61.93	<.0001

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Appendix D. Self-Reported Net-to-Gross Methodology

Net-to-gross (NTG) estimates are a critical part of demand-side management program impact evaluations, because they allow utilities to determine portions of gross energy savings that were influenced by and are attributable to their DSM programs. Freeridership and participant spillover are the two NTG components calculated in this evaluation. True freeriders are customers who would have purchased an incented appliance or equipment without any support from the program (e.g. taking the incentive). Participant spillover is the amount of additional savings obtained by customers investing in additional energy-efficient measures or activities due to their program participation. Various methods can be used to estimate program freeridership and spillover; for this evaluation, Cadmus used self-reports from survey participants to estimate NTG for appliances, HVAC, weatherization, and kit measure categories, as this method can gauge net effects for many measures at once and enables Cadmus to monitor freeridership and spillover over several evaluation efforts.

Survey Design

Direct questions (such as: "Would you have installed measure X without the program incentive?") tend to result in exaggerated "yes" responses. Participants tend to provide answers they believe surveyors seek; so a question becomes the equivalent of asking: "Would you have done the right thing on your own?" An effective solution, and an industry standard, for avoiding such bias involve asking a question in several different ways, then checking for consistent responses.

Cadmus used industry tested survey questions to determine why customers installed a given measure, and what influence the program had on their decisions. For rebate measure participants, we used the survey to establish what decision makers might have done in the program's absence, via five core freeridership questions:

1. Would participants have installed measures without the program?
2. Had participants ordered or installed the measures before learning about the program?
3. Would participants have installed the measures at the same efficiency levels without the program incentive?
4. Would participants have installed the same quantity of measures without the program?
5. In the program's absence, when would respondents have installed the measures?

Cadmus used a separate set of questions and scoring approach when estimating the freeridership for the kit measure category. After conducting participant surveys with energy efficient kit recipients, Cadmus utilized responses from three questions to estimate a freeridership score for each participant. Freeridership questions focused on whether the participant was already using the measure in their home and if they had plans to purchase the measure before signing up to receive the kit. For participants receiving energy efficiency kits, we used the kit survey to establish what decision makers might have done in the program's absence, via the core questions below:

1. Before the participant signed up for the kit, did they already have the measure installed in their home?
2. Was the participant already planning to purchase the measure before at the time they signed up for the kit?
3. If the participant was planning to purchase the measure before signing up for the kit, in terms of timing, when would they have purchased the CFLs? (ex. at the same time, later but within the same year, in one year or more)

Cadmus sought to answer three primary questions with our participant spillover survey design:

1. Since participating in the program evaluated, did participants install additional energy-efficient equipment or services incented through a utility program?
2. How influential was the evaluated program on the participants' decisions to install additional energy-efficient equipment in their homes?
3. Did customers receive incentives for additional measures installed?

Freeridership Survey Questions

The residential rebate survey's freeridership portion included 12 questions, addressing the five core freeridership questions. The survey's design included several skip patterns, allowing interviewers to confirm answers previously provided by respondents by asking the same question in a different format. The rebate freeridership questions (as asked in the survey format) included:

1. When you first heard about the incentive from Rocky Mountain Power, had you already been planning to purchase the measure?
2. Had you already purchased or installed the new measure before you learned about the incentive from the Home Energy Savings Program?
3. [*Ask if question 2 is Yes*] Just to confirm, you learned about the Rocky Mountain Power rebate program after you had already purchased or installed the new measure?
4. [*Ask if question 2 or 3 is No or Don't Know*] Would you have installed the same measure without the incentive from the Home Energy Savings Program?
5. [*Ask if question 4 is No or Don't Know*] Help me understand, would you have installed something without the Home Energy Savings Program incentive?
6. [*Ask if question 4 or 5 is Yes*] Let me make sure I understand. When you say you would have installed the measure, would you have installed the same one, that was just as energy efficient?
7. *[Ask if question 4 or question 5 is Yes AND measure quantity > 1]* Would you have installed the same quantity?
8. [*Ask if question 4 or question 5 is Yes*] Would you have installed the measure at the same time?
9. [*Ask if question 5 is No*] To confirm, when you say you would not have installed the same measure, do you mean you would not have installed the measure at all?

10. [*Ask if question 9 is No or Don't Know*] Again, help me understand. Would you have installed the same type of measure, but it would not have been as energy-efficient?
11. *[Ask if question 9 is No or Don't Know AND measure quantity > 1]* Would you have installed the same measures, but fewer of them?
12. [*Ask if question 9 is No or Don't Know*] Would you have installed the same measure at the same time?

The kit freeridership questions asked of each measure (as asked in the survey format) included:

1. Did you have any other high-efficiency [MEASURE] installed in your home at the time you signed up for the kit?
2. At the time you signed up for the kit, were you already planning on buying high-efficiency [MEASURE] for your home?
3. [*Ask if question 2 is Yes]* In terms of timing, when would you have purchased the high-efficiency [MEASURE]?

Participant Spillover Survey Questions

As noted, Cadmus used the results of the spillover questions to determine whether program participants installed additional energy-saving measures since participating in the program. Savings that participants received from additional measures were spillover if the program significantly influenced their decisions to purchase additional measures, and if they did not receive additional incentives for those measures.

With the surveys, we specifically asked residential participants whether they installed the following measures:

- Clothes washers
- Refrigerators
- Dishwashers
- Windows
- Fixtures
- Heat pumps
- Ceiling fans
- Electric water heaters
- CFLs
- Insulation

If the participant installed one or more of these measures, we asked additional questions about what year they purchased the measure, if they received an incentive for the measure, and how influential (highly influential, somewhat influential, not at all influential) the HES Program was on their purchasing decisions.

Cadmus combined the freeridership and spillover questions in the same survey, asked over the telephone with randomly selected program participants. Prior to beginning the survey effort, Cadmus pre-tested the survey to ensure that all appropriate prompts and skip patterns were correct. Cadmus also monitored the survey company's initial phone calls to verify that:

- Survey respondents understood the questions; and
- Adjustments were not required.

Freeridership Methodology

Cadmus developed a transparent, straightforward matrix for assigning freeridership scores to participants, based on their responses to targeted survey questions. We assigned a freeridership score to each question response pattern, and calculated confidence and precision estimates based on the distribution of these scores (a specific approach cited in the National Action Plan for Energy Efficiency's *Handbook on DSM Evaluation*, 2007 edition, page 5-1).

Cadmus left the response patterns and scoring weights explicit so that they could be discussed and changed. We used a rules-based approach to assign scoring weights to each response from each freeridership question. This allows for sensitivity analysis to be performed instantaneously and test the stability of the response patterns and scoring weights. Scoring weights can be changed for a given response option to a given question. This also provided other important features, including:

- Derivation of a partial freeridership score, based on the likelihood of a respondent taking similar actions in absence of the incentive.
- Use of a rules-based approach for consistency among multiple respondents.
- Use of open-ended questions to ensure quantitative scores matched respondents' more detailed explanations regarding program attribution.
- The ability to change weightings in a "what if" exercise, testing the stability of the response patterns and scoring weights.

This method offered a key advantage by including partial freeridership. Our experience has shown that program participants do not fall neatly into freerider and non-freerider categories. We assigned partial freeridership scores to participants who had plans to install the measure before hearing about the program, but for whom the program exerted some influence over their decisions. Further, by including partial freeridership, we could use "don't know" and "refused" responses rather than removing those respondents entirely from the analysis.

Cadmus assessed rebated measure freeridership at three levels:

1. We converted each participant survey response into freeridership matrix terminology.
2. We gave each participant's response combination a score from the matrix.
3. We aggregated all participants into an average freeridership score for the entire program category.

