2015–2016 Idaho Home Energy Savings Program Evaluation

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Glossary of Terms

APS
Advanced Power Strips

CDD
Cooling Degree Days

CSA
Conditional Savings Analysis

CV
Coefficient of Variation

DLC
Design Lights Consortium

DOE
U.S. Department of Energy

Downstream
Programs offering rebates on targeted products after purchase. When the buyer applies for the rebate, the program verifies that the intended use meets program requirements, sometimes even including verification that the buyer has a gas or electric account with a sponsoring utility.

DSM
Demand-Side Management

DSMC
Demand-Side Management Central

ECM
Electronically Commutated Motor

EISA
Energy Independence and Security Act of 2007

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

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

HDD
Heating Degree Days

HES
Home Energy Savings

HOU
Hours of Use

HVAC
Heating, Ventilation, and Air Conditioning

IMEF
Integrated Modified Energy Factor

In-Service Rate
Also called the installation rate, the ISR is the proportion of incented measures actually installed. For lighting, the average measure life of a light bulb takes burn-outs into account. A light bulb that is installed but later removed as a result of a burn-out is counted as in-service.

IWF
Integrated Water Factor

KWYS
Key What You See

MHDS
Manufactured Homes Duct Sealing

Midstream
Programs implemented as agreements between the program and a range of intermediaries, including distributors, retailers, and contractors. As noted, midstream intermediaries must apply a defined rebate amount to the measure's retail price.

NEEA
Northwest Energy Efficiency Alliance

NEI
Non-energy impact (NEI) is used in place of NEB's (non-energy benefits) to account for the fact that non-energy factors could be a benefit or a cost.

NTG
Net-to-Gross

NPSO
Nonparticipant Spillover

PCT
Participant Cost Test

PTRC
PacifiCorp Total Resource Cost

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 resulted from the intervention.

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

Regional Technical Forum
The RTF is an advisory committee to the Northwest Power and Conservation Council, established in 1999 to develop standards to verify and evaluate energy efficiency savings.

Reported Savings
Savings that Rocky Mountain Power presented in its annual report for conservation acquisition.

RIM
Ratepayer Impact Measure

RSAT
Retail Sales Allocation Tool

SEEM
Simplified Energy Enthalpy Model

SKU
Stock Keeping Unit

SPIF
Sales Performance Incentive Funds

TRC
Total Resource Cost

TRM
Technical Reference Manual

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 a 90% probability that the estimated coefficient differs from zero.

Trade Ally
Trade allies include retailers and contractors that supply and install discounted light bulbs and fixtures, appliances, HVAC, or insulation through the program.

UCT
Utility Cost Test

UES
Unit Energy Savings

UMP
Uniform Methods Project

Upstream
Programs implemented as agreements between the product manufacturer, distributors or retailers, and the program. The distributor or retailer must pass the entire product discount to buyers, resulting in target products offered at below-market prices.

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Executive Summary

In 2006, Rocky Mountain Power first offered the Home Energy Savings (HES) program in Idaho. The program provides residential customers with incentives to facilitate their purchases of energy-efficient products and services through upstream (manufacturer), midstream (retailer), and downstream (customer) incentive mechanisms. During the 2015 and 2016 program years, Rocky Mountain Power's HES program reported gross electricity savings of 5,495,579 kWh. HES has historically been the largest of Rocky Mountain Power's residential energy efficiency programs, however in 2016 HES reported savings were surpassed by Home Energy Reporting. The HES program contributed 41% of the Idaho residential portfolio's reported savings and 16% of Idaho's total energy efficiency portfolio savings in 2015 and 2016.[1]

The 2015–2016 evaluation spans two HES program periods. Though the HES program provided incentives for the following measure categories during the 2015–2016 period, not all measures were offered in both years:

- ***Appliances:*** efficient clothes washers, refrigerators, freezers
- ***Building Shell:*** attic, floor, wall insulation, high-efficiency windows
- ***Electronics:*** advanced power strips (APS) (2015 only)
- ***Heating, Ventilation, and Air Conditioning (HVAC):*** high-efficiency heating and cooling equipment and services, including central air conditioners, evaporative coolers, air source and ductless heat pumps, ground source heat pumps, smart thermostats (2016 only), and duct leakage testing and sealing services
- ***Lighting:*** CFL and LED bulbs and lighting fixtures
- ***Water Heating:*** high-efficiency electric water heaters (2015 only) and heat pump water heaters
- ***wattsmart Starter Kits:*** low-cost (or, for some configurations, no-cost) mailed kits, containing various combinations and quantities of CFLs, LEDs, bathroom and kitchen faucet aerators, and high-efficiency showerheads
- ***Whole Home:*** whole-home performance path efficiency improvements for new homes and manufactured homes (2016 only)

Rocky Mountain Power contracted with Cadmus to conduct impact and process evaluations of the Idaho HES program for program years 2015 and 2016. For the impact evaluation, Cadmus assessed energy impacts and program cost-effectiveness. For the process evaluation, Cadmus assessed program delivery and efficacy, bottlenecks, barriers, and opportunities for improvements. This document presents the

[1] Residential portfolio and total portfolio savings (at the customer site) sourced from the 2015 and 2016 Rocky Mountain Power Idaho annual energy efficiency and peak reduction reports.

results of these evaluations. Cadmus also benchmarked HES against other similar programs around the country.

Key Findings

Cadmus' impact evaluation addressed 99% of the HES program savings by collecting primary data on the top savings measures, performing billing analyses for insulation and HVAC measures, and completing engineering reviews using secondary data for the remaining measures.

Key Impact Evaluation Findings

As summarized in Table 1, key evaluation findings include the following:

- ***Appliances:*** Overall, Cadmus estimated a gross realization rate of 165% of reported savings for the appliance measure category. Incented appliances showed an overall weighted average installation rate of 100%. Gross savings realization rates ranged from 100% for dishwashers and freezers to 179% for clothes washers. Clothes washers realized high evaluated gross savings primarily because Cadmus verified a higher-than-reported number of average weekly clothes washer loads. Appliance measures had a savings-weighted net-to-gross (NTG) ratio of 72%.
- ***Building Shell:*** Overall, Cadmus estimated a 131% gross realization rate for the building shell measure category, consisting of attic, wall, and floor insulation as well as windows. Cadmus evaluated the insulation measures using a billing analysis that produced a net realization rate and therefore did not apply a net adjustment to these weatherization measures.[2] Windows measures had an 87% NTG ratio, from self-report surveys, resulting in a 99% NTG ratio for the entire measure category.
- ***Electronics:*** Overall, Cadmus estimated a 100% gross realization rate of reported savings for the electronics measure category. Due to low savings contributed to the program, Cadmus did not perform a detailed engineering review of the APS measure. Electronics measures achieved an 85% savings-weighted NTG, determined through Cadmus' review of this ratio in secondary sources. The measure was only offered in 2015.
- ***HVAC****:* Overall, the HVAC measure category realized 49% of reported gross savings. Evaluated gross savings realization rates ranged from 37% for heat pump upgrades to 112% for heat pump conversions, determined through engineering analysis. The biggest share of reported savings, however, came from manufactured homes duct sealing, which achieved a 45% net saving realization rate, determined through billing analysis. This realization rate resulted from a higher-than-evaluated average home energy usage in the reported savings (and therefore higher-than-evaluated energy use reduction due to duct sealing reported). HVAC measures had a 97% savings-weighted NTG.

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

- ***wattsmart Starter Kits:*** Though Cadmus evaluated ***watt***smart kit products (e.g., lighting and water saving devices) separately, when combined at the kit level, the kits realized 96% of reported savings. Installation rates varied from 60% for kitchen faucet aerators to 92% for LEDs, and 84% of survey respondents who received water-saving measures (e.g., faucet aerators and showerheads) reported having an electric water heater, meaning savings could not be claimed for 16% of water-saving measures. The kits had a 95% weighted NTG, derived from self-response surveys.
- ***Lighting:*** Overall, the HES lighting category, which included CFL and LED light bulbs as well as LED fixtures, realized 75% of reported savings. Incented CFL and LED bulbs realized 76% of reported savings with installation rates of 70% and 76%, respectively, based on installation, storage, and removal practices reported through telephone surveys. The evaluation estimated lower hours-of-use (HOU) for LEDs and CFLs than expected, and lower in-service rates (ISRs) for LEDs. Overall, the lighting measure category. had a weighted NTG of 47% (falling within the typical range for upstream lighting NTG).

Table 1. 2015 and 2016 HES Program Savings[1]

Measure Category	Reported Units[2]	Evaluated Units[2]	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Precision (at 90% Confidence)	Evaluated Net Savings (kWh)	NTG
Appliances	205	205	25,721	42,558	165%	±2%	30,650	72%
Building Shell	48,303	48,303	55,573	72,665	131%	±23%	72,087	99%
Electronics	259	259	7,770	7,770	100%	N/A	6,605	85%
HVAC	565	565	1,658,644	811,922	49%	±11%	788,734	97%
Energy Kits	2,875	2,875	1,205,491	1,156,412	96%	±10%	1,098,592	95%
Lighting	137,152	137,152	2,527,782	1,907,436	75%	±3%	898,187	47%
Water Heating	13	13	3,087	3,087	100%	N/A	2,593	84%
Whole Home	2	2	11,511	11,511	100%	N/A	11,511	100%
Total	**189,374**	**189,374**	**5,495,579**	**4,013,361**	**73%**	**±4%**	**2,908,959**	**72%**

[1]Totals in tables may not add exactly due to rounding.
[2]Cadmus counted each square foot of incented insulation or windows as one unit for the Building Shell category.

Table 2 and Table 3 show impact evaluation findings by program year. The change in overall realization rates primarily resulted from the reduction in lighting's contribution to program savings in 2016. Whereas the program realization rate was dominated by lighting realization rate in 2015, HVAC realization rate affected 2016's program realization rate as much as lighting.

Cadmus applied NTG ratios to each measure category consistently across the program years, except for lighting, where Cadmus separately performed two rounds of demand elasticity modeling to estimate freeridership for CFL and LED bulbs incented in 2015 and 2016. Overall, the program's NTG ratio remained consistent between the two years.

Table 2. 2015 HES Program Savings[1]

Measure Category	Reported Units[2]	Evaluated Units[2]	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Evaluated Net Savings (kWh)	NTG
Appliances	114	114	12,313	19,693	160%	13,982	71%
Building Shell	16,859	16,859	23,912	29,406	123%	29,131	99%
Electronics	259	259	7,770	7,770	100%	6,605	85%
HVAC	272	272	784,460	386,710	49%	372,762	96%
Energy Kits	2,460	2,460	1,015,442	976,098	96%	927,294	95%
Lighting	105,304	105,304	1,954,442	1,450,559	74%	735,075	51%
Water Heating	13	13	3,087	3,087	100%	2,593	84%
Total[3]	**125,281**	**125,281**	**3,801,426**	**2,873,324**	**76%**	**2,087,442**	**73%**

[1]Totals in tables may not add exactly due to rounding.

[2]Cadmus counted each square foot of incented insulation or windows as one unit for the Building Shell category.

[3]Rocky Mountain Power did not offer the whole home measure category in 2015.

Table 3. 2016 HES Program Savings[1]

Measure Category	Reported Units[2]	Evaluated Units[2]	Reported Gross Savings (kWh)	Evaluated Gross Savings (kWh)	Gross Realization Rate	Evaluated Net Savings (kWh)	NTG
Appliances	91	91	13,408	22,864	171%	16,668	73%
Building Shell	31,445	31,445	31,661	43,259	137%	42,956	99%
HVAC	293	293	874,184	425,212	49%	415,972	98%
Energy Kits	415	415	190,048	180,314	95%	171,298	95%
Lighting	31,848	31,848	573,340	456,877	80%	163,112	36%
Whole Home	2	2	11,511	11,511	100%	11,511	100%
Total[3]	**64,094**	**64,094**	**1,694,153**	**1,140,037**	**67%**	**821,517**	**72%**

[1]Totals in tables may not add exactly due to rounding.

[2]Cadmus counted each square foot of incented insulation or windows as one unit for the Building Shell category.

[3]Rocky Mountain Power did not offer electronics incentives in 2016. The company reported heat pump water heaters—the only water heating measure offered in 2016 under the appliances category.

Key Process Evaluation Findings

Key process evaluation findings include the following:

- Retailers (35%) served as the most commonly cited sources of program awareness for non-lighting participants. The general population (Rocky Mountain Power's residential customers surveyed about lighting and APS measure purchases), most commonly cited bill inserts (33%) and word of mouth (19%) as ways they learned about ***watt***smart offerings. Manufactured homes participants learned about the duct-testing and sealing offer through door knocking

(44%) and bill inserts (19%). ***watt***smart Starter Kit participants learned about the program through bill inserts (56%), and Rocky Mountain Power's website (15%).

- As in 2013–2014, general population survey respondents for 2015–2016 expressed high satisfaction levels for LED purchases.
- Rocky Mountain Power customers largely remain unfamiliar with APS, with 76% not having heard of this technology. All of the twelve general population survey respondents who purchased APS in the last month said they were very satisfied with their purchase.
- Non-lighting participants expressed satisfaction with their involvement in the program, with 98% reporting satisfaction with the program overall. In addition, non-lighting participants exhibited high satisfaction levels with measures they installed, their contractors, and incentive amounts they received.
- All manufactured home participants used electricity to heat their water, and 92% used an electric furnace to heat their home. The average age for all manufactured home heating equipment was almost 17 years. While 41% of manufactured homes used a room air conditioner as their primary cooling system, 34% reported they did not have a cooling system.
- The 2015-2016 cycle had a statistically significant increase in the number of ***watt***smart Starter Kit participants citing saving money or saving energy as their primary motivation, relative to the previous cycle, and a statistically significant decrease in the number of participants citing interest in new technology.
- Seven of 10 HVAC trade allies interviewed did not use program materials with customers, and one of these did not know program materials were available. All three that used program materials said the materials were somewhat useful.

Benchmarking

- For CFL and LED lighting measures, Rocky Mountain Power exhibited a lower evaluated savings-per-unit value than evaluated net savings reported by some utilities outside of the region. This resulted from lower ISRs and HOU, as well as higher freeridership, as Cadmus established in this evaluation.
- Rocky Mountain Power used a delivery channel strategy similar that used by other utilities. Lighting measures used an upstream and/or midstream incentive mechanism to provide a discount at the point of sale. Rocky Mountain Power and other utilities increasingly used midstream channels (i.e., instant rebates available from contractors and retailers) as a strategy to encourage adoption of new technologies and big ticket items. For example, Rocky Mountain Power offers midstream incentives on select measures such as central air conditioners and heat pumps in addition to downstream incentives offered on all non-lighting measures. Downstream incentives are paid post-purchase using mail-in or online incentive applications.
- The most effective new construction programs offer greater incentives for homes built to operate at substantially higher efficiency levels than codes or at ENERGY STAR minimum requirements. Although Rocky Mountain Power did not offer a standalone new construction

program in Idaho, it addressed the new construction market through its downstream incentives, including a whole-home, performance-based incentive.

Cost-Effectiveness Results

As shown in Table 4, including non-energy impacts, the program proved cost-effective across the2015–2016 evaluation period from all test perspectives, except for the Ratepayer Impact Measure (RIM). The program proved cost-effective from the Total Resource Cost Test (TRC) perspective, with a benefit-cost ratio of 1.47.

Table 4. 2015–2016 Evaluated Net HES Program Cost-Effectiveness Summary (Including Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit-Cost Ratio
PacifiCorp Total Resource Cost Test (PTRC) (TRC + 10% Conservation Adder)	$0.061	$1,552,801	$2,429,425	$876,623	1.56
Total Resource Cost Test (TRC) No Adder	$0.061	$1,552,801	$2,286,452	$733,650	1.47
Utility Cost Test (UCT)	$0.050	$1,255,699	$1,429,731	$174,032	1.14
Ratepayer Impact Measure (RIM) Test		$3,897,010	$1,429,731	($2,467,279)	0.37
Participant Cost Test (PCT)		$1,214,016	$5,115,120	$3,901,104	4.21
Life Cycle Revenue Impacts ($/kWh)					$0.000047076
Discounted Participant Payback (years)					1.57

The RIM test measures program impacts on customer rates. Most energy efficiency programs do not pass the RIM test given that, 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 fall due to the program. Typically, this only happens for demand response programs or programs targeted at the highest marginal cost hours (when marginal costs are greater than rates).

Table 5 shows that excluding non-energy impacts, the HES program proved cost-effective across the 2015–2016 evaluation period from all test perspectives except the RIM and TRC tests. The program proved not to be cost-effective from the TRC perspective, excluding non-energy impacts, with a benefit-cost ratio of 0.92.

Table 5. 2015–2016 Evaluated Net HES Program Cost-Effectiveness Summary
(Excluding Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit-Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.061	$1,552,801	$1,572,704	$19,903	1.01
TRC No Adder	$0.061	$1,552,801	$1,429,731	($123,070)	0.92
UCT	$0.050	$1,255,699	$1,429,731	$174,032	1.14
RIM		$3,897,010	$1,429,731	($2,467,279)	0.37
PCT		$1,214,016	$3,826,652	$2,612,636	3.15
Lifecycle Revenue Impacts ($/kWh)	$0.000047076				
Discounted Participant Payback (years)	2.03				

Summary and Recommendations

From the impact and process evaluation interviews, surveys, and other analyses, Cadmus drew the following conclusions and recommendations:

- ***watt*smart Kit Participant Phone Numbers:** As the ***watt***smart kit measure administrator did not collect kit participant phone numbers or e-mail addresses, Rocky Mountain Power filled in available data using its own customer database. While a small detail in terms of operating the program efficiently, this created additional strain on evaluation efforts and on Rocky Mountain Power to update program administrator data with kit participant phone numbers.

  Recommendation: Require that ***watt***smart kit program administrators collect kit participant phone numbers and e-mail addresses for kit program survey data collection activities. *[As of October 2017, the program administrator reported that customer e-mail addresses and phone numbers were mandatory online field entries for customers applying for kits.]*

- **Upstream Lighting Point-of-Sale Merchandizing Data:** Program tracking data did not include complete information about high-visibility product placements or merchandising within retail locations (only the second half of 2016 and only one retailer). Though decreasing the price of efficient lighting products primarily drives sales, merchandising also can generate substantial sales lift. Without complete data, Cadmus cannot attribute merchandizing's effect on the program.

  Recommendation: Track dates and locations for the program's merchandising and product placements. Providing model numbers, store locations, dates, and display types (e.g., end caps, pallet displays) allows more precise estimates of program-generated sales lift.

Introduction

Program Description

During the 2015 and 2016 program years, Rocky Mountain Power contracted with CLEAResult to administer the Home Energy Savings (HES) Program and to provide prescriptive incentives to residential customers who purchased the following: qualifying high-efficiency appliances; heating, ventilation, and air conditioning (HVAC); water heating; whole home; and building shell measures.[3] The HES program included an upstream lighting component, providing high-efficiency lighting options by offering incentives for eligible CFLs and LED lamps and for CFL or LED fixtures. The program also continued to offer low- and no-cost ***watt***smart Starter Kits. Rocky Mountain Power also offered customers incentives to purchase and install advanced power strips (APS).

The HES program offered the following measures for part or all of the 2015–2016 evaluation period:

- Appliances:
  - Clothes washer
  - Freezer
  - Refrigerator
- Building Shell:
  - Insulation (attic, floor, wall)
  - Windows
- Home Electronics: APS
- HVAC:
  - Air source heat pumps (e.g., upgrade and electric system to heat pump conversion)
  - Central air conditioner equipment
  - Ductless heat pumps
  - Duct sealing manufactured home
  - Duct sealing and insulation (2016 only)
  - Efficient gas furnace with electronically commutated motor (ECM)
  - Evaporative cooler
  - Ground source heat pump
  - Heat pump conversion
  - Heat pump upgrade
  - Heat pump best practice installation and sizing
  - Smart thermostat (2016 only)

[3] CLEAResult's contract for HES administration expired at the end of 2015. Rocky Mountain Power rebid the administration contract, and, in March 2016, issued a new three-year contract to CLEAResult.

- Lighting:
  - CFLs
  - LEDs
  - Efficient light fixtures
- Water Heating:
  - Electric water heater (2015 only)
  - Heat pump water heater
- ***watt***smart Starter Kits (e.g., CFLs, LEDs, aerators, high-efficiency showerheads)
- Whole Homes: whole-home performance path improvement

Program Participation

During the 2015–2016 HES program years, Rocky Mountain Power provided prescriptive incentives to more than 800 residential customers, ***watt***smart Starter Kits to more than 2,800 customers, and upstream discounts for more than 137,000 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, 2015–2016[1]

Measure Category	Measure Name	Reported Quantity	Quantity Type	Reported kWh Savings
Appliances	Energy Efficient Clothes Washer	192	Measures	21,418
	Energy Efficient Freezer	2	Measures	189
	Energy Efficient Refrigerator	9	Measures	772
	Heat Pump Water Heater	2	Measures	3,342
Building Shell	Insulation-Attic	29,366	Square Feet	25,898
	Insulation-Attic, Self-Installed	9,944	Square Feet	8,237
	Insulation-Floor	1,764	Square Feet	3,351
	Insulation-Wall	2,650	Square Feet	6,577
	Windows	4,579	Square Feet	11,509
Electronics	Advanced Power Strip	259	Measures	7,770
HVAC	Central Air Conditioner Equipment	5	Measures	446
	Duct Sealing—Manufactured Homes	443	Measures	1,447,281
	Duct Sealing & Insulation	1	Measures	3,802
	Duct Sealing w/Crossover—Manufactured Homes	3	Measures	9,801
	Efficient Gas Furnace with ECM	22	Measures	11,616
	Electric System to Ground Source Heat Pump Conversion	2	Measures	25,050
	Electric System to Heat Pump Conversion	4	Measures	20,664
	Evaporative Cooler—Tier 1	2	Measures	420
	Evaporative Cooler—Tier 2	24	Measures	8,832

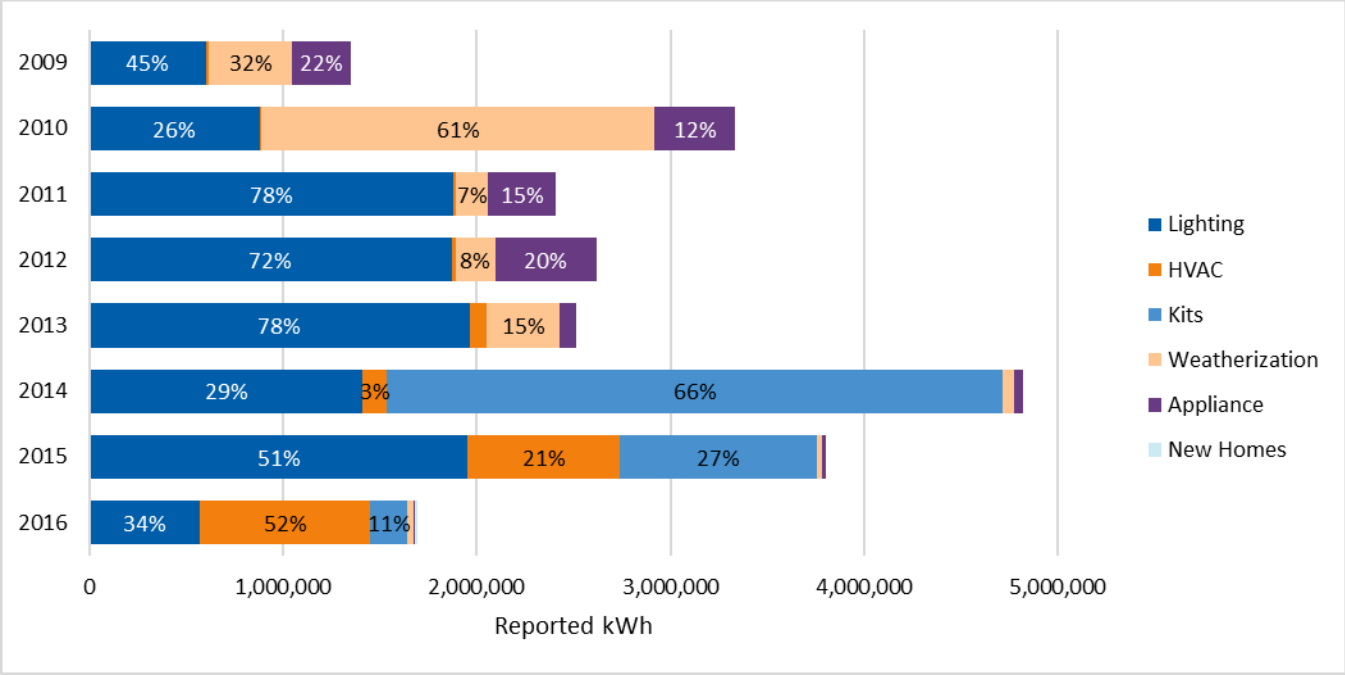
Measure Category	Measure Name	Reported Quantity	Quantity Type	Reported kWh Savings
	Heat Pump Best Practice Installation & Sizing	1	Measures	2,694
	Heat Pump to Heat Pump Upgrade	3	Measures	9,564
	Heat Pump, Ductless	32	Measures	100,096
	Smart Thermostat	14	Measures	18,378
Energy Kits	Basic Kit	1,361	Kits	877,892
	Best Kit	306	Kits	216,052
	Better Kit	49	Kits	32,126
	CFL Kit	953	Kits	60,687
	LED Kit	206	Kits	18,733
Lighting	Light Bulbs—CFL	106,711	Bulbs	1,823,462
	Light Bulbs—LED	30,056	Bulbs	688,559
	Light Fixtures—LED	385	Fixtures	15,762
Water Heating	Electric Water Heater	12	Measures	1,540
	Heat Pump Water Heater[1]	1	Measures	1,547
Whole Home	ENERGY STAR—Manufactured Homes	1	Measures	8,057
	Whole Home Performance Path—New Homes	1	Measures	3,454
Total				**5,495,579**

[1] Source: Rocky Mountain Power 2015 and 2016 annual reports and 2015–2016 kits, lighting, and non-lighting databases, provided by the program administrator.

[2] Rocky Mountain Power categorized heat pump water heaters as "water heating" in 2015 and "appliance" in 2016 in their annual energy efficiency and peak reduction reports.

After achieving the majority (66%) of HES program savings in 2014, savings from ***watt***smart Starter Kits decreased significantly in 2015–2016, achieving only 11% of program savings in 2016. As shown in Figure 1, HVAC increased dramatically in 2015 and 2016, accounting for 52% of HES program savings in 2016. Manufactured Homes Duct Sealing (MHDS) achieved nearly 88% of HVAC savings in 2015–2016.

Figure 1. Reported Gross kWh Savings by Measure Category from 2009–2016[1,2,3]



[1] Percentages may not add to 100% due to rounding.

[2] Rocky Mountain Power categorized light fixtures under the "appliance" measure category in its 2013 and 2014 annual reports, and under the "lighting" measure category in its 2015–2016 annual reports. Figure 1 shows all light fixtures for 2013–2016 in the "lighting" category. As such, percentages in the corresponding figure in Cadmus' 2013–2014 evaluation of this program vary from those in the figure above.

[3] Heat pump water heaters have been categorized under HVAC and electric water heaters have been categorized under appliances in 2015 and 2016, to allow for comparison with previous years.

Data Collection and Evaluation Activities

For the process evaluation, Cadmus assessed program design and process effectiveness, participant satisfaction, bottlenecks, barriers, marketing effectiveness, and opportunities for improvements. Cadmus also benchmarked select HES program aspects against other similar utility programs. Table 7 lists the evaluation activities supporting these evaluations. Appendix A provides survey and data collection instruments used.

Table 7. Summary of Evaluation Approach

Activities	Impact		Process
	Gross Savings	Net Savings	
Program Staff and Program Administrator Interviews			X
Participant Rebate Surveys (Non-Lighting)	X	X	X
Participant Kit Surveys	X	X	X
Participant Manufactured Homes Survey			X
General Population Surveys (Upstream Lighting/APS)	X	X[1]	X
HVAC Trade Ally Interviews			X
Building Shell and HVAC Billing Analysis		X	
Engineering Reviews	X		
Demand Elasticity Modeling		X	
Logic Model Review			X
Benchmarking Review			X

[1]This activity provided an estimate of nonparticipant spillover savings applied to program savings.

Sample Design and Data Collection Methods

For each measure category, Cadmus developed a representative sample of each surveyed population, designed to achieve ±10% precision with 90% statistical confidence. Cadmus assumed a coefficient of variation (CV)[4] equal to 0.5 for computing initial sample sizes. For a small surveyed population, Cadmus applied a finite population adjustment factor, which effectively reduced the necessary sample size while maintaining the target 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.[5]

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

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

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	2	2
Non-Lighting Participant Surveys[1]	381	353	240	148[2]
Kit Participant Survey[1]	2,875	2,804	140	134[2]
MHDS Participant Survey[3]	443	442	60	59
General Population Surveys[4]	56,486	53,183	250	250
HVAC Trade Ally Interviews	22	22	10	10

[1]Non-lighting and kit participant populations represent all unique participants by account number, according to program tracking data from the program administrator. The non-lighting participant population excludes Manufactured Home participants (listed separately in this table).

[2]Because of the small population of appliance, HVAC, building shell, and CFL kit participants, Cadmus could not attain the target number of completed surveys. All efforts were made to attain the target without placing an undue burden on customers; up to five attempts were made to reach each participant.

[3]The MHDS participant number represents all unique MHDS participants by account number. Though the MHDS population is a subset of the Non-Lighting Participant Population, the sampling frames were separate, and duplicate account numbers from the Non-Lighting Participant sample frame were removed from the MHDS sample frame.

[4]The general population count includes residential program participants and nonparticipants based on customer data provided by Rocky Mountain Power for the general population survey.

Non-Lighting Participant Telephone Surveys

Cadmus surveyed 148 non-lighting participants, gathering measure- and measure-category-level information on installations, freeridership, spillover, program awareness and satisfaction, and demographics. In developing survey targets by measure category, Cadmus used the measure mix from the 2015–2016 non-lighting database and randomly selected participants and measures within each measure category.

The MHDS measure contributed 26% of reported HES program savings during the evaluation period with the second-highest saving contribution after CFL bulbs. Given the importance of this measure to program savings, Cadmus also surveyed 59 MHDS participants as a subset of the HVAC category participants. This survey covered all topic areas addressed in the non-lighting participant survey, though particularly tailored towards gathering insights into the measure's midstream delivery process.

The total number of surveyed non-lighting participants was 207. Table 9 provides the population of non-lighting participants, targets, and achieved numbers of surveys. Due to the small population of appliance participants, Cadmus could not attain the target number of completed surveys. All efforts were made to attain the target without placing undue burdens on customers, with up to five attempts made to reach each participant.

Table 9. Non-Lighting Participant Survey Sample

Measure Category	Population	Sampling Frame	Targeted	Achieved
Appliances	215	189	80	64
HVAC	107	105	80	54
HVAC MHDS	443	442	60	59
Building shell	61	61	80	30
Total	**826[1]**	**797**	**300**	**207**

[1]The total population differs from the total population in as some participant respondents participated in multiple measure categories.

Participant Kit Surveys

Cadmus surveyed 134 customers who received ***watt***smart Starter Kits in 2015 and 2016, and gathered measure-level information on kit product installations, freeridership, spillover, program awareness and satisfaction, and demographics.

Cadmus targeted samples to achieve statistically significant results for kits containing CFLs and kits containing LEDs, and 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 survey participants. Table 10 lists the population of kit participants, targets, and achieved numbers of surveys.

Table 10. Participant Kit Survey Sample

Lighting Type	Population	Sampling Frame	Targeted	Achieved
CFL	2,363	2,300	70	64[1]
LED	512	504	70	70
Total	**2,875**	**2,804**	**140**	**134**

[1]Although the program had a large population of CFL kit participants, in 2016 the population of CFL kit participants dropped to 174. Cadmus conducted two rounds of kit participant surveys in 2015 and 2016, with a target of 35 completes for each technology. Due to the small population of CFL kit participants in 2016, Cadmus could not attain the target number of CFL kit surveys (35 in 2016). All efforts were made to attain the target without placing undue burdens on customers; up to five attempts were made to reach each participant.

General Population Surveys

The 2015–2016 general population surveys collected information on HES program awareness, key data for lighting and APS' engineering reviews, and nonparticipant spillover (NPSO) from a random group of customers in Idaho. Cadmus drew the general population survey sample from a random list of Idaho residential customers (provided by Rocky Mountain Power), achieving 250 completed responses.

HVAC Trade Ally Interviews

Cadmus interviewed 10 HES participating HVAC trade allies. The interviews collected information about the following:

- Trade ally engagement with the program (e.g., years of participation, equipment provided, training received)
- Trade ally outreach and marketing to customers
- Market or Program barriers to participation for customers and trade allies
- Trade ally satisfaction with HES

Impact Evaluation

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

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

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 2015 and 2016 Rocky Mountain Power Energy Efficiency and Peak Reduction Annual Reports.[6] To determine evaluated gross savings, Cadmus applied Step 1 through Step 3; and, to determine evaluated net savings, Cadmus applied Step 4:

- **Step 1** (verify participant database): This included reviewing the program tracking database to ensure participants and reported savings matched 2015 and 2016 annual reports.
- **Step 2** (adjust gross savings with the actual installation rate): Using telephone surveys, Cadmus determined the number of program measures installed and those remaining installed.
- **Step 3** (estimate gross unit energy savings [UES]): This included reviews of measure saving assumptions, equations, and inputs (e.g., engineering reviews for lighting and appliances, billing analysis for building shell measures).
- **Step 4** (applying net adjustments): Cadmus calculated net saving adjustments using results from customer self-response surveys and demand elasticity modeling. No net savings adjustments were applied to building shell measures as the billing analysis produced net savings through Step 3.

Table 11 lists the methodologies used for each evaluation savings step in the 2015–2016 HES program.

[6] Rocky Mountain Power Idaho Efficiency and Peak Reduction Annual Reports. Available online: 2015 report: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2015_ID_Annual_Report_Final.pdf. 2016 report: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2016_Idaho_DSM_Annual_Report%2BAppendix.pdf

Table 11. 2015–2016 HES Impact Methodology by Measure

Measure Category	Measure Name	Percentage of Savings	Method			
			Step 1: Database Review	Step 2: Verification	Step 3: Unit Energy Savings	Step 4: Net Adjustment
Appliances	Energy Efficient Clothes Washer	0.4%	Non-Lighting Tracking Database Review	In-Service Rate (ISR): Non-Lighting Survey	Engineering Review	Self-Response net-to-gross (NTG)
	Energy Efficient Freezer	0.0%			Reported	
	Energy Efficient Refrigerator	0.0%				
	Heat Pump Water Heater	0.1%				
Building Shell	Insulation-Attic	0.5%		Billing Analysis	Billing Analysis	No adjustment[1]
	Insulation-Attic, Self-Installed	0.1%				
	Insulation-Floor	0.1%				
	Insulation-Wall	0.1%				
	Windows	0.2%		ISR: Non-Lighting Survey	Engineering Review	Self-Response NTG
Electronics	Advanced Power Strip	0.1%		ISR: General Population Survey	Reported	NTG based on secondary sources
HVAC	Central Air Conditioner Equipment	0.0%		ISR: Non-Lighting Participant Survey	Reported	Self-Response NTG
	Duct Leakage Test—Manufactured Homes	0.0%		Billing Analysis	Billing Analysis	No adjustment[1]
	Duct Sealing—Manufactured Homes	26.3%				
	Duct Sealing & Insulation	0.1%				

Measure Category	Measure Name	Percentage of Savings	Method			
			Step 1: Database Review	Step 2: Verification	Step 3: Unit Energy Savings	Step 4: Net Adjustment
	Duct Sealing w/Crossover—Manufactured Homes	0.2%				
	Efficient Gas Furnace with ECM	0.2%		ISR: Non-Lighting Participant Survey	Engineering Review	Self-Response NTG
	Electric System to Ground Source Heat Pump Conversion	0.5%			Engineering Review	
	Electric System to Heat Pump Conversion	0.4%			Engineering Review	
	Evaporative Cooler—Tier 1	0.0%			Reported	
	Evaporative Cooler—Tier 2	0.2%				
	Heat Pump Best Practice Installation & Sizing	0.0%				
	Heat Pump to Heat Pump Upgrade	0.2%			Engineering Review	
	Heat Pump, Ductless	1.8%			Engineering Review	
	Smart Thermostat	0.3%			Engineering Review	
	Whole Home Upgrade Package—Ductless Heat Pump	0.0%			N/A	
Energy Kits	Basic Kit	16.0%	Kit Tracking Database Review	ISR: Kit Participant Survey	Engineering Review	Self-Response NTG
	Best Kit	3.9%				
	Better Kit	0.6%				
	CFL Kit	1.1%				
	LED Kit	0.3%				
Lighting	Light Bulbs—CFL	33.2%				Demand Elasticity Modeling

Measure Category	Measure Name	Percentage of Savings	Method			
			Step 1: Database Review	Step 2: Verification	Step 3: Unit Energy Savings	Step 4: Net Adjustment
	Light Bulbs—LED	12.5%	Lighting Tracking Database Review	ISR: General Population Survey	Engineering Review	
	Light Fixtures—CFL	0.0%				Market baseline used[2]
	Light Fixtures—LED	0.3%				
Water Heating	Electric Water Heater	0.0%	Non-Lighting Tracking Database Review	ISR: Non-Lighting Survey	Reported	Self-Response NTG
	Heat Pump Water Heater	0.0%				
Whole Home	ENERGY STAR—Manufactured Homes	0.1%				Not evaluated
	Whole Home Performance Path—New Homes	0.1%				

[1]Net adjustments were not applied to insulation and duct-sealing measures as the billing analysis conducted to generate savings produced a net result.

[2]Freeridership adjustments were not applied to measures as the engineering review used a market baseline to estimate savings, producing a net-of-freeridership result. Spillover was applied as applicable.

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 the top 99% of program savings when ranked by their percentage contribution to reported program savings during the evaluation period. Table 12 presents the share of savings and the evaluated savings' evaluation methods used for measures representing the applicable percentage during the 2015–2016 period.

Table 12. Measure Selection for Step 3: Engineering and Billing Analysis

Measure Category	Measure	Percentage of Reported kWh Savings	Step 3: Evaluation Method
Appliances	Clothes Washers	Less than 1%	Engineering Review
Building Shell	Attic, Floor, and Wall Insulation	1%	Billing Analysis
	Windows	Less than 1%	Engineering Review
HVAC	Duct Sealing and Insulation	27%	Billing Analysis
	Ductless Heat Pumps	2%	Engineering Review
	Gas Furnace with ECM	Less than 1%	Engineering Review
	Ground Source Heat Pumps	Less than 1%	Engineering Review
	Heat Pump Conversions and Upgrades	1%	Engineering Review
	Smart Thermostats	Less than 1%	Engineering Review
Energy Kits	***watt***smart Starter Kits	22%	Engineering Review
Lighting	Light Bulbs--CFL	33%	Engineering Review
	Light Bubs--LED	13%	Engineering Review
	Fixtures	Less than 1%	Engineering Review
Sum % of Reported Savings Evaluated		**99%**	

Table 13 provides gross savings evaluation results for evaluated quantities, gross savings, and realization rates by measure type.

Table 13. Reported and Evaluated Gross HES Program Savings for 2015–2016

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated[3]	
Appliance	Energy-Efficient Clothes Washer	192	21,418	38,255	179%
	Energy-Efficient Freezer	2	189	189	100%
	Energy-Efficient Refrigerator	9	772	772	100%
	Heat Pump Water Heater	2	3,342	3,342	100%
Building Shell[1]	Insulation-Attic	29,366	25,898	40,093	155%
	Insulation-Attic, Self-Installed	9,944	8,237	12,752	155%
	Insulation-Floor	1,764	3,351	5,187	155%
	Insulation-Wall	2,650	6,577	10,182	155%
	Windows	4,579	11,509	4,451	39%

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated[3]	
Electronics	Advanced Power Strip	259	7,770	7,770	100%
HVAC	Central Air Conditioner Equipment	5	446	446	100%
	Duct Sealing—Manufactured Homes	443	1,447,281	647,295	45%
	Duct Sealing & Insulation	1	3,802	1,700	45%
	Duct Sealing w/Crossover—Manufactured Homes	3	9,801	4,383	45%
	Efficient Gas Furnace with ECM	22	11,616	8,555	74%
	Electric System to Ground Source Heat Pump Conversion	2	25,050	20,351	81%
	Electric System to Heat Pump Conversion	4	20,664	21,314	103%
	Evaporative Cooler—Tier 1	2	420	420	100%
	Evaporative Cooler—Tier 2	24	8,832	8,832	100%
	Heat Pump Best Practice Installation & Sizing	1	2,694	2,694	100%
	Heat Pump to Heat Pump Upgrade	3	9,564	3,549	37%
	Heat Pump, Ductless	32	100,096	82,005	82%
	Smart Thermostat	14	18,378	10,377	56%
Energy Kits	Basic Kit	1,361	877,892	851,346	97%
	Best Kit	306	216,052	203,744	94%
	Better Kit	49	32,126	31,004	97%
	CFL Kit	953	60,687	54,879	90%
	LED Kit	206	18,733	15,439	82%
Lighting	Light Bulbs—CFL	106,711	1,823,462	1,377,444	76%
	Light Bulbs—LED	30,056	688,559	521,195	76%
	Light Fixtures—LED	385	15,762	8,797	56%
Water Heating	Electric Water Heater	12	1,540	1,540	100%
	Heat Pump Water Heater	1	1,547	1,547	100%
Whole Home	ENERGY STAR—Manufactured Homes	1	8,057	8,057	100%
	Whole Home Performance Path—New Homes	1	3,454	3,454	100%
Total[2]			**5,495,579**	**4,013,361**	**73%**

[1]Quantities for building shell measures are in square feet.