Cadmus assessed freeridership for each kit measure by estimating up to two separate freeridership scores:

1. We estimated a *future intent* freeridership score from questions focused on a participant's *future intent* to buy the kit measure within one year at the time of signing up to receive the kit.
2. In some instances we estimated a *prior use* freeridership score from a question focused on the *prior use* of the kit measure in question in the respondent home.

Convert Rebated Measure Responses to Matrix Terminology

Cadmus evaluated and converted each survey question's response into one of the following values, based on assessing rebate measure participants' freeridership levels for each question:

- Yes (Indicative of freeridership)
- No (Not indicative of freeridership)
- Partial (Partially indicative of freeridership)

Table J1 lists the 12 rebate measure freeridership survey questions, their corresponding response options, and the values they converted to (in parentheses). "Don't know" and "refused" responses converted to "partial" for all but the first three questions. For those questions, if a participant was unsure whether they had already purchased or were planning to purchase the measure before learning about the incentive, we considered them as an unlikely freerider.

Table J1. Assignments of HES Rebate Measure Survey Response Options into Matrix Terminology*

Already planning to purchase?	Already purchased or installed?	Confirmatory: Already purchased installed?	Installed same measure without incentive?	Installed something without incentive?	Installed same efficiency?	Installed same quantity?	Installed at the same time?	Would not have installed measure?	Installed lower efficiency?	Installed lower quantity?	Installed at the same time?
Yes (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	Same time (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	Same time (Yes)
No (No)	No (No)	No (No)	No (No)	No (No)	No (No)	No (No)	Within one year (P)	No (No)	No (No)	No (No)	Within one year (P)
DK (No)	DK (No)	DK (No)	DK (No)	DK (P)	DK (P)	DK (P)	Over one year (No)	DK (P)	DK (P)	DK (P)	Over one year (No)
RF (No)	RF (No)	RF (No)	RF (No)	RF (P)	RF (P)	RF (P)	DK (P)	RF (P)	RF (P)	RF (P)	DK (P)
							RF (P)				RF (P)

* In this table, (P) = partial, RF = refused, and DK = don't know.

Participant Freeridership Scoring

Non-lighting Rebate Measure

After converting survey responses into matrix terminology, Cadmus created a freeridership matrix, assigning a freeridership score to each participant's combined responses. We considered all combinations of survey question responses when creating the matrix, and assigned each combination a freeridership score of 0% to 100%. Using this matrix, we then scored every participant combination of responses.

Kit Measure

If a respondent was not planning to purchase a kit measure within one year at the time they signed up to receive the kit, they are automatically estimated at 0% freeridership for that measure. If a respondent did have plans to purchase the measure at the time of signing up for the kit, their *future intent* freeridership score derives from the prescribed values in Table J2.

Table J2. Kit Measure *Future Intent* Question Freeridership Scoring

Response	*Future Intent* FR Score
Around the same time I received the kit	100%
Later but within the same year	50%
In one year or more	0%
[DON'T READ] Don't Know	25%

If a respondent did not already have any of the measure installed in their home at the time they signed up for the kit, then they received a *prior-use* freeridership score of 0% and this *prior-use* freeridership estimate was then averaged with their *future intent* freeridership score only if they would have purchased the measure within one year of when they initially signing up for the kit. For example, if a respondent said they would have purchase the measure at the same time they received the kit but also said that they weren't using any of the measure in their home at the time they signed up for the kit, their *future intent* freeridership score of 100% is averaged with their *prior use* freeridership of 0% using the arithmetic mean to arrive at the participants final freeridership score of 50% for the measure. If respondent said they would have purchase the measure at the same time they received the kit and also were using the measure in their home at the time they signed up for the kit, their final freeridership score is 100%, which comes from their *future intent* freeridership score.

Measure Category Freeridership Scoring

Non-lighting Rebate Measures

After assigning a freeridership score to every survey respondent, Cadmus calculated a savings-weighted average freerider score for the program category. We individually weighted each respondent's freerider scores by the estimated savings from the equipment they installed, using the following calculation:

$$Savings\ Weighted\ Freeridership = \frac{\sum(Respondent\ FR\ Score) * (Rebated\ Measure\ kWh\ Savings)}{\sum(Rebated\ Measure\ kWh\ Savings\ of\ All\ Respondents)}$$

Kit Measures

After assigning freeridership scores to every survey respondent's kit measures, Cadmus calculated a savings-weighted average freerider score for each kit measure. We individually weighted each respondent's final measure level freeridership scores by the estimated savings from the equipment they installed, using the following calculation:

$$Measure\ Level\ Savings\ Weighted\ Freeridership = \frac{\sum(Kit\ Measure\ Respondent\ FR\ Score) * (Kit\ Measure\ kWh\ Savings)}{\sum(Kit\ Measure\ kWh\ Savings\ of\ All\ Respondents)}$$

Cadmus then weighted the kit measure level freeridership estimates by the evaluated gross program population kWh savings to arrive at the overall kit measure category freeridership estimate, using the following equation:

$$Kit\ Measure\ Category\ Weighted\ Freeridership = \frac{\sum(Measure\ Level\ FR\ Score) * (Measure\ Level\ kWh\ Population\ Savings)}{\sum(All\ Kit\ Measures\ Population\ kWh\ Savings)}$$

The Cadmus Rebate Measure Freeridership Scoring Model

Cadmus developed an Excel-based model to use for calculating freeridership, and to improve the consistency and quality of our results. The model translated raw survey responses into matrix terminology, and then assigned a matrix score to each participant's response pattern. Cadmus then aggregated the program participants into program categories to calculate average freeridership scores.

The model incorporated the following inputs:

- Raw survey responses from each participant, along with the program categories for their incented measures, and their energy savings from those measures, if applicable;
- Values converting raw survey responses into matrix terminologies for each program category; and
- Custom freeridership scoring matrices for each unique survey type.

The model displayed each participant's combination of responses and corresponding freeridership score, then produced a summary table with the average score and precision estimates for the program category. The model used the sample size and a two-tailed test target at the 90% confidence interval to determine the average score's precision.

The Cadmus Kit Measure Freeridership Scoring Model

The evaluation team developed a freeridership score for each survey respondent using a rules-based assignment of responses to survey items. The team estimated up to two freeridership scores for CFLs, LEDs, faucet and bathroom aerators, and showerheads, using two sets of questions, and in certain instances taking the arithmetic mean of the two estimates for each participant's measure to calculate final freeridership scores.

The first set of questions and freeridership score was focused on the participant's *future intent* to buy the kit measure within one year at the time they signed up to receive the kit. In some instances, a second freeridership score was estimated from a question focused on the *prior use* of the program measure in question. In cases where the respondent had *future intent* to buy the kit measure within one year and they reported not having any *prior use* of the measure in their home at the time of signing up for the kit, the arithmetic mean of the *future intent* and *prior use* freeridership scores was used as the participant's final freeridership score for that measure.

By averaging individual measure-level participant freeridership scores, weighted by participant's evaluated savings, the team calculated measure-level freerider scores. Then, the team averaged these scores to calculate a kit measure category level freeridership score, weighted by each measure's gross evaluated population energy savings.

Participant Spillover Methodology

For the HES Program, Cadmus measured participant spillover by asking a sample of participants about their purchases and whether they received an incentive for a particular measure (if they installed another efficient measure or undertook another energy-efficiency activity because of their program participation). We also asked these respondents to rate the HES Program's (and incentive's) relative influence (highly, somewhat, or not at all) on their decisions to pursue additional energy-efficient activities.

Participant Spillover Analysis

Cadmus used a top-down approach to calculate spillover savings. We began our analysis with a subset of data containing only survey respondents who indicated they installed additional energy-savings measures after participating in the HES Program. From this subset, we removed participants who said the program had little influence on their decisions to purchase additional measures, thus retaining only participants who rating the program as highly influential. We also removed participants who applied for an HES incentive for the additional measures they installed.

For the remaining participants with spillover savings, we estimated the energy savings from additional measures installed. Cadmus calculated savings values, which we matched to the additional measures installed by survey participants.