[2]Savings may not add exactly to the total due to rounding.

[3]The billing analysis produced net savings for insulation and duct sealing measures.

Step 1: Tracking Database Reviews

The program administrator provided three tracking databases containing Idaho data that covered all 2015 and 2016 participation for the three delivery methods: lighting, kits, and non-lighting rebates (e.g., HVAC, appliance, water heating, whole home, electronics, building shell).

Cadmus' review of tracking databases for 2015 and 2016 did not find discrepancies in total reported quantities or total savings compared to the 2015 and 2016 annual reports.

The ***watt***smart Starter Kit database provided account numbers, addresses, names, and types and quantities of kit types, but the program administrator did not track or provide phone numbers[7] from 2015 to 2016 (which were necessary for conducting phone surveys). Rocky Mountain Power provided participant phone numbers by mapping participant account numbers to its customer database.

Cadmus also reviewed the program administrator's tracking database of 2015 and 2016 non-lighting measures, which collected measure-level information (e.g., efficiency standards, unit quantities, purchase dates, incentive amounts). Total quantities and savings matched the 2015 and 2016 annual reports.

The upstream lighting measures' database contained information on bulbs and fixtures incented, in addition to retailers, electric savings, purchase dates, models, and stock keeping units [SKUs].[8] During the 2015–2016 evaluation cycle, Cadmus conducted lighting demand elasticity modeling to estimate freeridership for lighting incentives. In conducting this analysis, Cadmus requested merchandising and product placement data from the program administrator and included these in the demand elasticity model. Ideally, the program administrator would track products featured on high-visibility, off-shelf displays within each store location (i.e., end caps or pallet displays) along with the time frame for each display. With these data, Cadmus could have estimated sales lift due to price effects as well as product merchandising conducted separately.

As the program administrator's merchandising and product placement data proved unavailable, Cadmus could only account for program price changes and not program merchandising. This could lead to bias in freeridership estimates. Any merchandising coinciding with price changes and leading to increased sales, when unaccounted for in the demand elasticity model, could potentially lead to an upward bias in the price elasticity coefficients, with the model ultimately underestimating freeridership. Merchandising not coinciding with price changes, when unaccounted for in the model, would not be credited to the program, with the model overestimating freeridership.

Step 2: Verification

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

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[7] At the time of this evaluation, the program administrator has begun collecting phone numbers.

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

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 14 shows ISRs for each of these measures.

All survey respondents reported installing the measures listed in the survey, resulting in a 100% ISR for non-lighting measures. Table 14 also shows the breadth and quantity of measures addressed by the survey.

Table 14. ISR by Measure Category, 2015–2016

Measure Category	Measure	2015 and 2016			
		Total Surveyed Measures	Installed Measures	Percentage Installed	Weighted Average ISR
Appliances	Energy-Efficient Clothes Washer	53	53	100%	100%
	Energy-Efficiency Freezer	1	1	100%	
	Energy-Efficient Refrigerator	2	2	100%	
Building Shell	Attic Insulation	18,824	18,824	100%	100%
	Floor Insulation	650	650	100%	
	Windows	2,181	2,181	100%	
Water Heating	Electric Water Heater	8	8	100%	100%
	Heat Pump Water Heater	1	1	100%	
HVAC	Central Air Conditioner Equipment	1	1	100%	100%
	Ductless Heat Pump	12	12	100%	
	Evaporative Cooler	12	12	100%	
	Efficient Gas Furnace with ECM	6	6	100%	
	Heat Pump Conversion or Upgrade	3	3	100%	

wattsmart Starter Kits In-Service Rate

Cadmus calculated ISRs for each kit product using data collected through a survey of 134 Idaho kit recipients. The survey, conducted six months to one year after kit delivery, verified the number of kit products received and asked survey respondents how many products they installed at the time of the survey. If respondents reported that the product did not remain installed, the survey asked additional questions about why the measure had not been installed and what ultimately happened to the unit (e.g., stored, discarded).

Table 15 shows product-level ISR results for kit products, along with total products surveyed and reported installed.

Table 15. ISR by Kit Product, 2015–2016

Product	Total Surveyed Products	Products Reported as Installed	ISR
Bathroom Aerator	122	77	63%
CFLs*	244	197	81%
Kitchen Aerator	70	42	60%
LEDs*	268	247	92%
Showerheads	129	86	67%

*Consistent with the upstream CFL and LED ISR analysis, bulbs removed because they burned out were considered to have been installed.

CFLs and LEDs had the highest ISRs of the five products reported installed at the time of the survey, with 81% for CFLs and 92% for LEDs. Aerators had the lowest ISRs, with 60% for kitchen aerators and 63% for bathroom aerators installed at the time of the survey.

Cadmus compared ***watt***smart Starter Kit ISRs with those of two other utilities' residential energy efficiency kit programs in which free energy- and water-saving products are delivered to customers at their request. As shown in Table 16, except for the LEDs' ISR, ISRs from other kit programs were similar to those from the ***watt***smart Starter Kit program.

Table 16. Mail-by-Request Kit Program ISRs Comparison

Product	PPL Electric Utilities PA 2015[1]	Iowa Energy Wise IA 2016[2]	Idaho HES 2015–2016
Kitchen Faucet Aerator	65%	74%	**60%**
Bathroom Faucet Aerators	N/A	70%	**63%**
Showerheads	60%	74%	**67%**
CFLs	N/A	79%	**81%**
LEDs	97%	75%	**92%**

[1]Cadmus, on behalf of PPL Electric Utilities. *EDC Program Year 7 Annual Report*. 2016.

[2]Cadmus, on behalf of Iowa Energy Wise. *Final Report: Iowa 2016 Energy Wise Program.* 2017.

CFL and LED In-Service Rates

Cadmus calculated first-year ISRs for 2015–2016 using data collected through the general population survey of 250 Rocky Mountain Power Idaho customers. Each survey asked participants about the number of bulbs they purchased, installed, removed, and stored within the prior 12 months. If respondents reported removing bulbs, the survey asked why these removals took place. For customers stating that they removed bulbs due to burnout, Cadmus adjusted the ISRs based on the assumption that bulbs removed due to burn out would not have been removed had they remained functional. Additionally, the assumed effective useful life incorporated the burnout rate.

Surveys asked customers to consider bulbs purchased during the past 12 months rather than those purchased during the entire two-year evaluation period. This phrasing partially addressed Cadmus'

concerns about a customer's ability to recall purchases that occurred more than two years prior to the survey. The calculated ISRs did not account for installations occurring after the first year of purchase.

The following formula calculated the lighting ISR:

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

To reflect the program's move away from CFL incentives in Idaho, the 2015–2016 survey did not include questions related to CFL purchases. Therefore, CFL first-year ISR values reported for the current evaluation are based on the program's previous evaluation during 2013–2014.

CFL In-Service Rates

As the general population survey did not include questions about CFL bulbs, Cadmus obtained CFL installation rates from telephone surveys conducted for the program's previous evaluation during 2013–2014.[9] Of 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. In calculating the ISR, Cadmus used data from the remaining 133 respondents.

Table 17 provides ISR results for 2015–2016 CFLs.

Table 17. 2015 and 2016 First-Year CFL ISR (Based on 2013–2014 Upstream Lighting Survey)*

Bulb Status	Bulbs Reported	ISR
Purchased	**1,361**	70%
Installed	956	
Stored	405	
Removed	78	
Removed After Burning Out	71	
In-Service Bulbs (including burned out)	**949**	

*n = 133 respondents

Table 18 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.

[9] Cadmus. *2013–2014 Idaho Home Energy Savings Program Evaluation.* Prepared for Rocky Mountain Power. September 27, 2016. Available at: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2013-2014_Idaho_HES_Evaluation_Report.pdf

Table 18. 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%
Midwest Utility 2	Self-reporting: 301 customer surveys	2012	68%
Northeast Utility	Self-Reporting: 200 telephone surveys	2012	73%
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%
Rocky Mountain Power Idaho 2015–2016 HES Evaluation (Same as 2013–2014 Evaluation)	**Self-reporting: 133 in-territory upstream lighting surveys for 2013–2014 Evaluation**	**2016**	**70%**

LED In-Service Rates

Cadmus calculated the first-year LED ISR for 2015–2016 using data collected through the general population survey of 250 Idaho Rocky Mountain Power customers. The survey asked participants about the number of LED bulbs they purchased, installed, removed, and stored within the previous 12 months. If respondents reported removing bulbs, the survey asked why removal took place and adjusted the ISR accordingly. The calculated ISR did not account for installations occurring after the first year of purchase.

After filtering survey results for those who purchased LEDs and provided reliable responses, 68 customers remained for inclusion in the LED ISR analysis. Table 19 lists the LED ISR results.

Table 19. 2015–2016 First-Year LED ISR*

Bulb Status	Bulbs Reported	ISR
Purchased	**988**	76%
Installed	762	
Stored	226	
Removed	23	
Removed After Burning Out	8	
In-Service Bulbs (including burned out)	**747**	

*n = 68 respondents

Table 20 compares LED ISR values to ISRs calculated for LEDs in other jurisdictions. As noted, Rocky Mountain Power's 2015–2016 LED ISR value was the lowest among other studies referenced. All but one study referenced using a multiyear ISR, assuming that bulbs currently in storage will be installed in the future. Only one other first-year ISR in Maryland was verified using site visits, which may indicate that site visits produce ISRs higher than those produced through self-report surveys.

Table 20. Comparison of Evaluated LED ISR Estimates

Utility or Program Administrator	Source	First-Year or Multiyear	Program Year	ISR
Ameren, MO	Site Visits	Multiyear	2016	88%
Salt River Project, AZ	The Uniform Methods Project*	Multiyear	2016	99%
EmPOWER, MD	Site Visits	First-Year	2016	90%
PPL Electric, PA	Pennsylvania 2015 Technical Reference Manual	Multiyear	2016	97%
Rocky Mountain Power, ID 2015–2016 HES Evaluation	**Phone Surveys**	**First-Year**	**2016**	**76%**

*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

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 review measures included the following:

- CFL and LED bulbs
- Light fixtures
- Clothes washers
- Windows
- Smart thermostats
- Efficiency gas furnaces with ECMs
- ***watt***smart starter kits (including CFLs, LEDs, faucet aerators and high-efficiency showerheads)
- Heat pump upgrades and conversions
- Ductless heat pumps
- Ground source heat pump conversation

Cadmus evaluated the following measures using billing analysis:

- Attic, wall, and floor insulation
- MHDS

Cadmus gave a pass-through realization rate of 100% to all measures not listed above (when combined, they contributed less than 1% of program savings). As shown in Table 21, UES realization rates for evaluated measures ranged between 5% for heat pump to heat pump upgrades and 179% for clothes washers.

Table 21. 2015–2016 Evaluation Method and Gross[1] Unit Realization Rate Summary Table

Measure Category	Measure	Average UES (kWh/Unit)		UES Realization Rate[2]	UES Method
		Reported	Evaluated		
Appliance	Clothes Washer	112	199	179%	Engineering Review
Building Shell	Insulation[3]	1.0	1.6	155%	Billing Analysis
	Windows[3]	2.5	1.0	39%	Engineering Review
HVAC	Duct Sealing & Insulation	3,268	1,462	45%	Billing Analysis
	Gas Furnace with ECM	528	389	74%	Engineering Review
	Electric System to Ground Source Heat Pump Conversion	12,525	10,175	81%	Engineering Review
	Electric System to Heat Pump Conversion	5,166	5,328	103%	Engineering Review
	Heat Pump to Heat Pump Upgrade	3,188	1,183	37%	Engineering Review
	Heat Pump, Ductless	3,033	2,563	82%	Engineering Review
	Smart Thermostat	1,313	741	56%	Engineering Review
Energy Kits	***watt***smart Starter Kits	419	402	96%	Engineering Review
Lighting	CFL Lamps	17.1	12.9	76%	Engineering Review
	LED Lamps	22.9	17.3	76%	Engineering Review
	Fixtures	40.9	22.9	56%	Engineering Review

[1]Gross savings values or net values from billing analysis.

[2]The UES realization rate may not calculate exactly due to rounding reported and evaluated UES values.

[3]Insulation and window units are kWh/square foot.

The following sections describe the methodology and results of the UES calculations for each measure listed in Table 21.

CFL and LED Bulbs

During the 2015–2016 program years, Rocky Mountain Power provided incentives for 106,711 CFLs and 30,056 LEDs through 15 different Idaho retailers, representing 28 stores. Table 22 shows quantities and savings for the 14 different bulb types. Overall, bulbs represented 46% of total HES reported savings.

Table 22. 2015–2016 Incented CFL and LEDs Bulbs by Type

Lighting Type	Bulb Type	Reported Quantity (Bulbs)	Reported Quantity % (Bulbs)	Reported Savings (kWh)
CFL	A-Lamp	2,705	2.0%	34,612
	Spiral	94,621	69.2%	1,590,744
	Candelabra	208	0.2%	3,516
	Globe	243	0.2%	3,722
	Reflector	2,556	1.9%	70,957
	Daylight	6,323	4.6%	117,747
	Outdoor	3	0.0%	73
	3-Way	52	0.0%	2,089
CFL Total		**106,711**	**78.0%**	**1,823,462**
LED	A-Lamp	22,343	16.3%	427,355
	Candelabra	1,381	1.0%	22,656
	Globe	712	0.5%	17,472
	Downlight	5,620	4.1%	221,075
LED Total		**30,056**	**22.0%**	**688,559**
Overall Total		**136,767**	**100.0%**	**2,512,021**

For the 2015–2016 evaluation period, LEDs made up 36% of the upstream programs. This fraction increased from 2015 to 2016, as shown in Table 23. In 2016, CFL participation dropped precipitously, while LED participation held relatively steady.

Table 23. CFL and LED Upstream Lighting Participation, 2015–2016

Year	CFL Quantity	LED Quantity	Total	LED %	CFL %
2015	89,556	15,472	105,028	15%	85%
2016	17,155	14,584	31,739	46%	54%

Savings Calculation

The following equation provided evaluated lighting savings:

$$\text{Evaluated Per Unit Savings (kWh per unit)} = \frac{\Delta\text{Watts} \cdot \text{ISR} \cdot \text{HOU} \cdot 365.25 \cdot \text{WHF}}{1{,}000}$$

Where:

- ΔWatts = Delta watts, the difference between the evaluated baseline bulb wattage (W_{BASE}) and the evaluated efficient bulb wattage (W_{EFF})
- ISR = In-service rate, the percentage of incented measures installed within the first year
- HOU = Hours of use, the daily lighting operating hours
- WHF = Waste heat factor, accounting for interactive effects with a 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 24.

Table 24. CFL and LED Bulb Evaluated Gross Savings Activities

Savings Variable	Lighting Type	Activity	Value
ΔWatts	CFL	Lumen Equivalency Method, via the Uniform Methods Project (UMP)[2]	31.1[1]
	LED		36.7[1]
ISR	CFL	2013–2014 General Population Survey (n=133)	70%
	LED	2015–2016 General Population Survey (n=68)	76%
HOU	CFL	Multistate HOU Regression Model, 2013–2014 General Population Survey (n=69)	1.73
	LED	Multistate HOU Regression Model, 2015–2016 General Population Survey (n=192)	1.83
WHF	CFL + LED	2015–2016 General Population Survey (n=225)	0.938

[1]Weighted average value for all bulbs of each technology.

[2]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

Cadmus derived the annual savings algorithm from industry standard engineering practices, consistent with the methodology prescribed by that the UMP prescribed for calculating residential lighting energy use and savings. The following sections discuss each equation component (except for ISR, discussed above in the Step 2: Verification section).

Delta Watts

Delta watts represents the wattage difference between a baseline bulb and an equivalent CFL or LED bulb. Cadmus determined baseline wattages using the 2015–2016 upstream lighting tracking data, which included CFL and LED sales data by model numbers and bulb types for 136,767 bulbs sold through the program.

The lumen equivalency method produces delta watts for a given lamp by 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 equals the difference between this baseline wattage and the bulb's efficient wattage.

Whenever possible, Cadmus estimated each lamp's lumen output and efficient wattage by mapping it to the ENERGY STAR database. When this was not possible, Cadmus interpolated lumen outputs from efficient wattage, based on a best-fit line derived from the ENERGY STAR database.

The UMP defines five lamp types:

- Standard
- Decorative

- Globe
- Energy Independence and Security Act of 2007 (EISA)-exempt (typically three-way and certain globe lamps)
- Reflector

Cadmus used the UMP's latest methodology available to evaluate delta watts. Table 25 shows reported quantities for the five reported general lamp categories.

Table 25. 2015 and 2016 CFL Database Quantities by Bulb Types

Bulb Type	2015 Quantity	2015 Percentage	2016 Quantity	2016 Percentage	Overall Quantity	Overall Percentage
Standard	96,931	92.3%	29,026	91.5%	125,957	92.1%
Decorative	899	0.9%	716	2.3%	1,615	1.2%
Globe	562	0.5%	340	1.1%	902	0.7%
EISA-Exempt	52	0.0%	0	0.0%	52	0.0%
Reflector	6,584	6.3%	1,657	5.2%	8,241	6.0%
Total	**105,028**		**31,739**		**136,767**	

The majority of bulbs fell into the standard bulb category. Table 26 shows the lumen bins, UMP-specified baseline wattages, and 2015–2016 bulb quantities for standard lamps. Appendix B provides lumen bins and quantities for the remaining bulb types, including a plot of baseline wattages compared to lumen outputs for various bulb types. Overall, for a given lumen output, standard lamps possessed a lower baseline wattage than reflector, globe, decorative, or EISA-exempt lamps. Notably, baselines for reflector lamps were set by a 2009 lamps ruling,[10] with reflector lamps divided into six separate categories, following the practice of the Mid-Atlantic Technical Reference Manual (TRM).[11]

[10] Energy Conservation Program: Energy Conservation Standards and Test Procedures for General Service Fluorescent Lamps and Incandescent Reflector Lamps. 74 FR 34080. https://www.gpo.gov/fdsys/pkg/FR-2009-07-14/pdf/E9-15710.pdf

[11] The Mid-Atlantic TRM presents an analysis examining requirements and defining lumen bins for six different reflector categories, depending on the 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

Table 26. Lumen Bins for Standard Lamps and Lamp Quantities

Lumen Bin	Baseline Wattage	2015 Quantity	2016 Quantity	Total Quantity
0-309	25	0	0	0
310-449	25	219	17	236
450-799	29	3,081	2,007	5,088
800-1,099	43	76,355	24,780	101,135
1,100-1,599	53	9,528	1,407	10,935
1,600-1,999	72	7,748	815	8,563
2,000-2,600	72	0	0	0

ENERGY STAR-Qualified Product List Analysis

While all program bulbs had to be ENERGY STAR certified, 4% of bulbs (representing 71 models) could not be matched to the compiled ENERGY STAR-qualified product list that Cadmus used. This does not mean these models were not ENERGY STAR certified; rather, it means the 71 models (out of 464) did not automatically match to the ENERGY STAR database and consisted of too few to warrant manual look-ups. To estimate lumen outputs for these bulbs, Cadmus created linear fits of lumens to wattage, based on the ENERGY STAR-qualified product list.

To determine a relationship between CFL and LED wattages and lumen outputs, Cadmus used the ENERGY STAR-qualified bulb product lists captured in October 2015 and October 2016.[12] The database consisted of approximately 8,300 CFL products and 36,900 LED products, along with their associated wattages and lumens. Lumen outputs for a given lamp wattage varied significantly. For example, 90 CFL products rated for 20 watts had lumen outputs ranging from 1,000 to 1,367.