Cadmus calculated the spillover percentage by dividing the sum of additional spillover savings by the total incentivized gross savings achieved by all respondents in the program category:

$$Spillover\ \% = \frac{\sum Spillover\ Measure\ kWh\ Savings\ for\ All\ Survey\ Respondents}{\sum Program\ Measure\ kWh\ Savings\ for\ All\ Survey\ Respondents}$$

Appendix E. Nonparticipant Spillover Analysis

Effective program marketing and outreach generates program participation and increases general energy efficiency awareness among customers. The cumulative effect of sustained utility program marketing can affect customers' perceptions of their energy usage and, in some cases, motivate customers to take efficiency actions outside of the utility's program. This is generally called nonparticipant spillover (NPSO)—results in energy savings caused by, but not rebated through, utilities' demand-side management activities.

To understand whether Rocky Mountain Power's general and program marketing efforts generated energy efficiency improvements outside of the company's incentive programs, Cadmus collected spillover data through the general population survey, conducted with randomly selected residential customers.

Methodology

Cadmus randomly selected and surveyed 250 customers from a sample of 10,000 randomly generated residential accounts provided by Rocky Mountain Power. From the 250 customers surveyed, Cadmus screened out customers who self-reported that they participated in a Rocky Mountain Power residential program during 2013 or 2014. When estimating NPSO, Cadmus excluded these customers from analysis, focusing on identified nonparticipants; thus the analysis avoided potential double-counting program savings and/or program-specific spillover.

Cadmus limited the NPSO analysis to the same efficiency measures rebated through Rocky Mountain Power programs (known as "like" spillover). Examples included installing a high-efficiency clothes washer and installing high-efficiency insulation for which participants (for whatever reason) did not apply for and receive an incentive. Cadmus did exclude one notable category of "like" measures: lighting products. This precluded potentially double-counting NPSO lighting savings already captured through the upstream lighting incentives.

Using a 1 to 4 scale, with 1 meaning "not at all important" and 4 meaning "very important," the survey asked customers to rate the importance of several factors on their decisions to install energy efficient equipment without receiving an incentive from Rocky Mountain Power. This question determined whether Rocky Mountain Power's energy efficiency initiatives motivated energy-efficient purchases. The surveys asked respondents to address the following factors:

- Information about energy efficiency provided by Rocky Mountain Power;
- Information from friends or family who installed energy-efficient equipment and received an incentive from Rocky Mountain Power; and
- Their experiences with past Rocky Mountain Power incentive programs.

Cadmus estimated NPSO savings from respondents who rated any of the above factors as "very important" for any energy-efficient actions or installations reported.

Cadmus leveraged measure-level estimated gross savings from the 2013–2014, residential wattsmart evaluation activities for the reported NPSO measures.

Using the variables shown in Table E1, Cadmus determine total NPSO generated by Rocky Mountain Power's marketing efforts during the 2013–2014 evaluation year.

Table E1. NPSO Analysis Method

Variable	Metric	Source
A	Number of "like spillover" nonparticipant measures	Survey data
B	Total Nonparticipant Customers Surveyed	Survey disposition
C	Weighted Average of Per Unit Measures Savings in kWh	Variable C from Table E2
D	Total Residential Customer Population	PacifiCorp December 2014 305 Report
E	NPSO kWh Savings Applied to Population	[(A÷B)×C)] × D
F	Total Gross Reported Savings	2013-2014 Evaluation
G	NPSO as a Percentage of Total residential Portfolio Reported Savings	F ÷ G

Results

Of 250 Rocky Mountain Power Idaho customers surveyed, four nonparticipant respondents reported installing five different measure types attributed to Rocky Mountain Power's influence. Table E2 presents measures and gross evaluated kWh savings Cadmus attributed to Idaho Rocky Mountain Power, generating average savings per NPSO measure of 127 kWh.

Table E2. NPSO Response Summary

Reported Spillover Measures	Quantity	Unit Energy Savings (kWh)*	Total Savings (kWh)	Average Savings Per Spillover Measure (kWh)
ENERGY STAR Freezer	1	93.6 per unit	94	n/a
Efficient Central Air Conditioner	2	153.6 per unit	307	
Efficient Water Heater	1	131.0 per unit	131	
Efficient Showerhead	7	139.8 per unit	978	
Efficient Faucet Aerator	3	90.4 per unit	271	
Total	**14**		**1,781**	**127 (Variable C)**

*Unit energy savings (kWh) estimated for each measure were generated from average 2013–2014 HES evaluated gross savings by measure.

Table E3 presents variables used to estimate overall NPSO for the HES Program, a figure Cadmus estimated as 5% of total Rocky Mountain Power residential wattsmart program reported savings.

Table E3. NPSO Analysis Results

Variable	Metric	Value	Source
A	Number of Like Spillover Nonparticipant Measures	14	Survey data
B	Total Nonparticipant Customers Surveyed	229	Survey disposition
C	Weighted Average of Per Unit Measures Savings in kWh	127	Calculated in Table E2
D	Total Residential Customer Population	59,974	PacifiCorp December 2014 305 Report
E	NPSO kWh Savings Applied to Population	466,537	((A÷B)×C)) × D
F	Total Gross Reported Savings	8,876,146	2013-2014 Residential wattsmart Reported Savings
G	NPSO as a Percentage of Total Residential Portfolio Reported Savings	5%	F ÷ G

Cadmus then distributed the residential, portfolio-level result of 466,537 kWh NPSO to Rocky Mountain Power's residential programs, based on each program's size in terms of total gross reported kWh savings. Two programs were credited with achieving the greatest NPSO: Home Energy Savings (accounting for almost 83% of total reported energy savings) at 387,728 kWh; and Refrigerator Recycling (accounting for 15% of total energy savings) at 70,710 kWh. The distribution of NPSO savings for each program, based on their percentage of the combined residential reported portfolio savings, resulted in a 5% NPSO percentage for each program relative to their total reported gross savings.

Table E4. NPSO by Residential Program

Residential wattsmart Program	Program Reported Gross Savings (kWh)	Total NPSO (kWh)	Percentage of Combined Savings	Program-Specific NPSO (kWh)
Home Energy Savings	7,376,751	466,537	83%	387,728
Low Income Weatherization	154,091		2%	8,099
Refrigerator Recycling	1,345,304		15%	70,710
Total	**8,876,146**	**466,537**	**100%**	**466,537**

CADMUS

Appendix F. Lighting Retailer Allocation Review

Rocky Mountain Power subsidizes CFL and LED costs throughout its service territory. As shown in the leakage study findings (main report), some individuals who are not Rocky Mountain Power customers benefit from the program. These discounted bulbs "leak" outside of the service territory.

Cadmus met with the program administrator in early October 2015 to review the RSAT and any updates made since last year's analysis. Overall, the process of calculating a store's RSAT score followed the same process outlined below. Updates included streamlining a number of data processing steps to reduce the likelihood of human error. In addition, the tool can now handle LED purchases.

The program administrator developed a screening process to minimize the number of leaked bulbs. Using a proprietary RSAT[1] and Buxton Company's MicroMarketer[2] software, the program administrator only targeted stores where 90% or more of CFL purchases could be attributed to Rocky Mountain Power customers.

Through a series of meetings, e-mail exchanges, and software documentation reviews, Cadmus evaluated the program administrator's process for reducing CFL and LED leakage. This section outlines six key aspects of this:

1. Retail customer drive-time calculation.
2. Retailer locations.
3. Retailer trade areas.
4. Rocky Mountain Power's service territory.
5. Customer purchasing power.
6. Retail sales allocation.

Retail Customer Drive-Time Calculation

The time a customer willingly takes to drive to purchase efficient lighting from a brick-and-motor store greatly impacts the degree of leakage. Partnering with the Buxton Company, the program administrator determined three main factors that affected customer drive times: retail class, products sold, and urban density.