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 CFL wattages and lumen outputs. Cadmus used this linear relationship to determine lumen outputs for CFL lamps with model numbers not matched in the ENERGY STAR-qualified lamp product list.

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

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

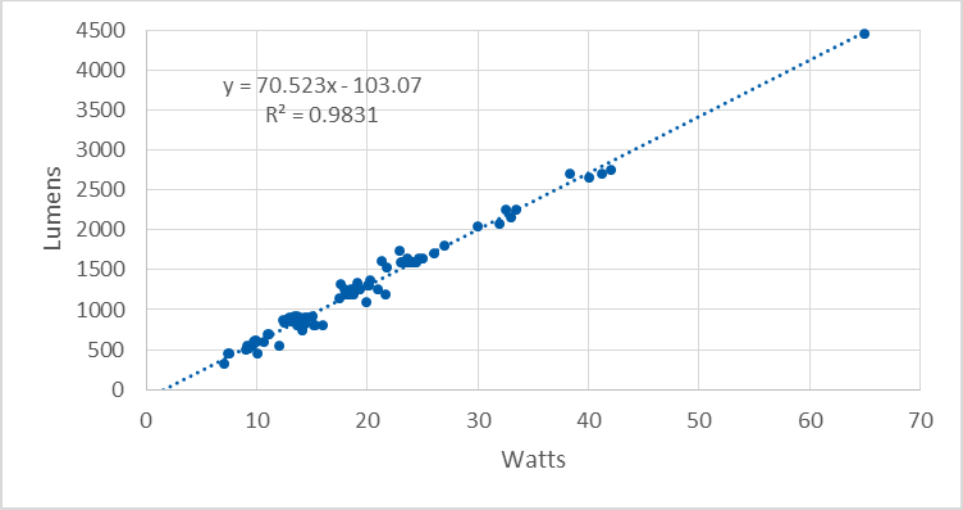
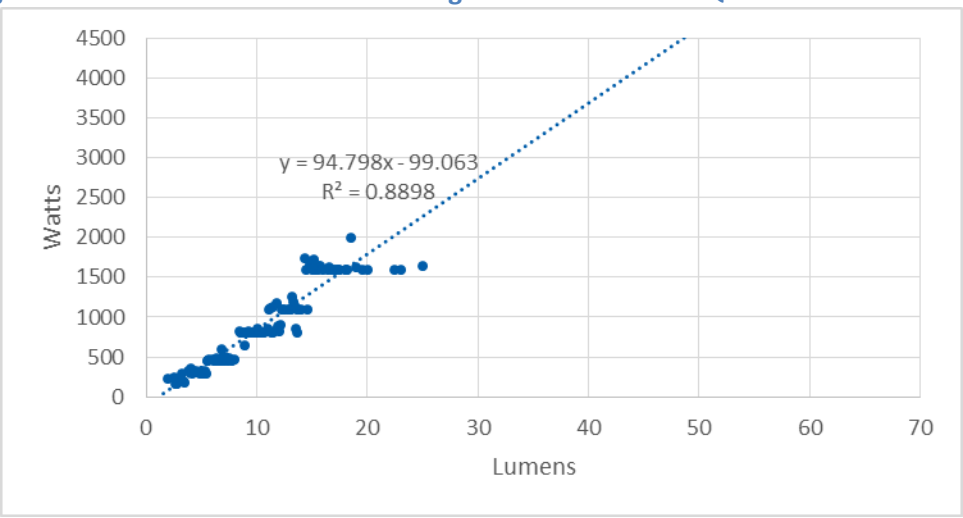


Figure 3 shows the same chart for LED standard lamps, indicating an even wider spread of efficacies, though the average efficacy was clearly higher than the average efficacy of CFLs (based on the slope of the linear fit).

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



In total, the analysis employed six linear best-fit lines for LED and CFL standard, reflector, and specialty lamps. Cadmus also created two additional trend lines, drawn from ENERGY STAR's database for CFL and LED fixtures. Appendix B lists all trend lines employed.

Hours of Use

Cadmus computed the HOU using the bulb installation location from surveys of Rocky Mountain Power customers in Idaho combined with analysis of covariance model coefficients, drawn from combined, multistate, multiyear data, produced by two recent CFL HOU metering studies that Cadmus conducted in Maryland and Missouri during 2014. 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 remains consistent with that used in the 2013–2014 program year evaluation.

Cadmus used the LED bulb installation location data from the 2015–2016 general population survey. Because the 2015–2016 general population survey did not ask questions regarding CFLs, its data could not be used to derive HOU for CFL bulbs. Instead, Cadmus used CFL installation location data from the 2013–2014 evaluation upstream lighting survey.

Cadmus calculated an average of 1.73 HOU for CFLs and 1.83 HOU for LEDs. Table 27 compares the evaluations' HOU results.

Table 27. HOU by Evaluation Period

Evaluation Period	Evaluated HOU
2009–2010	2.35 hours
2011–2012	2.34 hours
2013–2014 CFLs*	1.73 hours
2015–2016 CFLs*	1.73 hours
2013–2014 LEDs	1.90 hours
2015–2016 LEDs	1.83 hours

*Used the same 2013–2014 evaluation upstream lighting survey data.

The lower HOU values for 2015–2016 likely resulted from increased saturations of efficient bulbs. As the efficient lighting market matures and saturation increases in the average home, efficient lamps are being installed in lower-use sockets (e.g., rooms with lower usage, 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 28. The reported proportion of bulbs installed in some room types changed markedly between evaluation cycles. For example, the proportion of efficient bulbs installed in outdoor fixtures has dropped in recent years, from 30% in 2011–2012 (combined CFL/LED evaluation) to 4% for CFLs and 6% for LEDs. This drop is significant, given that outdoor fixtures have an average HOU of 2.39 hours per day—higher than any room other than kitchens. The "Other" category (e.g., closets, hallways, garages, dining, home office, utility or storage rooms) exhibited a large increase, to 30% for CFLs and 24% for LEDs in 2015–2016 compared to 7% in previous evaluations. As many room types in the "Other" category had a lower average HOU, an increase in the proportion of bulbs installed in these room types lowered the overall average HOU.

Table 28. Survey-Reported CFL and LED Installation Locations[1]

Bulb Location	Percentage of Total CFLs			Percentage of Total LEDs	
	2009–2010	2011–2012	2013–2014 (also used in 2015–2016 evaluation)	2013–2014	2015–2016
Living Space	31%	25%	19%	20%	15%
Bedroom	14%	11%	17%	17%	25%
Kitchen	8%	7%	12%	18%	15%
Bathroom	4%	5%	14%	17%	12%
Outdoor	22%	30%	4%	5%	6%
Basement	14%	15%	5%	2%	3%
Other	7%	7%	30%	20%	24%
Total[2]	**100%**	**100%**	**100%**	**100%**	**100%**

[1]n=250 for the 2009 and 2010 program years; n=245 for the 2011 and 2012 program years; n = 250 for the 2015–2016 program years.

[2]Percentages may not total to 100% due to rounding.

Current estimated HOU are close to the HOU calculated by the Regional Technical Forum (RTF) in the RTF Residential Lighting Workbook v4.2, approved in January 2016, which provided an average HOU of 2.0. [13]

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

Waste Heat Factor

A waste heat factor (WHF) adjustment made to energy savings accounts for the lighting measures' effects 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.

The evaluation used Simplified Energy Enthalpy Model (SEEM) results from the RTF Residential Lighting Workbook v4.2 as a foundation for LED bulbs' WHF analysis.[14,15]

Table 29 and Table 30 show the RTF's SEEM results and evaluation weightings. Cadmus determined saturation weightings for heating and cooling systems, based on the 2015–2016 general population

[13] RTF's savings workbook for residential, screw-in, CFL and LED lamps: ResLighting_Bulbs_v4_2.xlsm: https://nwcouncil.box.com/s/vu2d2uw5si5uyop848gyk2er0sg0xlv6

[14] SEEM is a building simulation model that the RTF calibrated for residential homes, thus providing the magnitude of interaction between lighting and HVAC systems. Additional background information for SEEM may be found at: Regional Technical Forum. "Simplified Energy Enthalpy Model." Accessed September 2017: http://rtf.nwcouncil.org/measures/support/seem/

[15] RTF's savings workbook for residential, screw-in, CFL and LED lamps: ResLighting_Bulbs_v4_2.xlsm.

surveys of Rocky Mountain Power residential customers in Idaho, cooling zone weightings from Typical Meteorological Year 3 (TMY3) weather data, and census population data for Idaho counties where RMP offers service.

Table 29. WHF Heating Inputs Summary[1]

WHF Component	Heating System Type	SEEM Results (kWh/kWh Saved)[2]	Cadmus Saturation Weighting
Heating Impact	Electric Zonal	-0.440	19.9%
	Electric Forced Air	-0.479	2.4%
	Heat Pump	-0.258	2.4%
	Non-Electric	0.000	75.3%

[1]Percentages may not add to 100% due to rounding.

[2]Regional Technical Forum. "Simplified Energy Enthalpy Model." Accessed May 2016: http://rtf.nwcouncil.org/measures/support/seem/

Table 30. 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	55.2%	**34%**
	Cooling Zone 2	0.053	39.7%	
	Cooling Zone 3	0.074	5.1%	

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

Calculating the weighted averages of values in Table 29 and Table 30 provided the impacts from heating and cooling of a bulb installed in a conditioned space, shown in Table 31. Summing the heating and cooling impacts produced an estimated combined impact of -0.091 kWh per kWh of lighting savings.

Table 31. WHF Weighted Average Impact, Conditioned Space

Component	kWh/kWh Savings*
Heating	-0.105
Cooling	0.015
Combined	**-0.091**

*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 32, Cadmus applied bulb allocations by space type from the 2015–2016 Rocky Mountain Power general population survey data to thermal coupling factors from the RTF.

Table 32. Thermal Coupling by Space Type

Space Type	RTF Thermal Coupling Correction Factor	Bulb Allocation*
Basement	50%	4.5%
Main House	75%	88.3%
Outdoor	0%	7.2%
Weighted Average		**68.5%**

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

Multiplying the combined impact from Table 31 with the weighted thermal coupling in Table 32 and adding 1 provided the final WHF shown in Table 33.

Table 33. Idaho CFL and LED Bulb WHF, Average Installation Location

Fuel	Value	Units
Electric	0.938*	kWh/kWh Saved

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

CFL and LED Bulbs Total Savings

Table 34 shows reported and evaluated savings inputs and input sources for CFL lamps, in addition to reported and evaluated UES. Cadmus determined evaluated savings and inputs using assumptions provided by Rocky Mountain Power and using information drawn from the tracking database. Reported and evaluated delta watts inputs varied widely across and within bulb categories.

As such, values for W_{EFF}, W_{BASE}, and ΔWatts in Table 34 represent weighted averages. The far-right column shows the fraction produced by dividing evaluated savings or inputs by reported savings or inputs. Its UES value equals the CFL bulb realization rate. This also serves as an approximate "partial realization rate" for each of the other inputs—delta watts, WHF, HOU, and ISR.

Table 34. 2015–2016 Reported and Evaluated CFL Bulb Savings and Inputs

Input[1]	Reported		Evaluated		Evaluated/ Reported
	Value	Source	Value	Source	
UES (kWh/bulb)	17.09[1]	Tracking database	12.91[1]	Calculated from factors below	76%
W_{EFF}	14.8[1]	UES values split and set by assigned integer efficient wattages	14.8[1]	Tracking database, with some verification. Values used were binned for each model.	101%
W_{BASE}	47.0[1]	Lumen equivalence via EISA bins and baselines, special reflector bins	46.0[1]	Lumen equivalence via UMP, Mid-Atlantic TRM	98%
ΔWatts (W)	32.2[1]	W_{BASE} - W_{EFF}	31.1[1]	W_{BASE} - W_{EFF}	97%
WHF	0.851	PacifiCorp HES 2011-2012 Evaluation[2]	0.938	2015–2016 General Population Survey (n=225)	110%
HOU (hr/day)	2.34		1.73	Multistate HOU Regression Model, 2013–2014 General Population Survey	74%
ISR	73.0%		69.7%	2013–2014 General Population Survey (n=133)	96%

[1]Weighted average values.

[2]Cadmus. *Final Report: 2011-2012 Idaho Residential Home Energy Savings Evaluation.* January 21, 2014. Available online: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2014/Idaho_Final_2011-2012_HES_Evaluation_Report.pdf

These weighted average input values could be used to discern general drivers of differences between CFLs' evaluated and reported savings. As shown in the Evaluated/Reported column for UES, CFL bulbs achieved a 76% overall realization rate. A difference in reported and evaluated HOU primarily drove this difference in evaluated and reported values. The reported 2.34 HOU came from the Cadmus 2011–2012 evaluation, though the HOU value from the 2013–2014 evaluation—used again this year—was 1.73. Reported and evaluated W_{EFF}, W_{BASE}, and ΔWatts were all extremely close. Smaller differences occurred between reported and evaluated WHF and ISR, but HOU served as the primary driver of realization rates for CFL bulbs.

Table 35 shows reported and evaluated savings inputs and input sources for LED bulbs, with wattage values again representing weighted averages. Several factors contributed to the overall realization rate of 76% for LED bulbs. Evaluated ΔWatts were 15% higher than reported, driven by a similar difference in W_{BASE}. As with CFLs, however, reported HOU was notably higher than evaluated HOU. In addition, the reported LED ISR followed a version of the RTF that assumed a 100% LED installation rate, but the 2015–2016 participant survey revealed an LED bulb installation rate of 76%. These factors all combined to produce the 76% overall LED realization rate.

Table 35. 2015–2016 Reported and Evaluated LED Bulb Savings and Inputs

Input[1]	Reported		Evaluated		Evaluated/ Reported
	Value	Source	Value	Source	
UES (kWh/bulb)	22.91[1]	Tracking database	17.34[1]	Calculated from factors below	76%
W_{EFF}	9.3[1]	Tracking database, UES values split and set by integer wattages	9.3[1]	Tracking database, with some verification. Values used were binned for each model.	99%
W_{BASE}	41.3[1]	Lumen equivalence via EISA bins and baselines, special reflector bins	45.9[1]	Lumen equivalence via UMP, Mid-Atlantic TRM	111%
ΔWatts (W)	31.9[1]	W_{BASE} - W_{EFF}	36.7[1]	W_{BASE} - W_{EFF}	115%
WHF	0.851	PacifiCorp HES 2011-2012 Evaluation[2]	0.938	2015–2016 General Population Survey (n=225)	110%
HOU (hr/day)	2.34		1.83	Multistate HOU Regression Model, 2015–2016 General Population Survey	78%
ISR	100.0%	RTF storage and removal rate	75.6%	2015–2016 General Population Survey (n=68)	76%

[1]Weighted average values.

[2]Cadmus. *Final Report: 2011-2012 Idaho Residential Home Energy Savings Evaluation.* January 21, 2014. Available online: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2014/Idaho_Final_2011-2012_HES_Evaluation_Report.pdf

Table 36 provides evaluated CFL and LED savings and realization rates by bulb types.

Table 36. 2015–2016 Evaluated and Reported HES Program CFL and LED Savings

Bulb Type	Reported		Evaluated		Realization Rate		
	CFL	LED	CFL	LED	CFL	LED	Overall
Standard	1,743,606	426,269	1,336,293	344,097	77%	81%	77%
Decorative	3,087	23,984	2,411	20,144	78%	84%	83%
Globe	3,722	16,144	5,003	9,890	134%	61%	75%
EISA-Exempt	2,089	0	2,481	0	119%	n/a	119%
Reflector	70,957	222,162	31,256	147,064	44%	66%	61%
Overall	**1,823,462**	**688,559**	**1,377,444**	**521,195**	**76%**	**76%**	**76%**

Light Fixtures

During the 2015–2016 program period, Rocky Mountain Power provided incentives for 385 LED ENERGY STAR light fixtures, representing less than 1% of reported program savings. Rocky Mountain Power did

not provide incentives for CFL fixtures during this evaluation period. Cadmus grouped and analyzed the fixture savings within two categories:

- Downlight fixtures
- Miscellaneous fixtures

Respectively, these categories contributed 91.4% and 5.5% of program fixtures by quantity, with 3.1% of fixtures of unidentifiable types. Generally, fixture savings calculations used the same methodology as that employed for light bulbs, though the two fixture types required slight variations in their energy savings calculations. Again, the lighting saving evaluation used the following general equation:

$$\text{Evaluated Per Unit Savings (kWh per unit)} = \frac{\Delta\text{Watts} \times \text{ISR} \times \text{HOU} \times 365.25 \times \text{WHF}}{1{,}000}$$

To calculate various light fixture component inputs, Cadmus conducted the primary and secondary data collection activities shown in Table 37.

Table 37. Light Fixture Evaluated Savings Activities and Results

Savings Variables	Lighting Technology	Activity	Value
ΔWatts	LED	Downlights: UMP[2], recessed can average baseline Miscellaneous: UMP[2], standard lamp baseline Unknown: Weighted average of known categories	45.6[1]
ISR	LED	Previous 2013–2014 HES evaluation[2]	99%
HOU	LED	Multistate HOU Regression Model, 2015–2016 General Population Survey (n=192)	1.826
WHF	LED	2015–2016 General Population Survey (n=225)	0.938

[1]Weighted average value for all bulbs.

[2] Cadmus. Rocky Mountain Power 2013–2014 Idaho Home Energy Savings Program Evaluation. September 27, 2016. Available online: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2013-2014_Idaho_HES_Evaluation_Report.pdf

Cadmus applied the same HOU and WHF used in the CFL and LED bulb analyses, along with a 100% ISR, based on previous HES program evaluation work in Idaho. For delta watts, Cadmus employed a modified lumen-binning approach that depended on fixture categories, as discussed below.

Downlight Fixtures

Figure 4 depicts a downlight fixture, designed for installation into recessed ceiling or "can" light receptacles (i.e., intended to accept reflector lamps). 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 4. Example of a Downlight Fixture

Calculating baseline wattages for LED downlights requires determining the lamp types typically replaced by LED downlight fixtures. Although recessed ceiling fixtures are usually designed to accommodate reflector lamps that point light down to maximize the lamp's output, other lamp types may be installed at times. 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 to account for the mix of bulb types typically installed in recessed ceiling receptacles.

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—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 the saturation of bulb types commonly installed in recessed ceiling receptacles, as determined by the four lighting inventories. The inventories collected data on bulb types installed in every fixture of over 200 homes. Using these data, Cadmus determined saturation levels of various lamp types typically installed in recessed ceiling receptacles.

As shown in Table 38, reflector lamps were installed in 85.6% of ceiling receptacles and standard lamps were installed in 13.5% of ceiling receptacles. Cadmus used these saturation values to create an average set of lumen bins and baseline wattages for recessed ceiling receptacles, for both 2015 and 2016. Appendix B provides plots of weighted reflector and final recessed can lumen bins and baseline wattages. As with reflector baseline wattages in general, recessed can baseline wattage values were generally higher than those for standard lamps.

Table 38. 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**	**2,225**
Total Households	**38**	**46**	**68**	**65**	**217**

Miscellaneous Fixtures

Just 5.5% of fixtures sold could not be classified as downlights. These constituted a mix of fixture types (e.g., single- and multi-bulb sconce lights, motion sensors, track lighting), with a majority serving as replacements for one- and two-lamp fixtures of various types. Cadmus applied the lumens equivalence approach to evaluate these fixtures.

Unknown Fixtures

The database included 3.1% of fixtures falling within unknown categories. These listed models that did not match the ENERGY STAR database or online resources. Cadmus applied the weighted average UES for the downlight and miscellaneous fixture categories.

Lighting Fixture Findings

In 2015–2016, the HES program provided incentives for 385 light fixtures. Table 39 provides lamp quantities, savings, and realization rates by fixture type for 2015–2016.

Table 39. 2015–2016 Light Fixture Quantity and Gross Savings

Fixture Category	Technology	Quantity	Reported Savings (kWh)	Evaluated Savings (kWh)	Evaluated UES (kWh/unit)	Realization Rate
Downlight	LED	352	14,411	8,446	24.0	59%
Miscellaneous	LED	21	860	224	10.7	26%
Unknown	N/A	12	491	279	23.2	57%
Total		**385**	**15,762**	**8,949**	**23.2**	**57%**

All fixtures reported UES values of 40.94 kWh per fixture, a much higher figure than the average evaluated UES of 23.1 kWh. This difference arose from two factors:

- Reported savings drew upon specialty lamp savings from a 2012 RTF version, which used an old market baseline driven by data from 2010.
- Reported savings assumed that each fixture used an average of 1.51 bulbs, the great majority of fixtures used only one bulb.

These two differences (and others to a lesser degree) combined to produce a 56% overall fixture realization rate.

wattsmart Starter Kits

Rock Mountain Power's HES program includes eight varieties of ***watt***smart Starter Kits, containing unique combinations of 13-watt CFLs, 10-watt LEDs, kitchen aerators, bathroom aerators, and showerheads. Table 40 shows the kit components available in 2015 and 2016.

Table 40. Components in Each *watt*smart Starter 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 kits provide a handheld showerhead with the same flow rate as the fixed showerhead in the Basic kits.

Kit CFLs and LEDs

Using the following equation (outlined in the UMP's Residential Lighting Evaluation Protocol),[16] Cadmus estimated energy savings for CFLs and LEDs distributed through ***watt***smart Starter Kits:

$$\Delta\text{kWh} = \left(\frac{W_{Base} - W_{EE}}{1{,}000}\right) * ISR * HOU * WHF$$

Table 41 defines and provides evaluation values and sources for the key variables in the equation.

[16] 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 41. *watt*smart Starter Kit Lighting Key Evaluation Variables and Assumptions

Parameter	Definition	CFL	LED	Unit	Source(s)
W_{Base}	Baseline wattage	43	43	W	Lumens equivalence method
W_{EE}	Measure wattage	13.0	10.5	W	Program materials
ISR	In-service rate	80.7	92.2	%	2015–2016 kit participant surveys (n=61 - CFL, 67 - LED)
HOU	Hours of use	634	667	$\frac{hours}{year}$	2015–2016 HES light bulb room and HOU analysis
WHF	Waste heat factor	0.938	0.938		2015–2016 HES light bulb WHF analysis
ΔkWh	**Energy Savings**	**14.4**	**18.7**	$\frac{kWh}{year}$	**Calculated**

The reported CFL and LED savings inputs for HOU (854), ISR (73.0% for CFLs and unknown for LEDs), and WHF (0.8561) are based on Cadmus' 2011–2012 evaluation of the HES Program in Idaho. The evaluated CFL and LED savings inputs for HOU, ISR, and WHF are based on Cadmus 2015–2016 program kit participant surveys. Cadmus derived baseline wattages using ENERGY STAR's lumens equivalence method.

Table 42 shows reported and evaluated savings as well as realization rates for each bulb type.

Table 42. Kit Lighting Reported and Evaluated Per-Unit Savings

Kit Product	Reported Savings Per Unit (kWh)	Evaluated Savings Per Unit (kWh)	Realization Rate
CFL	15.9	14.4	90%
LED	23.0	18.7	81%

The CFL realization rate increased slightly from 2013–2014 to 2015–2016 (i.e., 90%, up from 84%) and generally remained stable for LEDs (i.e., 81%, down slightly from 82%). Each ISR increased by about four percentage points from the previous evaluation, and the HOU assumption for LEDs decreased from 1.90 to 1.83 hours per day (the CFL HOU assumption remained the same, at 1.73 hours per day). CFLs and LEDs fell short of realizing 100% of their reported savings because of differences in ISR for CFLs and HOU for LEDs (roughly 200 fewer hours annually than assumed).

Kit Aerators

Using the following equation, Cadmus estimated energy savings for bathroom and kitchen faucet aerators distributed through ***watt***smart Starter Kits:

$$\Delta kWh = ISR * (GPM_{Base} - GPM_{EE}) * MPD * 365.25 * \frac{PH}{FH} * (T_{Mix} - T_{In}) * \frac{8.345}{RE * 3{,}412.14} * \%DHW$$

Table 43 defines and provides values and sources for the key variables in the equation.

Table 43. *watt*smart Starter Kit Aerator Evaluated Key Variables and Engineering Review Assumptions

Parameter	Definition	Kitchen Aerator	Bathroom Aerator	Unit	Source(s)[1]
ISR	In-service rate	60.0	63.1	%	2015–2016 kit participant surveys (n=70 - kitchen, 69 - bathroom)
GPM_{Base}	Baseline flow rate	2.2	2.2	$\frac{gal}{min}$	Federal rated maximum flow rate (10CFR430.32) (DOE 1998)
GPM_{EE}	Measure flow rate	1.5	0.5	$\frac{gal}{min}$	Program materials
MPD	Minutes of use per person per day	4.5	1.6	Min/person/day	2013 Cadmus Study[2]
PH	People per household	3.5	3.5	People	2015–2016 kit participant survey (n=127)
FH	Faucets per household	1	2.62	Faucets	Bathroom: 2015–2016 kit participant survey (n=130). Kitchen: One per household.
T_{Mix}	Usage water temperature	93	86	$°F$	2013 Cadmus Study[2]
T_{In}	Inlet water temperature	55.2	55.2	$°F$	DOE Hot Water Scheduler, 2016 U.S. Census Bureau
RE	Recovery efficiency of electric water heater	98	98	%	NREL, "Building America Research Benchmark Definition"[3]
$\%DHW$	Households with electric hot water	84.0	84.0	%	2015–2016 kit participant survey (n=75)
ΔkWh	**Energy Savings**	**190.0**	**53.6**	$\frac{kWh}{year}$	**Calculated**

[1] Survey results reflect averages only for those who received water-saving measures.

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

[3] National Renewable Energy Laboratory. *Building America Research Benchmark Definition*. December 2009. pg. 12. Available online: http://www.nrel.gov/docs/fy10osti/47246.pdf

Rocky Mountain Power derived several reported savings values for kit aerators from a 2013 Cadmus potential study.[17] The calculations assumed kitchen and bathroom faucet aerators would be used identically in terms of annual HOU. Rocky Mountain Power derived its ISR value (76%), which is higher than Cadmus' values (60% for kitchen aerators, 63% for bathroom aerators), from the version 2.1 of the Residential DHW (domestic hot water) Showerhead RTF workbook.[18] It also derived its percentage of homes with electric hot water (64%) from the RTF workbook.

[17] 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.

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

For its evaluated savings values, Cadmus assumed a baseline flow rate of 2.2 GPM, as specified by the U.S. Department of Energy (DOE). Cadmus based the people per household and fixtures per household (for bathroom aerators) values on the 2015–2016 kit participant survey. Cadmus only assigned energy savings to 84% of household respondents that claimed that their household had electric water heaters when surveyed. Cadmus calculated point-of-use water temperature according to a 2013 Cadmus metering study,[19] and inlet water temperature according to Rocky Mountain Power's service territory using U.S. Census Bureau and DOE data.

Table 44 shows reported and evaluated savings as well as realization rates for each faucet aerator type.

Table 44. Kit Aerator Reported and Evaluated Per-Unit Savings

Kit Product	Reported Savings Per Unit (kWh)	Evaluated Savings Per Unit (kWh)	Realization Rate
Kitchen Aerator	25.8	190.0	737%
Bathroom Aerator	62.6	53.6	86%

Realization rates increased from the 2013–2014 evaluation to the 2015–2016 evaluation for kitchen aerators (526% to 737%) and for bathroom aerators (72% to 86%). Evaluated savings input values for number of people per household decreased and fixtures per household increased from the previous evaluation. However, the percentage of homes with electric hot water and the assumed point-of-use water temperature increased four percentage points and 7°F, respectively, contributing to the increases in aerator realization rates.

Bathrooms aerators did not realize 100% of reported savings due to very different assumptions belying the reported and evaluated savings calculations, such as those for water temperature differences (75°F versus 55.2°F) and percentages of homes with electric water heat (64% versus 84%).

Rocky Mountain Power calculated reported kitchen aerator savings using a different methodology than the one used in this evaluation. The reported savings are based on whole house savings estimates from a 2013 Cadmus potential study, where all faucets (bathrooms and kitchen) are replaced with 1.5 GPM aerators (the deemed savings workbook divides the whole house savings by the average number of faucets per home, and applies a realization rate). Averaging savings between kitchen and bathroom aerators underestimates kitchen aerator savings, since kitchen faucets have higher daily use and average outlet water temperature.

Additionally, neither the evaluated nor the reported kitchen aerator savings account for a drain factor, the percentage of kitchen faucet flow that fills a fixed volume like the sink, a pot, or a glass. If water is collected in a sink, a faucet aerator will not result in water or electrical energy savings. Available drain factor estimates of 25% to 50% are based on professional judgement and thus not included in the

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

evaluation analysis. The evaluated kitchen aerator savings are overestimating the savings due to not accounting for a drain factor.

Kit Showerheads

Cadmus used the following equation to estimate energy savings for high-efficiency showerheads distributed through ***watt***smart Starter Kits:

$$\Delta kWh = (GPM_{Base} - GPM_{EE}) * MPS * EV * \frac{PH}{SH} * (T_{Mix} - T_{In}) * \frac{8.345}{RE * 3{,}412.14} * ISR * \%DWH$$

Table 45 defines and provides values and sources for key variables in the equation.

Table 45. *watt*smart Starter Kit Showerhead Evaluated Key Variables and Assumptions

Parameter	Definition	Value	Unit	Source
MPS	Shower duration	7.8	$\frac{min}{shower}$	2013 Cadmus Study[1]
GPM_{Base}	Baseline flow rate	2.5	$\frac{gal}{min}$	Federal-rated maximum flow rate for showerheads (10CFR430.32 (p) (DOE 1998)
GPM_{EE}	Efficient flow rate	1.5	$\frac{gal}{min}$	Program materials
EV	Showers per person per year	219	Showers	2013 Cadmus Study[1]
PH	People per household	3.47	People	2015–2016 kit participant survey (n=127)
SH	Showerheads per household	2.29	Showerheads	2015–2016 kit participant survey (n=129)
T_{Mix}	Usage water temperature	101	$°F$	2013 Cadmus Study[1]
T_{In}	Inlet water temperature	55.2	$°F$	DOE Hot Water Scheduler, 2016 U.S. Census Bureau
RE	Recovery efficiency	98	%	Constant[2]
ISR	In-service rate	66.7	%	2015–2016 kit participant survey (n=74)
$\%DHW$	Households with electric hot water	84.0	%	2015–2016 kit participant survey (n=75)
ΔkWh	**Energy Savings**	**165.9**	**$\frac{kWh}{year}$**	**Calculated**

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

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

Rocky Mountain Power derived its reported savings values—including persons per household (2.51), showers per person per year (193), percentage of homes with electric water heat (64%), and the difference between usage and inlet water temperatures (75°F)—from version 2.1 of the Residential DHW Showerhead RTF workbook.

As with kit faucet aerators, Cadmus derived evaluated values from the participant survey, including people per household, showerheads per household, and percentage of homes with electric hot water; using DOE for the baseline flow rate and a 2013 Cadmus metering study for shower events per person per year and water temperature changes.

Table 46 shows reported and evaluated savings as well as realization rates for kit showerheads.

Table 46. Kit Showerhead Reported and Evaluated Per-Unit Savings

Kit Product	Reported Savings Per Unit (kWh)	Evaluated Savings Per Unit (kWh)	Realization Rate
Showerhead	260.0	165.9	64%

Kit showerheads' realization rates increased from the 2013–2014 evaluation (54%) to the current 2015–2016 evaluation (64%). Inputs for ISR and percentage of households with electric water heat increased about 10 and 4 percentage points, respectively, from 2013–2014 to 2015–2016. This has a larger positive effect on evaluated savings than negative effect of the decrease in inlet water temperature (-4°F).

Showerheads did not realize 100% of reported savings due to very different assumptions belying the reported and evaluated savings calculations, such as those for inlet water temperature (75°F versus 55.2°F) and percentage of homes with electric water heat (64% versus 84%).

*watt*smart Starter Kits Summary

Using the above evaluated savings for CFLs, LEDs, aerators, and showerheads, Cadmus calculated savings for each kit variety. Table 47 shows the percentage of evaluated savings attributable to each kit product.

Table 47. Percent of Evaluated Savings by Kit Product

Kit Name	Percent of Kit Evaluated Savings				
	CFL Bulbs	LED Bulbs	Kitchen Aerators	Bathroom Aerators	Showerheads
Basic 1	12%	0%	41%	11%	36%
Basic 2	8%	0%	28%	16%	48%
Better 1	12%	0%	41%	11%	36%
Better 2	8%	0%	28%	16%	48%
Best 1	0%	15%	39%	11%	34%
Best 2	0%	11%	27%	15%	47%
CFL Only	100%	0%	0%	0%	0%
LED Only	0%	100%	0%	0%	0%

For kits that included water-saving products, showerheads and kitchen aerators accounted for the greatest share of evaluated savings. Lighting and bathroom aerators accounted for roughly the same energy savings amount in such kits. LEDs accounted for slightly more savings in kits that both included and excluded water-saving products.

For each of the eight ***watt***smart Starter Kits, Table 48 shows the quantity of each product making up the kit, the quantity of kits installed in 2015 and 2016, the reported and evaluated savings per kit, and the realization rates.

Table 48. Products in Each *watt*smart Starter 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	Shower-head				
Basic 1	4	0	1	1	1	378	412	467	113%
Basic 2	4	0	1	2	2	983	735	686	93%
Better 1	4	0	1	1	1	12	412	467	113%
Better 2[1]	4	0	1	2	2	37	735	686	93%
Best 1	0	4	1	1	1	53	439	484	110%
Best 2	0	4	1	2	2	253	762	704	92%
CFL Only	4	0	0	0	0	953	64	58	90%
LED Only	0	4	0	0	0	206	91	75	82%
Total	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**2,875**	**1,205,491[2]**	**1,156,412[2]**	**96%**

[1] Better kits provide the same products as Basic kits but replace the fixed showerhead with a handheld showerhead. The difference does not affect reported or evaluated savings per kit.

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

Clothes Washers

Cadmus estimated clothes washers' energy savings using version 5.4 of the RTF workbook for residential clothes washers. Published on December 2, 2016, the RTF workbook compared energy consumption of efficient clothes washers to a baseline of average non-ENERGY STAR-compliant clothes washers. With the change in federal standards for energy-efficient clothes washers in 2015, the Integrated Modified Energy Factor (IMEF) and Integrated Water Factor (IWF) replaced the program-tracked parameters of the Modified Energy Factor and Water Factor as best practices to estimate clothes washers' energy consumption.

Cadmus used the ENERGY STAR Clothes Washer database to find IMEF and IWF for evaluated clothes washers. Expected savings were expressed relative to efficient unit performance (divided into four performance tiers) and whether dryers or water heaters were electric or non-electric (e.g., natural gas, propane). Cadmus adjusted the RTF savings to use program-specific results from participant surveys for the expected number of loads per year, with participant surveys indicating 395 average loads expected per year—a result 45% greater than that predicted by the RTF (i.e., 273 average loads).

Cadmus estimated an average evaluated savings value of 196 kWh per unit, yielding a 176% realization rate for program years 2015–2016.

Cadmus also estimated savings for each combination of DHW fuel and dryer fuel. If the DHW system or the dryer did not use electricity (e.g., natural gas or propane), Cadmus set those savings components (respectively, $kWh_{sav\ HW}$ and $kWh_{sav\ dryer}$) equal to zero.

Table 49 shows the quantity of measures incented, reported and evaluated savings, realization rates, and percentages of reported savings for each combination of DHW and dryer fuel at each efficiency level.

Table 49. Clothes Washer Savings by Performance Level and DWH/Dryer Fuel

Efficiency Level	IMEF Low	IMEF High	DHW Fuel	Dryer Fuel	Quantity Evaluated		Reported UES		Evaluated UES		Realization Rate[1]		Percentage of Reported Savings[2]	
					2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
CEE Tier 1	2.38	2.73	Electric	Electric	6	6	143	143	564	564	394%	394%	7%	9%
			Electric	Other	0	0	n/a	n/a	n/a	n/a	n/a	n/a	0%	0%
			Other	Electric	6	5	53	106	50	259	94%	244%	6%	5%
			Other	Other	0	2	n/a	8	n/a	31	n/a	393%	0%	0%
CEE Tier 2	2.74	2.91	Electric	Electric	30	24	72	151	160	586	224%	388%	37%	38%
			Electric	Other	2	2	27	35	96	96	355%	278%	1%	1%
			Other	Electric	48	25	53	41	60	60	114%	146%	44%	21%
			Other	Other	9	1	8	8	-4	-4	-47%	-47%	1%	0%
CEE Tier 3	2.92	N/A	Electric	Electric	2	5	72	86	175	175	245%	203%	2%	9%
			Electric	Other	0	1	n/a	51	n/a	105	n/a	206%	0%	1%
			Other	Electric	1	3	53	43	66	66	125%	153%	1%	3%
			Other	Other	1	0	8	n/a	-4	n/a	-49%	n/a	0%	0%
All Levels	2	N/A	Electric	Electric	38	35	143	160	318	337	223%	211%	47%	61%
			Electric	Other	2	3	54	80	n/a	198	n/a	247%	1%	2%
			Other	Electric	55	33	106	83	118	122	112%	147%	51%	36%
			Other	Other	10	3	16	16	-8	18	-48%	115%	1%	0%
Weighted Average[3]					**105**	**74**	**110**	**117**	**180**	**222**	**164%**	**190%**	**100%**	**100%**

[1] Realization rates may not calculate exactly due to rounding of evaluated UES values. Percentage of reported savings may not add to 100% due to rounding.

[2] Percentage of reported savings may not add to 100% due to measures with no match in the ENERGY STAR database.

[3] "Quantity" and "Percent of Report Savings" values are summations, not average values.

As shown in Table 49, a clothes washer, paired with a non-electric dryer and a non-electric water heater, offered lower savings than a unit paired with an electric dryer and/or water heater. In 2015 and 2016, the tracking database showed that measures combining natural gas dryers and water heaters accounted for 7% of all incented measures. Unlike some measures reviewed through this evaluation that include eligibility requirements, the clothes washer measure does not have an electric dryer or water heater requirement.

Table 50 shows the percentage of measures installed in 2015 and 2016 at each performance level.

Table 50. Clothes Washer Performance Level by Year

Efficiency Level	Percent of Measures		Source
	2015	2016	
CEE Tier 1	11%	18%	ID 2015–2016 Non-Lighting Tracking Database
CEE Tier 2	85%	70%	ID 2015–2016 Non-Lighting Tracking Database
CEE Tier 3	4%	12%	ID 2015–2016 Non-Lighting Tracking Database

Table 51 shows the percentage of measures installed in homes with electrically heated DHW and dryers.

Table 51. Clothes Washer Percent of Electric DHW and Dryer Fuel

Input Categories		2015–2016 Saturation of Fuel Types	2013–2014 Saturation of Fuel Types	Source
DHW Fuel	Electric	44%	43%	ID 2013–2014 and 2015–2016 Non-Lighting Tracking Databases
	Other	56%	57%	
Dryer Fuel	Electric	90%	89%	
	Other	10%	11%	

Heat Pumps

As Rocky Mountain Power offers incentives for several heat pump-related measures, Cadmus evaluated savings for these measures using the relevant RTF workbooks. Table 52 shows measures incented by Rocky Mountain Power and the RTF workbooks used in this evaluation.

Table 52. Heat Pump Measure List and Evaluation Sources

Measure	Source
Electric System to Heat Pump Conversion	[1]
Heat Pump to Heat Pump Upgrade	[1], [4]
Heat Pump, Ductless	[2]
Electric System to Ground Source Heat Pump Conversion	[3]

[1] RTF. "Air Source Heat Pump Conversions SF." ResSFExistingHVAC_v4_1.xlsm. July 18, 2016. Available online: https://rtf.nwcouncil.org/measure/air-source-heat-pump-conversions-sf

[2] RTF. "Ductless Heat Pumps for Zonal Heat SF." ResSFExistingHVAC_V4_1.xlsm. July 18, 2016, Available online: https://rtf.nwcouncil.org/measure/ductless-heat-pumps-zonal-heat-sf

[3] RTF. "Ground Source Heat Pump Upgrade." ResGSHP_v2_6.xlsm. November 16, 2016. Available online: https://rtf.nwcouncil.org/measure/ground-source-heat-pump-upgrades

[4] RTF. "Commissioning, Controls, & Sizing SF. ResHeatingCoolingCommissioningControlsSizingSF_V3_6.xlsx. December 2, 2016, Available online: https://rtf.nwcouncil.org/measure/air-source-heat-pump-conversions-sf

Whenever possible, Cadmus refined the RTF model by incorporating program- or Idaho-specific data. Specifically, Cadmus used 2015-2016 non-lighting rebate participant survey to more completely define the pre-existing baseline. Based on 2015-2016 non-lighting participant survey, an estimated 7% of customers used central air conditioning prior to installing the heat pump measure. In addition, before applying the heat pump conversion, Cadmus assumed participants used an electric forced air furnace baseline before the heat pump conversion measure applies. For the ductless heat pump measures, however, the survey indicated 90% of homes used electric resistance zonal systems, and 10% used electric forced air furnaces. Therefore, for ductless heat pumps, Cadmus used this breakdown as a baseline, proportionally applying RTF-modeled savings for the baseline.