Retail Class

The program administrator/Buxton Company research indicated store types affect customer drive times. For example, customers commonly drive farther to a Costco than to a local hardware store. The program

[1] http://www.peci.org/retail-sales-allocation-tool

[2] Buxton specializes in retailer analysis and customer profiling: http://buxtonco.com/

administrator divided the retailer list into five classes (classes A through F), based on the North American Industry Classification System (NAICS).[3] Table F1 provides examples of NAICS classes.

Table F1. NAICS Classification Examples

NAICS Code	NAICS Title
44411	Home Centers
44413	Hardware Stores
443141	Household Appliance Stores

Products Sold

The program administrator categorized products sold by retailers into three classes: White Goods; Over the Counter (Retrofit); and Over the Counter (Plug and Play).[4] CFLs fell within the last of these categories.

Urban Density

The program administrator assigned stores with an urban or rural designation, based on the Buxton Urban Density Score (BUDS), which examines population per square foot to account for population density changes when moving farther from an urban center.

The program administrator modeled the 30 possible drive time factor combinations with over 500,000 survey responses from seven states to establish the amount of time customers drove for a given product and store type. Figure F1 reflects the drive time results capturing 80% of product sales for a particular retail class.

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3 http://www.census.gov/eos/www/naics/

4 White Goods include clothes washers, refrigerators, and freezers. Characterized as major purchases, customers usually undertake a degree of product research and/or assistance from a store sales person. Over the Counter (Retrofit) includes lighting fixtures (both CFLs and LEDs) and lighting controls. Characterized as midrange cost ($20–$200) products, the category sells as over-the-counter home improvement or retrofit products. Over the Counter (Plug and Play) includes bulbs (both CFLs and LEDs) and showerheads. Characterized as low-cost ($1–$20) products, this category sells through a variety of store types; an average consumer can reasonably install these products without assistance.

Figure F1. Example of Product Drive-Time Calculation

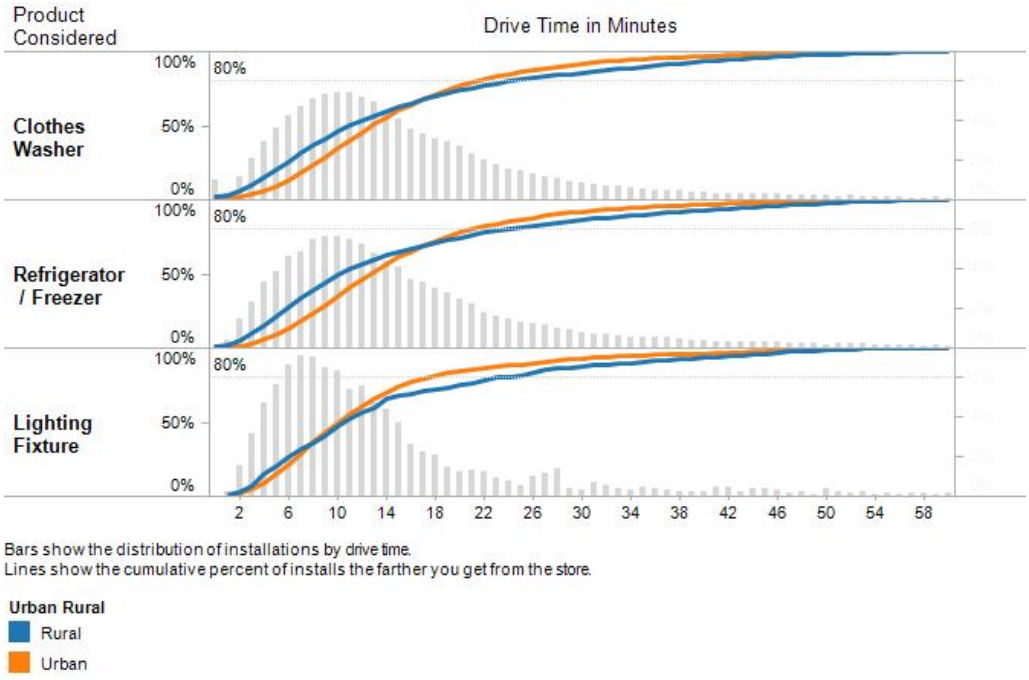


Table F2 summarizes the program administrator's calculated drive times by retail class and product type.

Table F2. Drive Times Calculated by Program Administrator

Retail Class	Product Type	Trade Area Drive Time	
		Urban	Rural
Class A	White Goods	12	17
	Over the Counter (Retrofit)	9	19
	Over the Counter (Plug and Play)	7	14
Class B	White Goods	17	22
	Over the Counter (Retrofit)	15	24
	Over the Counter (Plug and Play)	13	16
Class C	White Goods	22	27
	Over the Counter (Retrofit)	15	23
	Over the Counter (Plug and Play)	11	17
Class D	White Goods	24	26
	Over the Counter (Retrofit)	20	22
	Over the Counter (Plug and Play)	15	16
Class E	White Goods	21	26
	Over the Counter (Retrofit)	18	22
	Over the Counter (Plug and Play)	13	16
Class F	White Goods	22	29
	Over the Counter (Retrofit)	23	34
	Over the Counter (Plug and Play)	17	25

Retailer Locations

Retailers and manufacturers provided retailer address information to the program administrator, which geocoded[5] the addresses using a Coding Accuracy Support System (CASS) certified[6] geocoder, housed within the Buxton Company's MicroMarketer software and loaded into a geographic information system (GIS). If the geocoder could not find a match, the program administrator used Google Earth to visually geocode a store. Overall, the program administrator reported a 98% geocoding match rate.

Retailer Trade Areas

The program administrator created drive-time polygons, representing retailer trade areas using NAVTEQ's Guzzler™ utility,[7] housed within the Buxton Company's MicroMarketer software. Drive-time calculations require a specialized road network dataset that contains roads, indicators for one-way roads, locations of turn restrictions (e.g., no left turn intersections), the grade (slope) of roads, and other

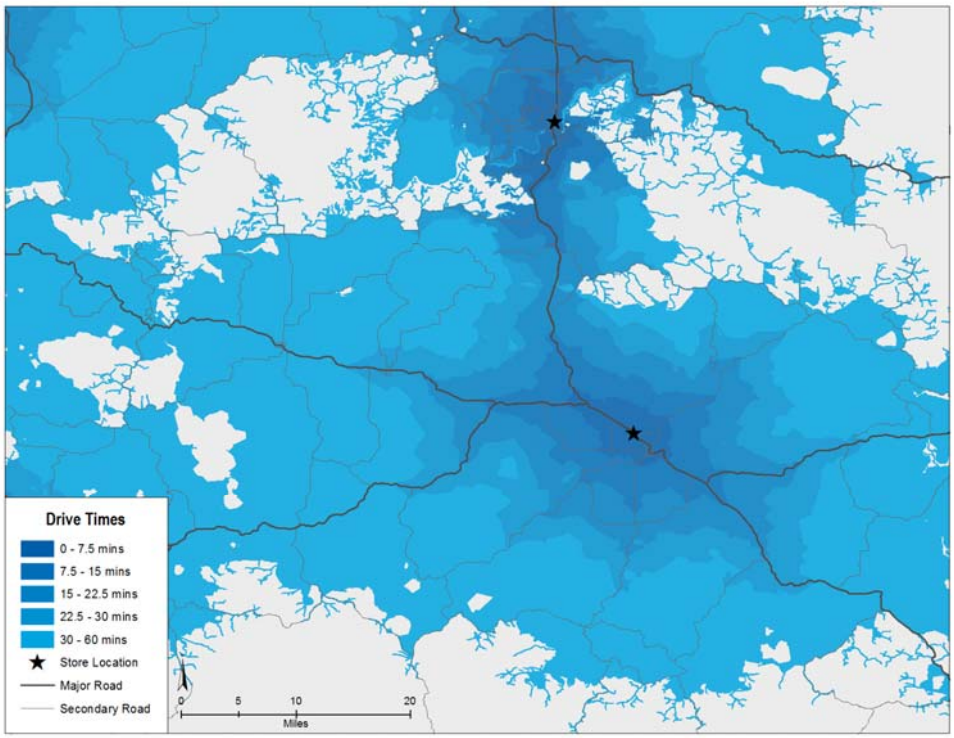
[5] This process converts a street address to latitude and longitude coordinate points.