The RTF provided unique savings values for distinct heating and cooling zones, defined by average annual heating degree days (HDD) and cooling degree days (CDD). Cadmus determined the RTF-defined heating and cooling zones based on the zip code for each measure. Table 53 (below) shows the quantity of each heat pump measures incented in 2015 and 2016, reported and evaluated savings, and realization rates. Ductless heat pumps contributed a large amount of the heat pump savings in 2015 and 2016 as the most common heat pump measure. For 2015, reported savings values for ductless heat pumps (3,500 kWh per unit) were consistent with previous RTF versions. In 2016, however, reported savings were adjusted and the 2016 realization rate increased.

Ground source heat pump conversions accounted for a large amount of savings due to the high per-unit savings. Cadmus conservatively assumed the measures did not include desuperheaters and, from the 2015-2016 non-lighting rebate participant survey, estimated 80% of houses were smaller than 4,000 square feet. The heat pump upgrade measure reported savings include savings associated with the upgrade as well as best practices sizing and installation. The evaluated commissioning, sizing, and controls savings (1,014 kWh/year) had a low realization rate compared to deemed savings (2,694 kWh/year). The heat pump upgrade part of the savings made up a small percentage of the total measure savings.

Table 53. 2015–2016 Reported and Evaluated Heat Pump Savings

Measure	Quantity 2015	Average Reported Per Unit Savings 2015	Average Evaluated Per Unit Savings 2015	Realization Rate 2015	Quantity 2016	Average Reported Per Unit Savings 2016	Average Evaluated Per Unit Savings 2016	Realization Rate 2016
Electric System to Heat Pump Conversion	3	5,166	5,170	100%	1	5,166	5,805	112%
Heat Pump to Heat Pump Upgrade	3	3,188	1,183	37%	-	-	-	-
Heat Pump, Ductless	21	3,500	2,553	73%	11	2,418	2,581	107%
Electric System to Ground Source Heat Pump Conversion	2	12,525	10,175	81%	-	-	-	-
Total	**29**			**75%**	**12**			**108%**

Attic, Wall, and Floor Insulation

Cadmus conducted a billing analysis to assess actual net energy savings associated with insulation measure installations.[20] The analysis determined the savings estimate using a pooled, conditional savings analysis (CSA) regression model, which involved two groups:

- 2015–2016 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 2014 (before measure installations occurred) and the post-period as June 2016 through May 2017.[21]

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 2,589 kWh per participant, translating to a 155% 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 average participant pre-usage of 18,735 kWh, the savings represented a 14% reduction in total energy usage from insulation measures installed. Table 54 presents overall net savings estimates for wall, floor, and attic insulation.

Table 54. 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*	**15**	**1,672**	**2,589**	**155%**	**±52%**	**75%–235%**
Electric Heat	14	1,790	2,730	152%	±50%	76%–229%

*Overall model includes electric and gas heat; gas heat could not be split out due to the small sample size.

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

[21] Because participants installing measures in mid-late 2016 had less than 10 months of post-period data, Cadmus removed them from the analysis. Similarly, Cadmus removed customers participating in 2015 with measure installation dates before November 2014 as this produced less than 10 months of pre-period data.

Cadmus only used overall model results (which included electric and gas heat) to determine measure-level net savings, but provided results for the electric space heating fuel. Separate results could not be estimated for gas heated homes due to the small sample size (n=1).

Manufactured Home Duct Sealing and Insulation

Cadmus conducted a billing analysis to assess evaluated energy savings associated with MHDS and duct insulation measure installations,[22] determining the savings estimate from a pooled, CSA regression model, which included the following groups:

- 2015–2016 Ductwork participants (combined duct sealing and duct insulation)
- Nonparticipant homes, serving as the comparison group

Cadmus used program participants, a control group, billing consumption, and Idaho weather data specific to participants' zip codes 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 2014 (before measure installations occurred) and the post-period as June 2016 through May 2017.[23]

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

Manufactured Home Duct Sealing and Insulation Results

Cadmus estimated average MHDS and duct insulation savings of 1,462 kWh per home. Rocky Mountain Power reported duct sealing and duct insulation average savings of 3,268 kWh,[24] translating to a 45% evaluated realization rate for duct sealing and insulation measures. As with the 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 16,664 kWh, savings represented a 9% reduction in total energy use from installing the manufactured homes duct measure. Table 55 presents the overall savings estimate for the MHDS and duct insulation billing analysis.

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[22] Billing analysis performed for customers installing only duct sealing and/or duct insulation measures.

[23] Because participants who installed measures in mid-late 2016 had less than 10 months of post-period data, Cadmus removed them from the analysis. Similarly, Cadmus removed customers participating in 2015 with measure installation dates before November 2014 as this produced less than 10 months of pre-period data.

[24] The reported average 3,268 kWh saving was unusually high compared to the other states at 20% of the entire pre-period usage.

Table 55. 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	200	3,268	1,462	45%	±19%	36%–53%

Efficient Gas Furnace with ECM

Cadmus evaluated gross savings for efficient gas furnaces with ECMs, based on Idaho weather data and on metered data collected for a 2013 ECM study in Wisconsin.[25] The study provided the best available savings estimate for this technology, and other comparable metering studies did not exist for the Rocky Mountain Power regions.

The 2013 Wisconsin study collected fan-use data from 67 single-family homes over a two-year period. Cadmus calculated gross electric savings for efficient gas furnaces with ECMs within Rocky Mountain Power's territory by applying a linear ratio adjustment, using typical HDDs and CDDs in Wisconsin and the HDDs and CDDs of actual incented measures in Idaho based on their zip codes.

Cadmus used the following equations to estimate savings:

$$kWh_{savings\ total} = kWh_{savings\ cool} + kWh_{savings\ heat} + kWh_{savings\ circ}$$

$$kWh_{savings\ cool} = tons \times EFLH_{cooling} \times 12 \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ECM}}\right) \times \%AC$$

$$kWh_{savings\ heat} = hours_{heat} \times \Delta kW_{heat}$$

$$kWh_{savings\ circ} = hours_{circ} \times \Delta kW_{circ}$$

Table 56 outlines the values used in the equations above, sources for these values, and the resulting energy savings.

Table 56. ECM Assumptions and Calculated Savings

Parameter	Definition	Value	Unit	Source
$tons$	Air conditioner capacity	2.425	$tons$	Focus on Energy Evaluation, Residential Programs: CY09 Deemed Savings Review. March 26, 2010
$EFLH_{cooling}$	Effective full load cooling hours	257	$hours$	Cadmus Wisconsin 2013 metering study scaled using CDD ratios between installation

[25] Cadmus. *Focus on Energy Evaluated Deemed Savings Changes*. Prepared for the Public Service Commission of Wisconsin. November 14, 2014. Available online: https://focusonenergy.com/sites/default/files/FoE_Deemed_WriteUp%20CY14%20Final.pdf.

Parameter	Definition	Value	Unit	Source
				locations in ID, and average CDDs in Wisconsin*
12	Unit conversion	12	$\frac{kBtu}{ton}$	Constant
$SEER_{base}$	Baseline SEER	12	$\frac{kBtu}{kWh}$	2013 Cadmus Wisconsin ECM metering study
$SEER_{ECM}$	Efficient SEER	13	$\frac{kBtu}{kWh}$	2013 Cadmus Wisconsin ECM metering study
$\%AC$	Percentage of furnaces with air conditioning	83%	%	Idaho 2015–2016 non-lighting participant survey.
$\boldsymbol{kWh_{savings\ cool}}$	**Cooling mode energy savings**	**40**	$\boldsymbol{\frac{kWh}{year}}$	**Calculated**
$hours_{heat}$	Hours of heating operation	1,187	$\frac{hours}{year}$	Cadmus metering study, scaled using HDD ratios between installation locations in ID, and average HDDs in Wisconsin*
ΔkW_{heat}	Power savings in heating	0.116	kW	2013 Cadmus Wisconsin ECM metering study
$\boldsymbol{kWh_{savings\ heat}}$	**Heating mode energy savings**	**138**	$\boldsymbol{\frac{kWh}{year}}$	**Calculated**
$hours_{circ}$	Hours of fan-only operation	1,020	$\frac{hours}{year}$	2013 Cadmus Wisconsin ECM metering study
ΔkW_{circ}	Power savings in fan-only mode	0.207	kW	2013 Cadmus Wisconsin ECM metering study
$\boldsymbol{kWh_{savings\ circ}}$	**Circulation mode energy savings**	**211**	$\boldsymbol{\frac{kWh}{year}}$	**Calculated**
$\boldsymbol{kWh_{savings\ total}}$	**Total Savings**	**389**	$\boldsymbol{\frac{kWh}{year}}$	**Calculated**

*Website for HDDs and CDDs: http://www.climate-zone.com/climate/united-states/

The 2013 Cadmus metering study used a baseline SEER of 12 rather than the federal standard baseline SEER of 13 as the study found: "many air conditioners were not replaced when the furnace was replaced and were installed before the minimum efficiency standard increased to 13 SEER."[26]

[26] Cadmus. *Focus on Energy Evaluated Deemed Savings Changes*. Prepared for the Public Service Commission of Wisconsin. November 14, 2014. Available online: https://focusonenergy.com/sites/default/files/FoE_Deemed_WriteUp%20CY14%20Final.pdf.

Table 57. 2015–2016 Reported and Evaluated Efficient Gas Furnace with ECM Savings

Measure	Quantity 2015	Quantity 2016	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Efficient Gas Furnace with ECM	12	10	528	389	74%

A realization rate below 100% resulted for two primary reasons:

Estimated hours in heating and cooling mode were greater in the reported savings calculation than in the evaluated savings calculation. The reported savings hours of operation were based on the assumption that all measures were in IECC Climate Zone 5, while Cadmus based evaluated hours of operation on a metering study scaled for the actual installed measures' HDDs and CDDs in Idaho.

During the 2015–2016 participant survey, Cadmus found that only 83% of homes receiving the efficient gas furnace with the ECM measure used air conditioning. Participants must have air conditioning to qualify for this measure.

Smart Thermostats

Cadmus evaluated smart thermostat savings using version 1.2 of the RTF Connected Thermostat workbook (April 2017).[27] The first workbook version did not become available until November 2016; so Rocky Mountain Power could not use this as deemed savings. The data, however, used to calculate savings was derived from 2015–2016 or earlier, hence the results were applicable to the program period.

Cadmus used the RTF to estimate savings based on the average building size (participant survey data), heating zone (location of installed measures), and heating and cooling types (tracking data).

Table 58. 2015–2016 Reported and Evaluated Smart Thermostat Savings

Measure	Quantity 2015	Quantity 2016	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Smart Thermostats	0	14	1,313	741	56%

A smart thermostat realization rate lower than 100% resulted for two primary reasons:

- The reported savings calculation assumed a baseline heating load 30%–60% greater than that provided in the RTF workbook. The connected thermostat workbook provided the best available data for heating baseload.

[27] Regional Technical Forum. "Connected Thermostats." ResConnectedTsats_v1.2.xlsx. April 5, 2017. Available online: https://rtf.nwcouncil.org/measure/connected-thermostats

- During the 2015–2016 participant survey, Cadmus found one of two respondents surveyed reported installing the thermostat in a gas-heated building. Therefore, there were no electrical heating savings at this site.

A survey sample consisting of two was insufficient to produce statistically significant results; so Cadmus did not reduce savings by 50%. Instead, Cadmus assumed the 12 sites not surveyed had electrical heating systems, and therefore reduced savings by 7% (1/14). Participants must have electric heating to qualify for this measure.

Windows

Cadmus evaluated savings for four window measures for which Rocky Mountain Power offered incentives, dividing window efficiency incentives between two tiers, with each tier containing options for zonal heat and electric heat. Cadmus estimated savings for all window measures using version 3.4 of the RTF residential single-family weatherization savings workbook,[28] and incorporating participant-specific climate information into the RTF model.

Table 59 shows the quantity of each window measure incented in 2015 and 2016, the reported and evaluated savings, and realization rates. Although Rocky Mountain Power used the same RTF version 3.4 for its reported savings, it did not use the correct heating zone specific saving for each participant. The reported values over-estimated savings for each heating type. This was accounted for by using RTF specific coefficients.

Table 59. 2015–2016 Reported and Evaluated Window Savings

Measure	Quantity 2015	Quantity 2016	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Tier 1					
Electric FAF	4	4	2.27	0.89	39%
Zonal or DHP	11	11	1.80	0.70	39%
Tier 2					
Electric FAF	1	2	5.58	2.37	42%
Zonal or DHP	2	1	5.39	1.78	33%
Weighted Average	**18**	**18**	**2.51**	**0.97**	**39%**

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 freeridership for a discounted bulb's price.

[28] Regional Technical Forum. "Residential: Single Family Weatherization." ResSFWx_v3_4.xlsx. June 30, 2015. Available online: https://rtf.nwcouncil.org/measure/single-family

For non-lighting measure categories (including kits), Cadmus conducted freeridership and participant spillover analysis using responses from the non-lighting and participant kit surveys.

Further, Cadmus included a series of questions from the 2015–2016 general population survey of Idaho RMP customers to estimate NPSO, consisting of savings generated by customers motivated by the program's reputation and marketing to conduct energy efficiency installations without receiving an incentive. Cadmus estimated NPSO as 5% of the HES program's total evaluated savings, applying the 5% NPSO equally across HES program measures.

Table 60 provides net savings evaluation results: evaluated gross savings, evaluated net savings, and NTG by measure type, as well as the NTG methodology utilized.

Table 60. HES Program NTG Methods and Results for 2015–2016

Measure Category	Measure Name	Program Savings (kWh)		NTG	NTG Methodology
		Evaluated Gross	Evaluated Net		
Appliance	Clothes Washer	38,255	27,161	71%	Self-Report NTG
	Freezer	189	134		
	Refrigerator	772	548		
	Heat Pump Water Heater	3,342	2,807	84%	Self-Report NTG
Home Electronics	Advanced Power Strip	7,770	6,605	85%	Deemed NTG Used[1]
HVAC	Central Air Conditioner Equipment	446	375	84%	Self-Response NTG
	Duct Sealing—Manufactured Homes	651,678	651,678	100%	No Adjustments[2]
	Duct Sealing and Insulation	1,700	1,700		
	Efficient Gas Furnace with ECM	8,555	7,186	84%	Self-Response NTG
	Evaporative Cooler	9,252	7,772		Self-Response NTG
	Ground Source Heat Pump	20,351	17,095		Self-Response NTG
	Heat Pump Best Practice Installation & Sizing	2,694	2,263		Self-Response NTG
	Heat Pump System Conversion	21,314	17,904		Self-Response NTG
	Heat Pump	3,549	2,981		Self-Response NTG
	Ductless Heat Pump	82,005	68,884		Self-Response NTG
	Smart Thermostat	10,377	10,896	105%	Market baseline used[3]
Energy Kits	***watt***smart Starter Kit	1,156,412	1,098,592	95%	Self-Response NTG
Lighting	CFL Bulb	1,377,444	658,330	48%	Demand Elasticity Modeling
	LED Bulb	521,195	230,620	44%	
	LED Fixture	8,797	9,237	105%	Market baseline used[3]
Whole Home	Manufactured Homes	8,057	8,057	100%	Not evaluated
	New Homes	3,454	3,454		

Measure Category	Measure Name	Program Savings (kWh)		NTG	NTG Methodology
		Evaluated Gross	Evaluated Net		
Water Heating	Heat Pump Water Heater	1,547	1,299	84%	Self-Response NTG
	Water Heater	1,540	1,294		
Weatherization	Attic Insulation	52,845	52,845	100%	No Adjustments[2]
	Floor Insulation	5,187	5,187		
	Wall Insulation	10,182	10,182		
	Windows	4,451	3,872	87%	Self-Response NTG
Total		**4,013,361**	**2,908,959**	**72%**	

[1] Deemed NTG for CPUC - Tier 2 Audio Visual (AV) Advanced Power Strip from: http://www.embertec.com/assets/pdf/CPUC%20Approval.pdf

[2] No net adjustments applied to insulation and duct sealing measures as the billing analysis conducted to generate savings produced a net result.

[3] Freeridership adjustments were not applied to measures as the engineering review used a market baseline to estimate savings, producing a result net of freeridership. Spillover was applied as applicable.

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, 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 model expressed sales as a function of price (including incentives), seasonality, retail channel, and bulb characteristics. Appendix B provides the equation for the elasticity model. Cadmus used model coefficients to predict sales as though prices had remained at their original levels, to predict freerider sales at program-incented prices. 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.[29] The difference in savings between the hypothetical original price scenario and what actually occurred produced CFL and LED bulb savings attributable to the program.

Because Rocky Mountain Power's program, however, had insufficient price variations to conduct an evaluation specific to just Idaho's territory, Cadmus combined Idaho sales with Rocky Mountain Power's Wyoming sales data as well as with Pacific Power's Washington and California sales data to produce

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

elasticity estimates. While consumer behaviors may differ between the regions, the combined sales data provide the most representative information available with which to estimate price elasticities.

Consequently, Cadmus applied these elasticity estimates to Idaho sales data to reflect the observed markdown levels (i.e., the incentive price compared to the price without the incentive), the product mix (i.e., elasticities varying between standard, reflector, and specialty bulbs), and the retailer mix specific to Rocky Mountain Power Idaho. Table 61 shows the net savings results.

Table 61. Lighting Freeridership and NTG

Bulb Type	Freeridership	Net of Freeridership	NTG
CFLs	57%	43%	48%
LEDs	61%	39%	44%
All Bulbs[1]	**58%**	**42%**	**47%**

[1]Only individually modeled CFL and LED NTG ratios were applied to determine net savings in this evaluation. Model results were not combined for CFLs and LEDs to determine net savings. The all-bulb model results are provided here for information only.

[2]Includes NPSO.

Overall, freerider savings were estimated at 58%, resulting in a 42% NTG (43% for CFLs and 39% for LEDs). Demand for both CFLs and LEDs remained relatively inelastic, meaning sales did not appear to respond to price changes over the evaluation period. Additionally, 2015 and 2016 exhibited low CFL markdowns. LED markdowns were greater in 2015 and decreased in 2016.

Table 62 shows markdown levels.

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

Year	Technology	Final Price per Bulb	Original Price per Bulb	Markdown %
2015	CFL	$3.39	$4.29	21%
	LED	$5.70	$9.81	42%
2016	CFL	$1.52	$2.09	27%
	LED	$3.77	$5.39	30%

Table 63 shows the estimated price elasticities used to predict program sales.

Table 63. Estimated Price Elasticities by Year, Retail Channel, and Technology

Year	Channel	Technology	Average Elasticity
2015	Club	CFL	-0.87
		LED	-1.06
	DIY	CFL	-0.74
		LED	-0.74
	Mass Market	CFL	-1.04
		LED	-1.02
2016	Club	CFL	-1.43
		LED	-1.71
	DIY	CFL	-0.58
		LED	-0.87
	Mass Market	CFL	-0.67
		LED	-0.96

The two primary drivers of freeridership are the price elasticities and the markdown. The price elasticity measures the average change in sales in response to the program markdown and is not something the program can manipulate (though the program could be designed to focus in products with greater average elasticities). The markdown is the easiest for the program to manipulate to achieve the program goals. In this case, the low markdown levels resulted in high freeridership.

Demand for both CFLs and LEDs was relatively inelastic with the exception of bulbs at club stores in 2016. Cadmus typically observes greater price elasticities in club stores than other channels, likely because club stores have built a business model that encourages customers to stock up and take advantage of price discounts. In 2016, sales at club stores accounted for only 4% of CFL savings and 12% of LED savings. Increasing the share of program bulbs sold through club stores could help to reduce freeridership.

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

Freeridership Comparisons

Table 64 shows LED freeridership estimates from four other recent evaluations. Rocky Mountain Power Idaho programs exhibited a greater freeridership estimate than the other utilities. Additional details for markdown levels and prices did not apply as the retail and product mix (i.e., reflectors vs. a-lines or decorative bulbs) varied considerably between evaluations and represents a major factor in per-bulb prices. LED markdown levels, however, typically fell within the 40% to 50% range—considerably higher than the 30% markdown observed in Rocky Mountain Power's Idaho program in 2016.

Table 64. Comparison of LED Freeridership

Utility (Program Year)	Freeridership
Focus on Energy Wisconsin (2016)	38%
Focus on Energy Wisconsin (2015)	29%
Midwest Utility 1 (2016)	40%
Ameren Missouri (2015)	35%
Connecticut (2016)	39%
Rocky Mountain Power Idaho (2015–2016)	**61%**

Non-Lighting Evaluated Net Savings

Cadmus relied on the non-lighting participant surveys to determine the NTG for appliances, HVAC, weatherization, and kit product categories for 2015 and 2016 participants. Freeridership, participant spillover and NPSO constituted the NTG. Cadmus used the following formula to determine the final NTG ratio for each non-lighting program measure category:

Net-to-gross ratio = (1 – Freeridership) + Participant Spillover + Nonparticipant Spillover

Methodology

Cadmus determined freeridership amounts for the appliance, HVAC, and weatherization measure categories, based on a previously developed approach for Rocky Mountain Power that ascertained freeridership using response patterns 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, allowing Cadmus to calculate confidence and precision estimates based on score distributions.[30]

Cadmus used a separate set of questions and scoring approach when estimating the freeridership for the kit product category. After conducting participant surveys with ***watt***smart Starter 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 already used the measure in their home and if they planned to purchase the measure before signing up to receive the kit.

Cadmus determined participant spillover by estimating the savings 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, and then used the measure category's freeridership

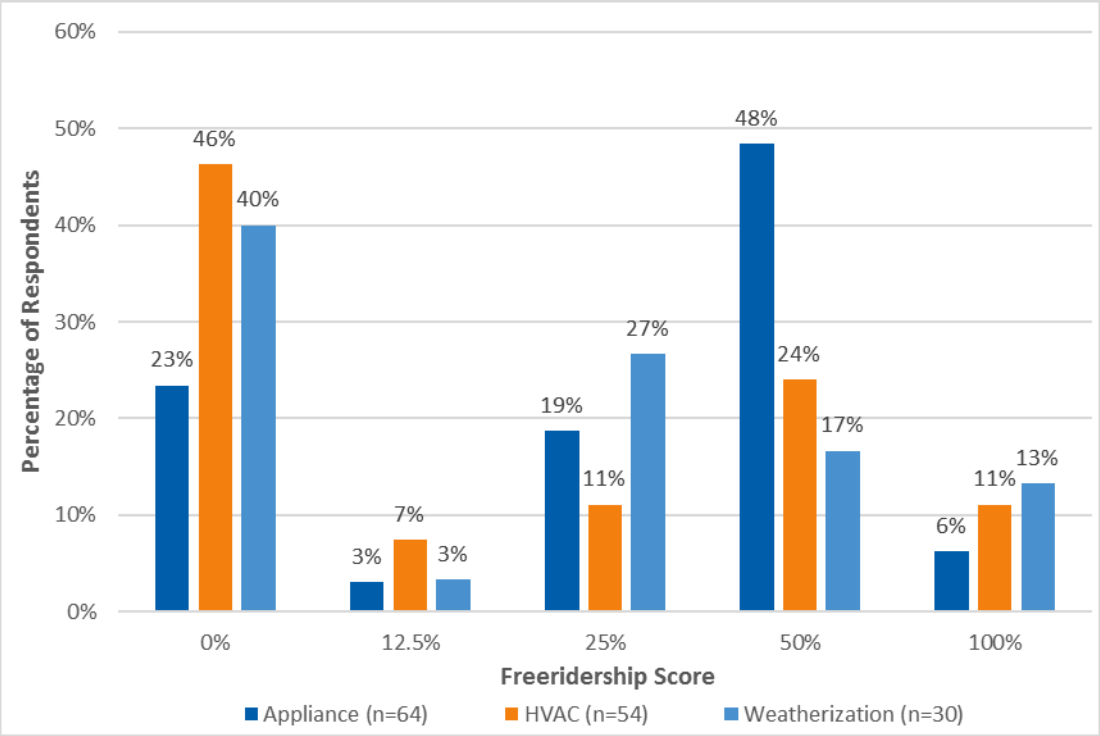
[30] This approach was outlined in Schiller, Steven, et al. "National Action Plan for Energy Efficiency." *Model Energy Efficiency Program Impact Evaluation Guide*. 2007. Available online: https://www.epa.gov/sites/production/files/2015-08/documents/evaluation_guide.pdf.

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 from six freeridership questions to a score for each participant using the Excel-based matrix approach described in Appendix D. Cadmus derived each participant's freerider score by translating these responses into a matrix value and applying a rules-based calculation. Figure 5 shows freeridership score distributions for appliances, HVAC, and weatherization survey respondents.

Figure 5. 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 23% of appliance respondents, 46% of HVAC measure respondents, and 40% of weatherization respondents indicated no freeridership: these respondents would not have purchased the efficient measure in the absence of Rocky Mountain Power's program. More appliance respondents indicated high freeridership rates (scores of 50% to 100%) than the other measure categories.

Kit Freeridership

Table 65 summarizes freeridership findings by measure for the kit product category. Cadmus weighted the measure-level freeridership estimates by the evaluated gross program population's kWh savings to determine a 10% freeridership estimate for the kit product category.

Table 65. HES Kit Measure Category Freeridership by Measure

Measure	Responses (n)	Freeridership Ratio	Evaluated Program Population kWh Savings
CFL	59	23%	136,076
LED	69	23%	38,372
Kitchen Faucet Aerator	45	5%	325,988
Bathroom Faucet Aerator	52	10%	160,217
Showerhead	61	8%	495,760
Overall		**10%***	**1,156,412**

*Weighted by evaluated program population kWh savings.

Spillover

This section presents the results from additional, energy-efficient measures that 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 solely to additional purchases significantly influenced by HES program participation and not claimed through the program.[31] 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 product category by dividing the sum of additional spillover savings by total gross program savings achieved by all 131 kit respondents. Table 66 shows the results.

Table 66. Non-Lighting Spillover Responses

Program Category	Spillover Measure Installed	Quantity	Electric Savings (kWh)	Surveyed Measure Category Savings (kWh)	Spillover Ratio
Kit	Dishwasher	1	46	45,380	0%

Non-Lighting NTG Findings

Cadmus conducted 64 surveys with appliance measure category participants, 54 with HVAC measure category participants,[32] and 15 with weatherization measure category participants.[33] Additionally, 131 surveys addressed customers who received ***watt***smart Starter Kits. Cadmus used these participant responses to generate NTG ratios of 71% for appliance measures, 85% for HVAC, 87% for weatherization, and 95% for kits. Table 67 lists these findings.

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31 "Highly Influential" responses for question "How influential would you say the ***watt***smart Home Energy Savings program was in your decision to add the[MEASURE] to your home? Was it...?" qualified the measure for being significantly influenced by HES.

32 Out of a population of 83.

33 Out of a population of 121.

Table 67. Non-Lighting NTG Ratio by Measure Category

Program Category	Responses (n)	Freeridership Ratio	Participant Spillover Ratio	NPSO Ratio	NTG	Absolute Precision at 90% Confidence
Appliance	64	34%	0%	5%	71%	±6%
HVAC	54	20%	0%	5%	85%	±5%
Weatherization	30	18%	0%	5%	87%	±8%
Kit	131	10%	0%	5%	95%	±13%

[1]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, indicating 71% of gross savings for appliance measures could be attributed to the HES program.

Table 68 shows freeridership, spillover, and NTG estimates for appliance, HVAC, weatherization and kit program categories 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[1]

Utility/Region	Evaluation Report Publish Year	Responses (n)	Percentage FR[2]	Participant Spillover	NPSO	NTG
Appliances						
Rocky Mountain Power Idaho 2015–2016 HES Evaluation: Appliances	**2017**	**64**	**34%**	**0%**	**5%**	**71%**
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Appliances	2016	68	29%	0%	0%[3]	71%
Northeast Utility—Appliance	2015	65	65%	3%	NA	38%
Northwest Utility—Appliance	2014	73	79%	2%	NA	23 %
HVAC						
Rocky Mountain Power Idaho 2015–2016 HES Evaluation: HVAC	**2017**	**54**	**20%**	**0%**	**5%**	**85%**
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: HVAC	2016	27	24%	0%	0%[3]	76%
Midwest Utility—HVAC	2015	73	51%	1%	NA	50%
Northwest Utility—HVAC	2014	48	72%	1%	NA	29%
Building Shell						
Rocky Mountain Power Idaho 2015–2016 HES Evaluation: Weatherization	**2017**	**30**	**18%**	**0%**	**5%**	**87%**
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Weatherization	2016	15	21%	0%	0%[3]	79%
Midwest Utility—Weatherization	2015	208	30%	2%	NA	72%
Midwest Utility—Weatherization	2015	79	36%	2%	NA	66%
Energy Kits						
Rocky Mountain Power Idaho 2015–2016 HES Evaluation: Kit	**2017**	**131**	**10%**	**0%**	**5%**	**95%**
Rocky Mountain Power Idaho 2013–2014 HES Evaluation: Kit	2016	130	11%	1%	0%[3]	90%
Mideast Utility—Kit	2015	150	8%	1%	NA	93%

[1]NTG values derived from self-response surveys, though differences in analysis and scoring methodologies may have varied across evaluations.

[2]FR = Freeridership

[3]NPSO was not calculated in the 2013-2014 evaluation of the program.

Process Evaluation

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

- Effectiveness of the program design, marketing, and process
- Customer satisfaction and participation barriers
- HVAC trade ally experience with HES
- HES upstream/midstream/downstream delivery channels vs. those used by other similar utility programs

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. Table 69 lists the study's primary research questions.

Table 69. Research Areas

Research Areas	Researchable Questions and Topics
Program status	How did the program perform in 2015–2016, and what opportunities and challenges do program staff foresee for future program years?
Awareness	Are customers aware of the Rocky Mountain Power's programs? If so, how did they learn about the programs?
Satisfaction	How satisfied are customers with their LEDs, APS, ***watt***smart Starter Kits, incented non-lighting measures, or contractors? Why?
Motivations/ Behaviors	What actions have customers taken to save energy, and what has motivated them to purchase a rebated LED, APS, ***watt***smart Starter Kit, or non-lighting measure?
Demographics	How do awareness/activities/behaviors vary by demographic characteristics?

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
- ***watt***smart Starter Kit participant survey
- Manufactured Homes participant survey
- HVAC trade ally interviews
- Benchmarking of selected program components

Program Materials Review

The program materials review concentrated on critical program documents and the program logic model:[34]

- Cadmus reviewed the HES program logic model and determined it reflected, with minor changes, the 2015–2016 program processes (see Appendix F)
- Cadmus reviewed Rocky Mountain Power's online materials and website, and compared the messages conveyed to the challenges and motivations described by customers

Utility and Administrator Staff Interviews

Cadmus developed stakeholder interview guides and collected information about key topics from program management staff. The evaluation involved four interviews: one with program staff at Rocky Mountain Power; and three 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
- Customer and trade ally experiences
- Barriers and areas for improvements
- Data tracking

Cadmus conducted the interviews by telephone, contacting interviewees via e-mail for follow-up questions or clarification requests, as needed.

Participant Surveys

Cadmus conducted telephone surveys with non-lighting, manufactured homes participants, and ***watt***smart Starter 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's processes
  - Program awareness
  - Participation motivations and barriers
  - Behavior changes (manufactured homes participants)

[34] CLEAResult. ***watt****smart Homes—Program Manual*. Rocky Mountain Power. Updated June 2016. CLEAResult. *Home Energy Savings—Implementation Manual*. Rocky Mountain Power. Updated August 2015. ***watt****smart Homes 2015–2016 Marketing Activities* Excel file provided by CLEAResult. Updated March 9, 2017. PacifiCorp. *2015 Idaho Peak Energy Efficiency and Peak Reduction Annual Report*. Issued April 29, 2016. *Idaho Energy Efficiency and Peak Reduction Annual Report*. Issued May 1, 2017.

  - Customer satisfaction
  - Program strengths and/or areas for improvement
- ***Customer information***. Demographic information and household statistics.

General Population Survey

Cadmus conducted a telephone survey of customers that regarded LED lighting and APS purchases, designing the survey instrument to collect data regarding the following process topics:

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

HVAC Trade Ally Interviews

Cadmus conducted telephone interviews with 10 HVAC contractors that provided program-eligible equipment and services to Rocky Mountain Power's HES non-lighting participants during 2015 or 2016. Cadmus designed the interview to collect information about the following topics:

- Trade ally outreach and marketing practices
- Experience with the program application process
- Trade ally satisfaction

Benchmarking

In conversations with Rocky Mountain Power, Cadmus chose to benchmark the HES upstream/ midstream/downstream delivery channels and measures offered through each channel against other similar utility programs across the country (where possible, focusing on the northwest United States). Cadmus conducted this benchmarking, utilizing its ESource data resource as well as a library of Cadmus' current and past utility program evaluations.[35]

Program Implementation and Delivery

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

Program Overview

During the evaluation period, Rocky Mountain Power offered energy efficiency measures in three primary categories (e.g., lighting/APS, non-lighting, and ***watt***smart Starter Kits). The lighting component used an upstream and/or midstream incentive mechanism with a discount applied at the point of sale,

[35] Data from DSM Insights, used with permission from E Source.

whereas the non-lighting component used a midstream incentive mechanism for central air conditioning, various heat pumps and gas furnaces, and downstream post-purchase mechanisms for all other non-lighting measures using mail-in or online incentive applications. The program incentivized insulation using both midstream and downstream channels.

The HES program incentivizes APS as needed, through specific, time-limited campaigns to increase program kWh savings.

Participants in the third delivery channel could order ***watt***smart Starter Kits through Rocky Mountain Power's website, with delivery by mail. Rocky Mountain Power offered eight kit types, containing a mix of measures that depended on the participant's lighting preferences (i.e., CFLs, LEDs) and on whether or not the participant used an electric water heater.

Rocky Mountain Power delivered the basic kit package—including four CFLs—at no cost to customers. If customers reported using an electric water heater, they qualified for water-savings measures (e.g., bath and kitchen faucet aerators, a high-efficiency showerhead). For $4.99, the 2015 and 2016 program offered a kit upgrade option from CFLs to LEDs.

Tariff Changes

HES program incentives and eligibility requirements for existing measures changed during the 2015-2016 period. Rocky Mountain Power added new non-lighting measures, including the following:

- Smart thermostats
- Heat pumps for manufactured homes
- Ductless heat pump for new homes
- Heat pump water heater for new homes
- High performance, ENERGY STAR and Eco-rated certifications for new manufactured homes

The program also removed measures with reduced savings or low consumer interest, including the following:

- Refrigerators
- Freezers
- Electric water heaters
- Heat pump tune-up
- Thermostatic valve

Rocky Mountain Power moved lighting fixtures from downstream to upstream incentives to simplify sales tracking and to allow greater flexibility in incentive amounts.

Delivery Structure and Processes

Rocky Mountain Power offered their midstream and upstream lighting incentives through retailers, identifying retailers using the Retail Sales Allocation Tool (RSAT), developed in partnership with the

Bonneville Power Administration. RSAT helped Rocky Mountain Power reduce sales of incentivized measures to people residing outside of the company's territory. The program administrator reported that the RSAT approach helped the program reach customers in outlying areas, while enabling the program to stop incentivizing measures as funds became exhausted for the year.

The program administrator noted that delivery in Idaho is challenging because Idaho has so few big box stores and only a handful of independent stores. The administrator was considering developing an online store in the 2017 or 2018 timeframe to increase customer access and assure equity for customers who may be too far from a participating store.

Rocky Mountain Power offers non-lighting post-purchase incentives through downstream channels, which customers or trade allies may access. These retailers, again are primarily big box chain, with a few independent stores, and online sites such as Amazon.com or BestBuy.com.

Data Tracking

Program Data

CLEAResult reported that it enters downstream rebate application data into the program's Key What You See (KWYS) system, a Microsoft Access-based tool that performs an auto check to ensure the applicant's eligibility and that all required information has been provided on the application. From KWYS, information transmits to Sprocket, a Salesforce database. Weekly, the program administrator pulls data from Sprocket into a DSM Central (DSMC) spreadsheet for invoicing. DSMC serves as Rocky Mountain Power's project management and reporting database.

Monthly, the program administrator provides Rocky Mountain Power with a snapshot of the program's actual performance compared to forecasts, and updates the monthly forecasts for the remainder of the year (a technique that Rocky Mountain Power characterized as easy to use). In late 2016, the administrator began specifically addressing the program's quarterly progress toward goals, seeking to identify areas at risk of under-delivery or over-delivery, and to initiate more frequent program delivery strategy conversations to address these risks.

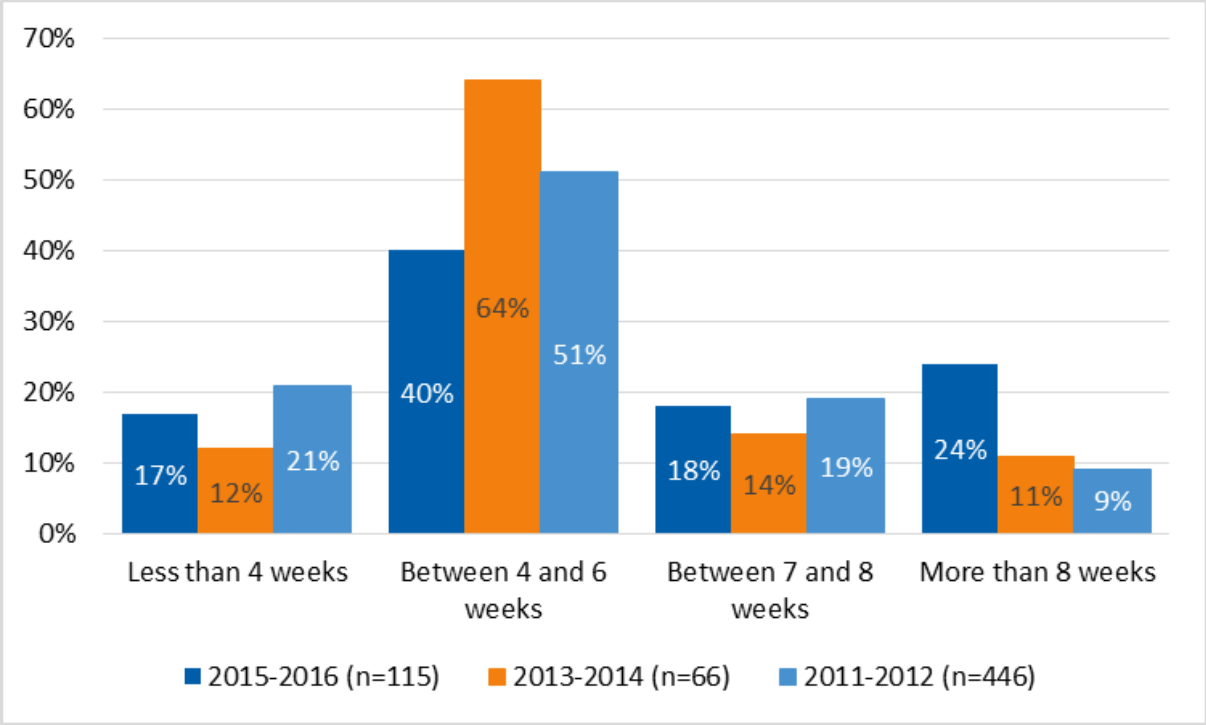
Application Processing

By the end of 2016, CLEAResult provided almost all applications online. These actions sought to streamline the submittal process and reduce missing information required for processing the applications. Program staff, however, said customers still struggled to provide clear, legible images of their invoices. CLEAResult also launched an online portal in 2016, allowing customers to enter their account numbers and track the status of their applications and incentives.

As shown in Figure 6, 17% of non-lighting customers reported it took less than four weeks to receive their incentive in 2015–2016. Numbers of customers reporting that they received incentives in four to six weeks significantly decreased, and those reporting they received them after more than eight weeks significantly increased in 2015–2016 vs. 2013–2014, while those reporting seven to eight weeks,

remained unchanged.[36] 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 6. Time Between Non-Lighting Application Submission and Incentive Receipt (2011–2016)



Source: Rocky Mountain Power Idaho HES Residential Non-Lighting Survey (Appendix A) (QE7 2015–2016, 2013–2014, QF6 2011-2012). Don't know, refused, and have not received the incentive yet responses removed.