[6] The United States Postal Service (USPS) developed CASS to evaluate the accuracy of software that provides mailing-related services to customers: https://www.usps.com/business/certification-programs.htm

[7] http://www.navmart.com/drivetime_by_guzzler.php.

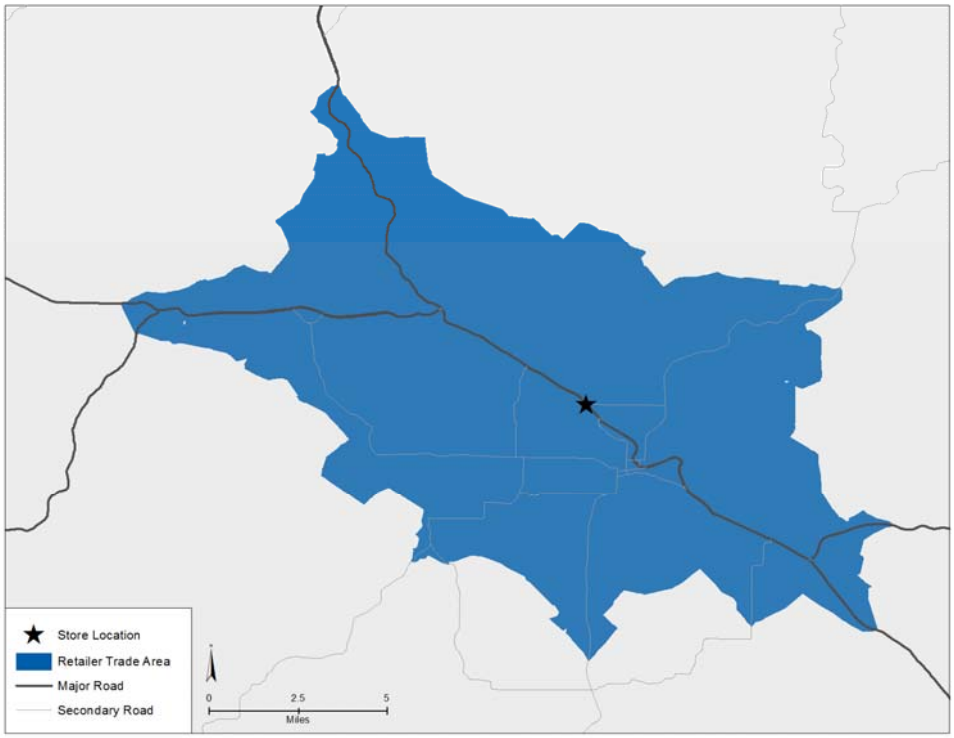
ancillary attributes that impact drive times. Figure F2 provides an example of concentric zones, representing increasing amounts of travel time from a store.

Figure F2. Example of Drive-Time Zones



The program administrator established retailer trade areas for each geocoded store using drive times, capturing 80% of CFL sales, as shown in Figure F3.

Figure F3. Example of Retailer Trade Area



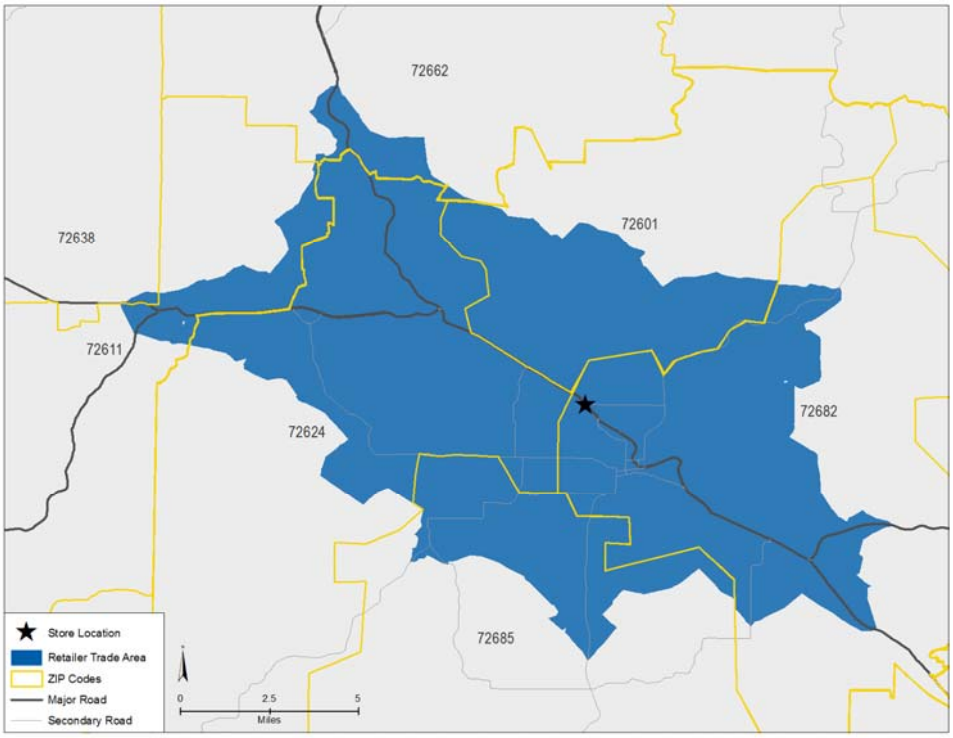
Rocky Mountain Power Service Territory

In 2007, the program administrator purchased utility service area data through a DOE contractor for all utilities in the Pacific Northwest and the Western parts of the United States. The data lists utilities serving each zip code. Data also include a utility's type (municipal or other) and whether it serves as a zip code's primary electric provider.

After contacting utilities to confirm their zip code-based territory, the program administrator created a Rocky Mountain Power GIS data layer using Zip Code Tabulation Area boundaries.[8] The administrator laid this service area designation over the retailer trade area layer to identify intersecting zip codes. In the example shown in Figure F4, all zip codes intersect with the retailer trade area.

[8] Generalized aerial representations of USPS zip code service areas. Available online: http://www.census.gov/geo/reference/zctas.html

Figure F4. Example of Zip Codes and a Retailer Trade Area



While the program administrator still relies on zip code-based tables to define utility service areas, the use of utility service area polygons is being explored. Given not all utility service areas can be cleanly defined by within polygons and due to situations with multiple utility service area polygons overlapping, the program administrator has yet to decide whether to pursue this polygon approach.

Customer Purchase Power

For each retailer trade area, the program administrator determined the likelihood that households within the area would purchase CFLs or LEDs and weighted zip code household counts within a retailer's trade area, based on a GreenAware[9] index score and the retailer's core market segments.

[9] These categories are outlined online: http://www.fusbp.com/pdf/BeGreenBeAwareBeGreenAware.pdf.

GreenAware Index Score

Experian's Marketing Mosaic® USA software[10] assigns each household[11] to one of 71 unique market segments. According to the GreenAware segmentation system, each market segment receives a score[12] on a scale of 0–200 for each of the four GreenAware categories: Behavioral Greens, Think Greens, Potential Greens, and True Browns.

The program administrator applied weights to GreenAware category scores, based on the category's propensity to buy energy efficiency products. Table F3 provides category names, descriptions, and weights.

Table F3. GreenAware Categories, Descriptions, and Weights

Category Name	Description	Weight
Behavior Green	Think and act green, hold negative attitudes toward products that pollute, and incorporate green practices on a regular basis.	3x
Think Green	Think green, but do not necessarily act green.	2x
Potential Green	Neither behave nor think along particularly environmentally conscious lines, and remain on the fence about key green issues.	1x (no weighting)
True Brown	Not environmentally conscious, and may have negative attitudes about the green movement.	-1x (negative weighting)

The sum of weighted GreenAware category scores divided by five determined a new weighted GreenAware score for each market segment. The program administrator considered a market segment as "Green Aware" if it received a weighted GreenAware score greater than 100.

Core Market Segments

The program administrator applied weights to market segment household counts identified as a retailer's core[13] market segment, and calculated new weighted household counts using the weights shown in Table F4.

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[10] A household-based consumer lifestyle segmentation system that classifies all U.S. household and neighborhoods. More information is available online: http://www.experian.com/assets/marketing-services/brochures/mosaic-brochure.pdf

[11] Households are assigned at the block group level. See: http://www.census.gov/geo/reference/pdfs/geodiagram.pdf.

[12] Determined by Experian.

[13] Determined by Experian.

Table F4. Core Market Segment Weighting

Segment Category	Weight
Green Aware *and* part of the core retail segment	3x
Either Green Aware *or* part of the core retail segment	2x
Neither Green Aware *nor* part of the core retail segment	1x (no weighting)

The sum of weighted market segment household counts determined a new weighted population count for each zip code.

Retail Sales Allocation

Using the weighted zip code population count and utility service area data, the program administrator determined a Total Utility Score for each zip code corresponding to retailer's trade area. The weight '*w*' of the $'i'^{\text{th}}$ utility was expressed as:

$$W_i = \frac{p_i + m_i + 1}{U + M + 1}$$

Where:

p_i = 1 if the $'i'^{th}$ utility is the primary provider, 0 otherwise.

m_i = 1 if the $'i'^{th}$ utility is municipal, 0 otherwise.

U = Total number of utilities.

M = Total number of municipalities.

Thus:

Total Utility Score = $\sum Z_k W_i$

Where:

Z_k = Total weighted household count of the $'k'^{th}$ zip code.

The sum of a retailer's Total Utility Scores, divided by the sum of the weighted zip code population counts, determined a store's retail sales allocation score. The program administrator only approached stores that could allocate 90% or more of CFL purchases to Rocky Mountain Power customers for inclusion in the HES Program.

Overall, Cadmus found the program administrator's method for reducing and controlling for CFL leakage both thorough and innovative. The analysis used current and relevant data in conjunction with computer-aided geospatial analysis techniques to assist the program administrator's store inclusion process. Relevant considerations included drive times, customer purchasing behaviors, and store type/locations, appropriately factored into the overall calculation.

Appendix G. Measure Category Cost-Effectiveness

Completed at the measure category level, cost-effectiveness was reported for evaluated net savings. Net results apply the evaluated NTG to evaluated gross savings. Table G1 shows cost-effectiveness inputs for net results.

Table G1. Idaho Measure Category Cost-Effectiveness Inputs

Input Description	2013	2014	Total
Average Measure Life*			
Appliance	15	14	14
HVAC	20	20	20
Lighting	5	8	6
Weatherization	30	30	30
Kits	N/A	9	9
Manufactured Homes	N/A	18	18
Evaluated Net Energy Savings (kWh/year)**			
Appliance	379,955	420,896	800,851
HVAC	66,872	97,944	164,816
Lighting	929,657	395,704	1,325,361
Weatherization	380,059	58,132	438,191
Kits	-	2,253,684	2,253,684
Manufactured Homes	-	43,700	43,700
Total Utility Cost (including incentives)***			
Appliance	$356,585	$441,286	$797,871
HVAC	$33,985	$45,392	$79,376
Lighting	$172,284	$100,019	$272,303
Weatherization	$262,596	$39,906	$302,502
Kits	$0	$283,296	$283,296
Manufactured Homes	$0	$12,308	$12,308
Incentives			
Appliance	$274,233	$371,718	$645,951
HVAC	$19,225	$28,875	$48,100
Lighting	$82,862	$50,576	$133,439
Weatherization	$142,307	$24,861	$167,168
Kits	$0	$87,851	$87,851
Manufactured Homes	$0	$5,740	$5,740
Retail Rate	**$0.1062**	**$0.1049**	**N/A**

*Weighted average measure category lives are based on individual measure lifetimes and weighted by savings and the frequency of installations.

**Evaluated savings reflect impacts at the customer meter.

***Rocky Mountain Power provided program costs and incentives in annual report data, allocating program costs by weighted savings.

Appliances

Cost-effectiveness results for net savings excluding non-energy benefits are shown in Table G2, Table G3, and Table G4. The appliance measure category (excluding non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G2). Table G5 provides the annual program non-energy benefits. Table G6, Table G7, and Table G8 provide the cost-effectiveness results including non-energy benefits. The appliance measure category (including non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G6).

Table G2. Idaho Appliance 2013-2014 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.066	$544,929	$737,605	$192,676	1.35
TRC	$0.066	$544,929	$670,550	$125,621	1.23
UCT	$0.093	$769,457	$670,550	($98,907)	0.87
RIM		$1,630,147	$670,550	($959,596)	0.41
PCT		$559,842	$1,834,255	$1,274,412	3.28
Lifecycle Revenue Impacts ($/kWh)					$0.000023731
Discounted Participant Payback (years)					1.50

Table G3. Idaho Appliance 2013 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.082	$334,170	$360,493	$26,323	1.08
TRC	$0.082	$334,170	$327,721	($6,449)	0.98
UCT	$0.087	$356,585	$327,721	($28,864)	0.92
RIM		$784,120	$327,721	($456,399)	0.42
PCT		$354,673	$876,394	$521,721	2.47
Lifecycle Revenue Impacts ($/kWh)					$0.000011287
Discounted Participant Payback (years)					1.44

Table G4. Idaho Appliance 2014 Net (Excluding Non-Energy Benefits) (2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.051	$225,263	$403,065	$177,802	1.79
TRC	$0.051	$225,263	$366,423	$141,160	1.63
UCT	$0.100	$441,286	$366,423	($74,863)	0.83
RIM		$904,251	$366,423	($537,828)	0.41
PCT		$219,289	$1,023,781	$804,491	4.67
Lifecycle Revenue Impacts ($/kWh)					$0.000015561
Discounted Participant Payback (years)					0.51

Table G5. Idaho Appliance Annual Non-Energy Benefits

Measure	Annual Value	Perspective Adjusted
Clothes Washer - 2013	$20,445.24	PTRC, TRC, PCT
Clothes Washer - 2014	$11,950.68	PTRC, TRC, PCT

Table G6. Idaho Appliance 2013-2014 Net (Including Non-Energy Benefits) (2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.066	$544,929	$970,319	$425,389	1.78
TRC No Adder	$0.066	$544,929	$882,108	$337,179	1.62
UTC	$0.093	$769,457	$670,550	($98,907)	0.87
RIM		$1,630,147	$670,550	($959,596)	0.41
PCT		$559,842	$2,132,223	$1,572,381	3.81
Lifecycle Revenue Impacts ($/kWh)					$0.000023731
Discounted Participant Payback (years)					1.43

Table G7. Idaho Appliance 2013 Net (Including Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.082	$334,170	$510,811	$176,640	1.53
TRC No Adder	$0.082	$334,170	$464,373	$130,203	1.39
UTC	$0.087	$356,585	$327,721	($28,864)	0.92
RIM		$784,120	$327,721	($456,399)	0.42
PCT		$354,673	$1,068,862	$714,189	3.01
Lifecycle Revenue Impacts ($/kWh)					$0.000011287
Discounted Participant Payback (years)					1.04

Table G8. Idaho Appliance 2014 Net (Including Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.051	$225,263	$491,131	$265,868	2.18
TRC No Adder	$0.051	$225,263	$446,483	$221,220	1.98
UTC	$0.100	$441,286	$366,423	($74,863)	0.83
RIM		$904,251	$366,423	($537,828)	0.41
PCT		$219,289	$1,136,541	$917,252	5.18
Lifecycle Revenue Impacts ($/kWh)					$0.000015054
Discounted Participant Payback (years)					0.49

HVAC

Table G9, Table G10, and Table G11 show HVAC measure category cost-effectiveness results for net evaluated savings. The HVAC measure category proved cost-effective from the UCT and PCT perspectives (Table G9).

Table G9. Idaho HVAC 2013-2014 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.104	$165,346	$137,008	($28,338)	0.83
TRC	$0.104	$165,346	$124,553	($40,794)	0.75
UCT	$0.048	$76,454	$124,553	$48,099	1.63
RIM		$248,320	$124,553	($123,768)	0.50
PCT		$177,807	$272,381	$94,574	1.53
Lifecycle Revenue Impacts ($/kWh)					$0.000002986
Discounted Participant Payback (years)					9.73

Table G10. Idaho HVAC 2013 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.112	$77,163	$58,090	($19,072)	0.75
TRC	$0.112	$77,163	$52,810	($24,353)	0.68
UCT	$0.050	$33,985	$52,810	$18,825	1.55
RIM		$108,009	$52,810	($55,199)	0.49
PCT		$82,109	$116,625	$34,516	1.42
Lifecycle Revenue Impacts ($/kWh)					$0.000001365
Discounted Participant Payback (years)					10.39

Table G11. Idaho HVAC 2014 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.098	$94,252	$84,349	($9,904)	0.89
TRC	$0.098	$94,252	$76,680	($17,572)	0.81
UCT	$0.047	$45,392	$76,680	$31,289	1.69
RIM		$149,968	$76,680	($73,287)	0.51
PCT		$102,284	$166,475	$64,191	1.63
Lifecycle Revenue Impacts ($/kWh)					$0.000001802
Discounted Participant Payback (years)					8.26

Kits

Cost-effectiveness results for net savings excluding non-energy benefits are shown in Table G12. The kits measure category (excluding non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G12). Table G13 provides the annual program non-energy benefits. Table G14 provide the cost-effectiveness results including non-energy benefits. The kits measure category (including non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G14).

Table G12. Idaho Kits 2014 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.016	$289,515	$1,480,853	$1,191,338	5.11
TRC	$0.016	$289,515	$1,346,230	$1,056,715	4.65
UCT	$0.016	$283,296	$1,346,230	$1,062,934	4.75
RIM		$2,108,091	$1,346,230	($761,861)	0.64
PCT		$104,522	$2,115,401	$2,010,879	20.24
Lifecycle Revenue Impacts ($/kWh)					$0.000028972
Discounted Participant Payback (years)					0.30

Table G13. Idaho Kits Annual Non-Energy Benefits

Measure	Annual Value	Perspective Adjusted
Kits - 2014	$186,469.44	PTRC, TRC, PCT

Table G14. Idaho Kits 2014 Net (Including Non-Energy Benefits)
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.016	$289,515	$2,808,139	$2,518,624	9.70
TRC No Adder	$0.016	$289,515	$2,552,854	$2,263,338	8.82
UTC	$0.016	$283,296	$1,346,230	$1,062,934	4.75
RIM		$2,108,091	$1,346,230	($761,861)	0.64
PCT		$104,522	$3,456,094	$3,351,572	33.07
Lifecycle Revenue Impacts ($/kWh)					$0.000027215
Discounted Participant Payback (years)					0.19

Lighting

Cost-effectiveness results for net savings excluding non-energy benefits are shown in Table G15, Table G16, and Table G17. The lighting measure category (excluding non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G15). Table G18 provides the annual program non-energy benefits. Table G19, Table G20, and Table G21 provide the cost-effectiveness results including non-energy benefits. The lighting measure category (including non-energy benefits) proved cost-effective from all perspectives except for the RIM (Table G19).

Table G15. Idaho Lighting 2013-2014 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.066	$479,091	$531,192	$52,101	1.11
TRC	$0.066	$479,091	$482,902	$3,811	1.01
UCT	$0.037	$265,863	$482,902	$217,039	1.82
RIM		$976,430	$482,902	($493,528)	0.49
PCT		$631,181	$1,434,430	$803,249	2.27
Lifecycle Revenue Impacts ($/kWh)					$0.000018873
Discounted Participant Payback (years)					2.35

Table G16. Idaho Lighting 2013 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.055	$252,691	$326,523	$73,831	1.29
TRC	$0.055	$252,691	$296,839	$44,147	1.17
UCT	$0.038	$172,284	$296,839	$124,554	1.72
RIM		$615,463	$296,839	($318,625)	0.48
PCT		$298,730	$893,736	$595,006	2.99
Lifecycle Revenue Impacts ($/kWh)					$0.000021167
Discounted Participant Payback (years)					1.21

Table G17. Idaho Lighting 2014 Net (Excluding Non-Energy Benefits)
(2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.085	$241,981	$218,755	($23,226)	0.90
TRC	$0.085	$241,981	$198,868	($43,112)	0.82
UCT	$0.035	$100,019	$198,868	$98,850	1.99
RIM		$385,808	$198,868	($186,940)	0.52
PCT		$355,331	$577,905	$222,574	1.63
Lifecycle Revenue Impacts ($/kWh)					$0.000007685
Discounted Participant Payback (years)					4.30

Table G18. Idaho Lighting Annual Non-Energy Benefits

Measure	Annual Value	Perspective Adjusted
CFL General Purpose - 2013	$58,020.27	PTRC, TRC, PCT
CFL Specialty - 2013	$21,511.40	PTRC, TRC, PCT
CFL General Purpose - 2014	$33,572.77	PTRC, TRC, PCT
CFL Specialty – 2014	$12,137.48	PTRC, TRC, PCT
LED General Purpose - 2014	$177.45	PTRC, TRC, PCT
LED Specialty - 2014	$963.24	PTRC, TRC, PCT

Table G19. Idaho Lighting 2013-2014 Net (Including Non-Energy Benefits) (2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.066	$479,091	$908,627	$429,536	1.90
TRC No Adder	$0.066	$479,091	$826,025	$346,934	1.72
UTC	$0.037	$265,863	$482,902	$217,039	1.82
RIM		$976,430	$482,902	($493,528)	0.49
PCT		$631,181	$2,063,186	$1,432,005	3.27
Lifecycle Revenue Impacts ($/kWh)					$0.000018873
Discounted Participant Payback (years)					1.71

Table G20. Idaho Lighting 2013 Net (Including Non-Energy Benefits) (2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.055	$252,691	$536,725	$284,034	2.12
TRC No Adder	$0.055	$252,691	$487,932	$235,241	1.93
UTC	$0.038	$172,284	$296,839	$124,554	1.72
RIM		$615,463	$296,839	($318,625)	0.48
PCT		$298,730	$1,243,378	$944,648	4.16
Lifecycle Revenue Impacts ($/kWh)					$0.000021167
Discounted Participant Payback (years)					0.87

Table G21. Idaho Lighting 2014 Net (Including Non-Energy Benefits)
(2013 IRP East Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.085	$241,981	$397,497	$155,516	1.64
TRC No Adder	$0.085	$241,981	$361,361	$119,380	1.49
UTC	$0.035	$100,019	$198,868	$98,850	1.99
RIM		$385,808	$198,868	($186,940)	0.52
PCT		$355,331	$876,228	$520,897	2.47
Lifecycle Revenue Impacts ($/kWh)					$0.000007149
Discounted Participant Payback (years)					2.60

Manufactured Homes

Table G22 shows manufactured homes measure category cost-effectiveness results for net evaluated savings. The manufactured homes measure category proved cost-effective from all perspectives except for the RIM (Table G22).

Table G22. Idaho Manufactured Homes 2014 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.023	$12,308	$45,423	$33,116	3.69
TRC	$0.023	$12,308	$41,294	$28,986	3.36
UCT	$0.023	$12,308	$41,294	$28,986	3.36
RIM		$69,004	$41,294	($27,711)	0.60
PCT		$5,740	$62,437	$56,697	10.88
Lifecycle Revenue Impacts ($/kWh)					$0.000000721
Discounted Participant Payback (years)					0.56

Weatherization

Table G23, Table G24, and Table G25 show weatherization measure category cost-effectiveness results for net evaluated savings. The weatherization measure category proved cost-effective from all perspectives except for the RIM (Table G23).

Table G23. Idaho Weatherization 2013-2014 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

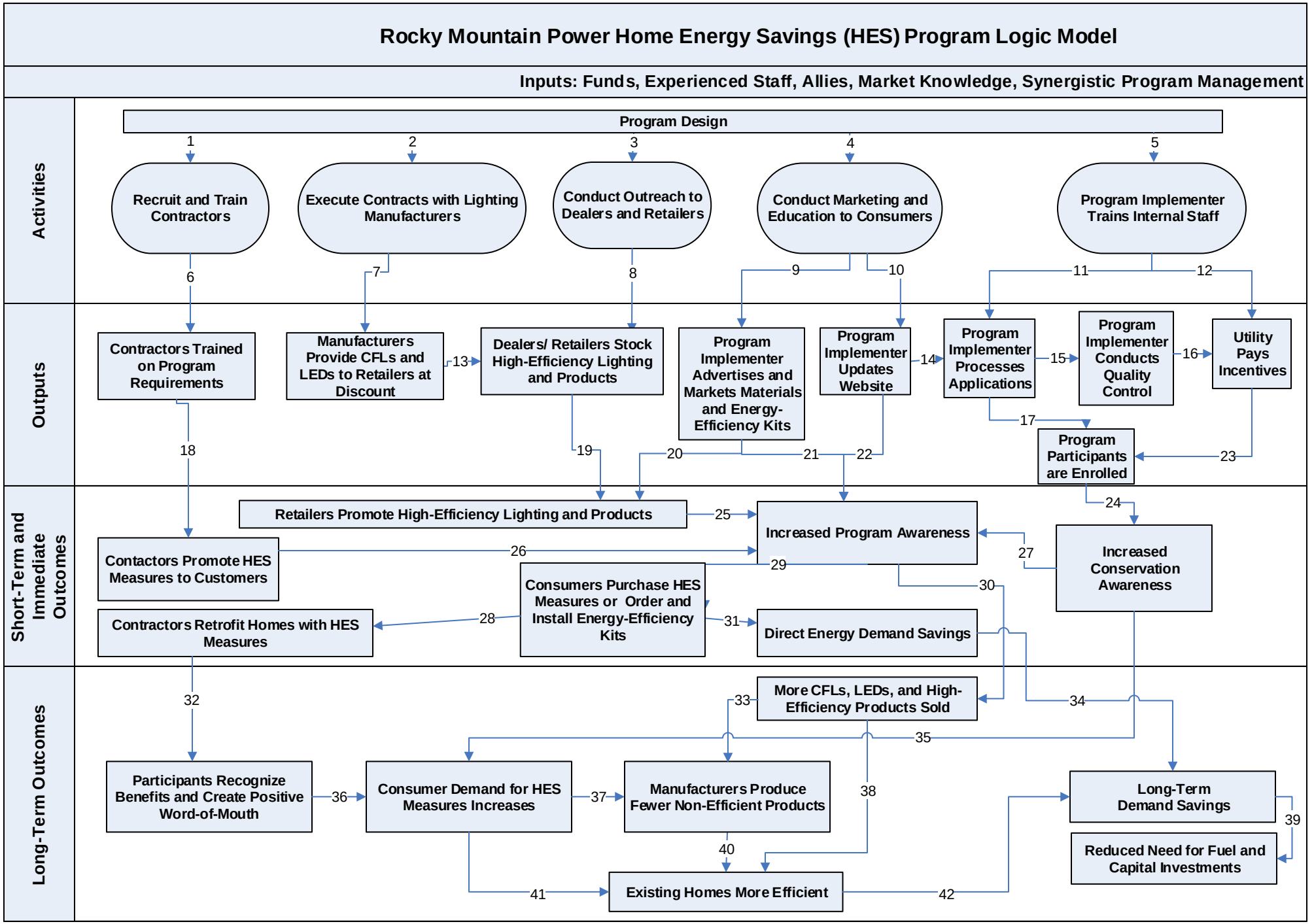
Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.055	$360,389	$639,224	$278,835	1.77
TRC	$0.055	$360,389	$581,113	$220,724	1.61
UCT	$0.046	$299,932	$581,113	$281,180	1.94
RIM		$1,040,674	$581,113	($459,562)	0.56
PCT		$227,594	$911,610	$684,016	4.01
Lifecycle Revenue Impacts ($/kWh)					$0.000009427
Discounted Participant Payback (years)					1.67

Table G24. Idaho Weatherization 2013 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.055	$314,487	$557,099	$242,612	1.77
TRC	$0.055	$314,487	$506,454	$191,967	1.61
UCT	$0.046	$262,596	$506,454	$243,858	1.93
RIM		$910,169	$506,454	($403,715)	0.56
PCT		$194,697	$792,086	$597,389	4.07
Lifecycle Revenue Impacts ($/kWh)					$0.000008375
Discounted Participant Payback (years)					1.31

Table G25. Idaho Weatherization 2014 Net
(2013 IRP East Residential Whole House 35% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.056	$49,061	$87,776	$38,716	1.79
TRC	$0.056	$49,061	$79,797	$30,736	1.63
UCT	$0.046	$39,906	$79,797	$39,891	2.00
RIM		$139,486	$79,797	($59,690)	0.57
PCT		$35,161	$127,750	$92,588	3.63
Lifecycle Revenue Impacts ($/kWh)					$0.000001231
Discounted Participant Payback (years)					1.67


Rocky Mountain Power Home Energy Savings (HES) Program Logic Model
Inputs: Funds, Experienced Staff, Allies, Market Knowledge, Synergistic Program Management
Activities
Outputs
Short-Term and Immediate Outcomes
Long-Term Outcomes
Program Design
1
2
3
4
5
Recruit and Train Contractors
Execute Contracts with Lighting Manufacturers
Conduct Outreach to Dealers and Retailers
Conduct Marketing and Education to Consumers
Program Implementer Trains Internal Staff
6
7
8
9
10
11
12
Contractors Trained on Program Requirements
Manufacturers Provide CFLs and LEDs to Retailers at Discount
13
Dealers/ Retailers Stock High-Efficiency Lighting and Products
Program Implementer Advertises and Markets Materials and Energy-Efficiency Kits
Program Implementer Updates Website
14
Program Implementer Processes Applications
15
Program Implementer Conducts Quality Control
16
Utility Pays Incentives
17
Program Participants are Enrolled
18
19
20
21
22
23
24
Retailers Promote High-Efficiency Lighting and Products
25
Increased Program Awareness
Contactors Promote HES Measures to Customers
26
27
Increased Conservation Awareness
29
30
Consumers Purchase HES Measures or Order and Install Energy-Efficiency Kits
Contractors Retrofit Homes with HES Measures
28
31
Direct Energy Demand Savings
32
More CFLs, LEDs, and High-Efficiency Products Sold
33
34
35
Participants Recognize Benefits and Create Positive Word-of-Mouth
36
Consumer Demand for HES Measures Increases
37
Manufacturers Produce Fewer Non-Efficient Products
38
Long-Term Demand Savings
39
40
Reduced Need for Fuel and Capital Investments
41
Existing Homes More Efficient
42