Seventy-five percent of non-lighting customers expressed satisfaction with the time required to receive incentives. Among the 25% of customers who expressed dissatisfaction (i.e., 28 total customers), six reported the incentive taking too long to arrive.

Overall, 55% of non-lighting customers expressed high satisfaction rates (very satisfied) with the application process, and 37% said they were somewhat satisfied. Six percent said they were not very satisfied, and 1% said they were not at all satisfied. Respondents that were less than somewhat satisfied offered the following reasons:

- "Had to keep going back because something was always wrong with the application."
- "I just didn't like the time it took to get it done, to go through all the loop holes."

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

Trade Allies

The program administrator continued its use of a tiered system for trade allies, reflecting savings delivered to the HES Program by a trade ally and the attention level provided by the administrator. Tier 1 trade allies—those delivering 80% of program savings—received more support from the administrator. The program administrator employed a full-time account manager for all trade allies in the Rocky Mountain Power network, based in Utah. The account manager made periodic site visits to Idaho trade allies to maintain the program relationship.

The program administrator funded Performance Tested Comfort Systems (PTCS) training for Idaho trade allies. The PTCS program, administered by the Bonneville Power Administration, trains trade allies to use the correct technical methods for testing and sealing HVAC ducts. However, in the 2016 Rocky Mountain Power Energy Efficiency and Peak Reduction Annual Report, the program administrator reported only one HVAC trade ally registered to provide duct sealing and insulation services generally, and only one trade ally, based in Utah, that was registered to perform duct sealing and insulation for manufactured homes.

The administrator also noted that trade allies reacted positively as the program moved more rebate applications online.

Marketing

Approach

In 2015–2016, the ***watt***smart program shifted resources toward marketing renewables and business solutions more than the residential market. HES, however, continued utilizing a variety of channels to communicate with customers, retailers, and trade allies. The administrator marketed the HES program using combined tactics, including bill inserts, direct mail, the Rocky Mountain Power website, and content in Rocky Mountain Power's customer newsletters and social media (Facebook) channels.

In executing these tactics, the program sought to educate customers how to reduce consumption and save money on their own or through the program. Marketing campaigns followed several key marketing strategies, including the following:

- Focusing on priority measures during key seasonal selling windows (e.g., heating season, cooling season, lighting season)
- Promoting ***watt***smart Starter Kits throughout the year, using targeted customer communication through direct mail, e-mail, and social media

In 2015, the program also targeted the manufactured homes market through a free duct testing and duct sealing offer.

Effectiveness

In the month of deploying a marketing tactic, the program administrator measured the HES landing pages' web traffic, comparing this to prior and subsequent months to determine the tactic's

effectiveness in increasing traffic to the site. The program administrator pointed out that other Google Analytics (e.g., session lengths, bounce rates) did not provide particularly valuable metrics. Visitors used the website to gain quick information about available rebates and to provide a path to the online application website.

Table 70 provides several direct-to-customer tactics Rocky Mountain Power deployed in 2015-2016 and the subsequent increases in website visits.

Table 70. Direct-to-Customer Marketing Tactics (2015–2016)

Tactic	Date	Increase in Website Visits
LED/Starter Kit Bill Insert	April 2015	65%
Ductless Heat Pump Bill Insert	June 2015	25%
Smart Thermostat Bill Insert	February 2016	82%

Source: CLEAResult provided the data included in this table in response to follow-up questions submitted by Cadmus.

One primary HES website objective, as the administrator noted, was to drive customers toward applying for incentives online. The administrator saw a dramatic increase in the number of year-over-year visits to the application landing page from 2014 to 2015 (192 vs. 791), but the site experienced a slight decrease in 2016 (779).

According to the program administrator, direct mail and e-mail blasts for kits in the first and second quarter of 2016 proved more effective than expected, resulting in a surge of kit orders. Following the second quarter, the program administrator shut down all kit marketing for the remainder of the year to limit additional participation.

Program Challenges and Successes

Program staff reported that limited participation from trade allies posed a primary challenge in Idaho during 2015 and 2016. The program administrator reported a decline in trade ally participation in Idaho, primarily due to staff turnover within trade ally companies. Per the administrator, when staff familiar with the program left a company, several companies dropped out of the program rather than train new staff.

As a result, the administrator made trade ally recruitment a priority for Idaho over the 2015–2016 cycle. The administrator used online tools such as DexKnows, Angie's List, or Google to canvas the market for nonparticipating companies likely eligible to participate. For those companies, the administrator offered an in-person meeting to explain the program and to paperwork and requirements. They offered support for completing applications and to attend meetings with customers. Although this succeeded to an extent, the program administrator expected trade ally recruitment to continue as a priority during the next cycle.

The program administrator noted that because there are a limited number of big box retailer partners and locations in Idaho, and because sales in Idaho were low due to a small, more rural population, it was difficult to secure retailer cooperation with regard to product placement and promotion. By working closely with the retailer and manufacturers, the administrator could secure a limited-time end-cap placement for incented products in one retail with multiple locations in Rocky Mountain Power's Idaho territory. The administrator plans to continue to work closely with relevant partners to secure additional placements.

Customer Response

Awareness

The general population of Rocky Mountain Power's customers learned of the ***watt***smart HES program through a variety of means, with bill inserts as the most frequently reported source of awareness in each program period (representing a significant increase in 2013–2014 and an equally significant decrease in 2015–2016).[37] Respondents also cited word-of-mouth (19%). For the first time, customers also reported learning of the program through the following means:

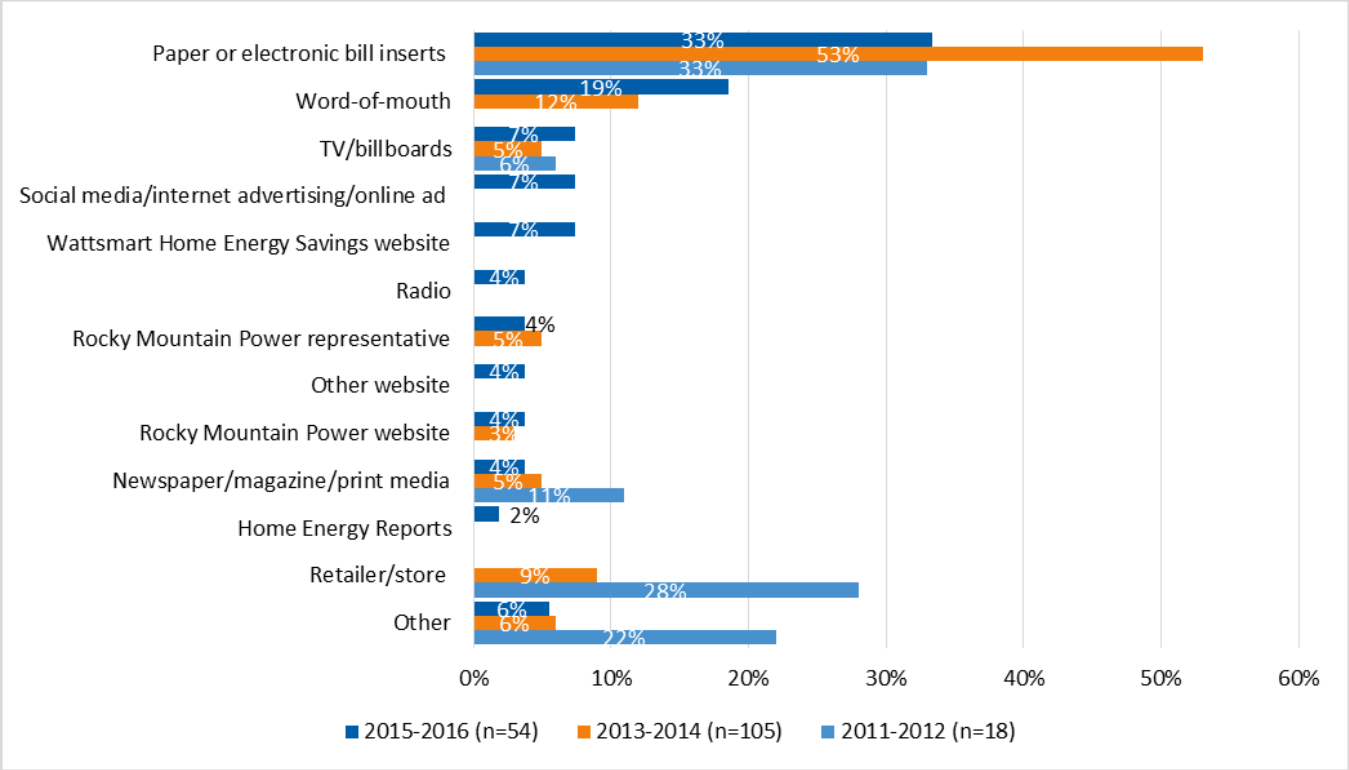
- Social media/Internet/online advertising
- ***watt***smart HES or other websites
- Radio
- Home Energy Reports

The "Other" responses included an e-mail from Rocky Mountain Power, prior experience with the HES program, and learning about the program while preparing taxes.

The general population did not report frequent visits to the ***watt***smart website. Those visiting the site (n=17) found it very helpful or somewhat helpful, and said they looked for incentives or were just curious about programs and offerings were available. Figure 7 presents awareness sources from 2011 to 2016.

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

Figure 7. General Population Survey Source of *watt*smart Awareness

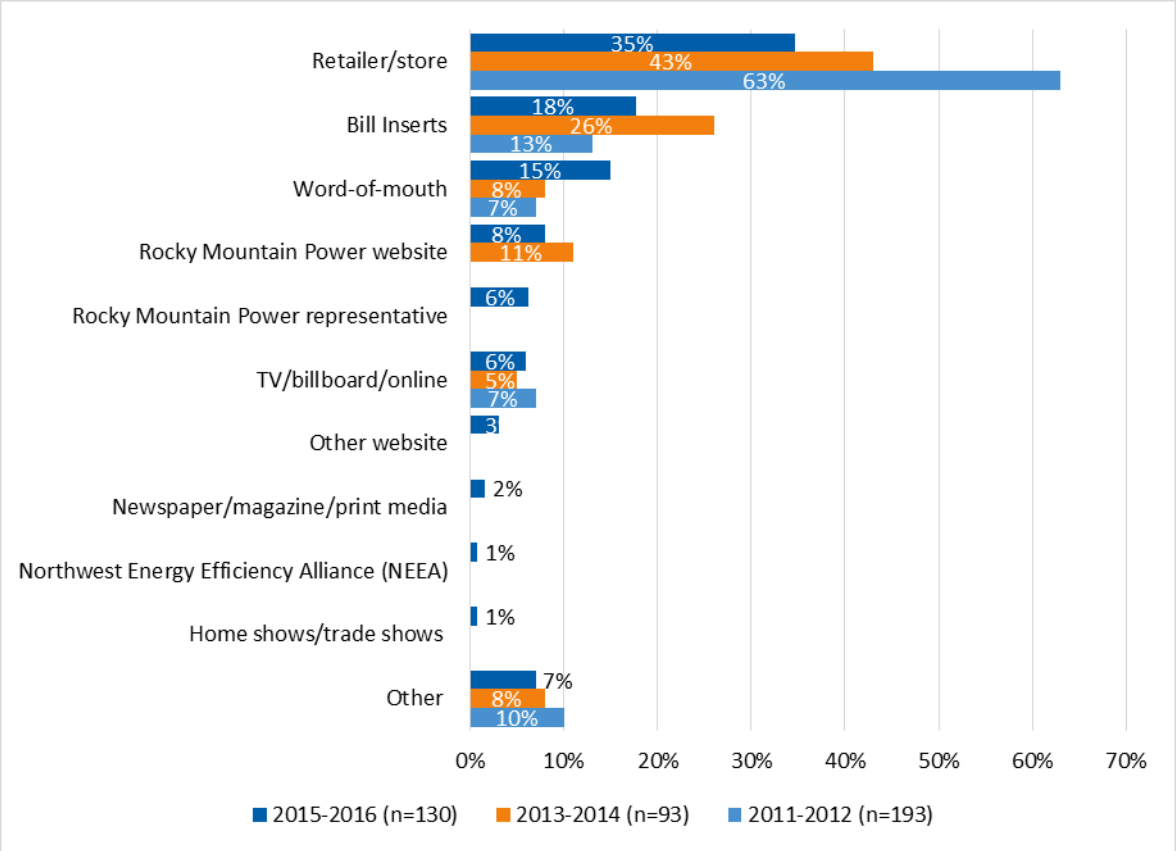


Source: 2015–2016 Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A) (QE10 2015–2016, QD3 2013–2014, QB2 2011-2012). Don't know and refused responses removed.

As shown in Figure 8, 35% of non-lighting participants reported learning of the program through a retailer, and 18% learned of it from bill inserts representing a significant decrease from 2013–2014.[38] Customers also reported learning about the program through word-of-mouth (15%). The "Other" responses included contractors and prior experience with the program.

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

Figure 8. Non-Lighting Participant Source of Awareness

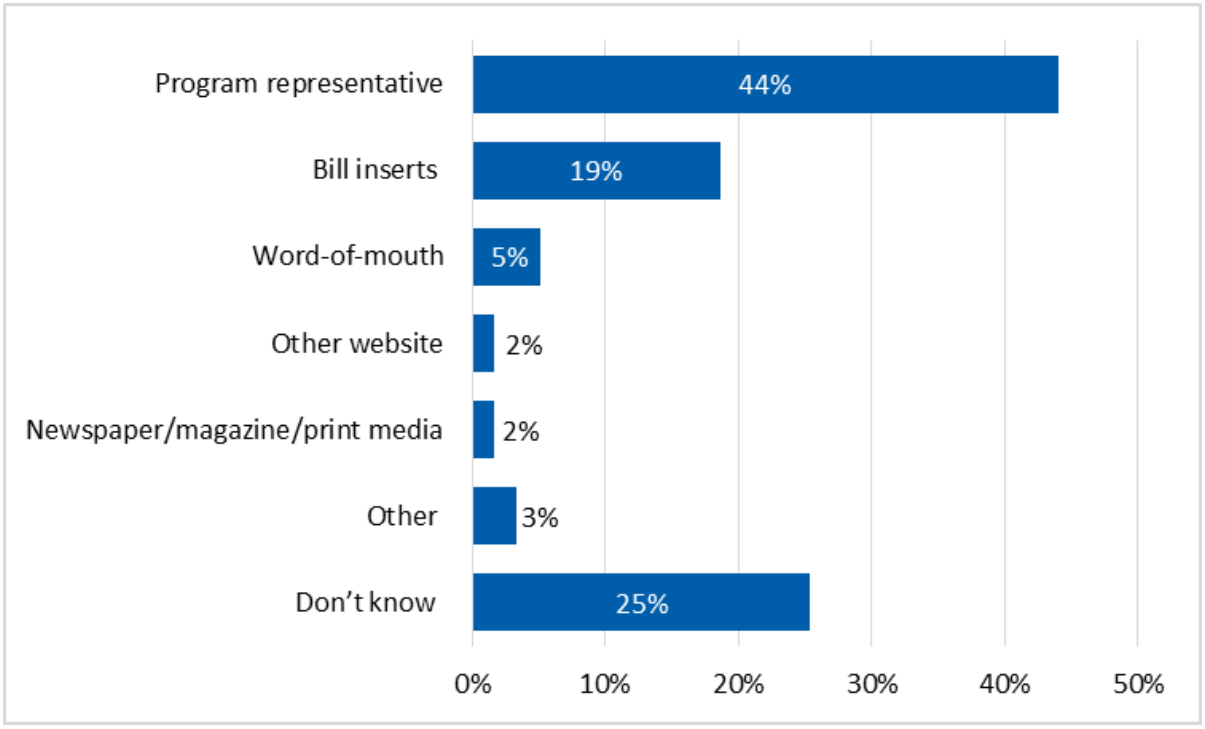


Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A) (QC1 2015–2016 and 2013–2014, QM1 2011-2012). Don't know and refused responses removed.

Among the non-lighting participants that visited the ***watt***smart website (n=74), 98% and found it very or somewhat helpful. Of those reporting satisfaction levels other than very satisfied (n=24), 29% said it needed nothing more to make it more helpful. Others said it would be helpful if the site improved its navigation, the program information became clearer and more concise, and it incorporated more graphics and less text.

Manufactured homes participants most frequently reported learning about the program through door-knocking by program affiliated contractors/representatives (44%) or bill inserts (19%). Four of the 59 participants said they visited the program website and found it very or somewhat helpful. Figure 9 shows how manufactured homes participants learned about the program.

Figure 9. Manufactured Homes Participant Source of Awareness

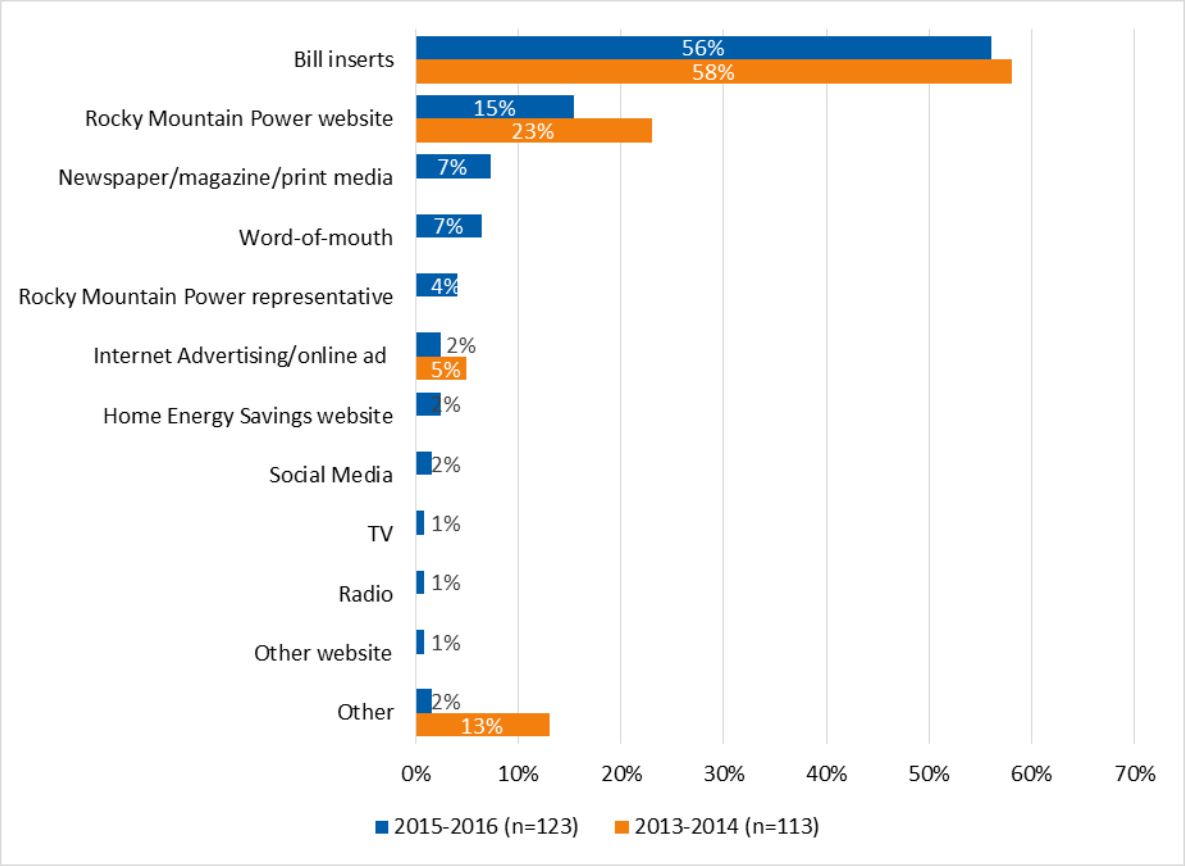


Source: Rocky Mountain Power Idaho HES Residential Manufactured Homes Participant Survey (Appendix A) (QB1). Refused responses removed. (n=59)

Of kit customers, 56% reported learning about the program through bill inserts, and 15% cited Rocky Mountain Power's website. "Other" responses included e-mail. Eighteen kit customers (n=57) participated in the Home Energy Reports web portal.

Figure 10 shows how participants learned about the ***watt***smart Starter Kits.

Figure 10. Sources of Awareness (*watt*smart Starter Kits)



Source: Rocky Mountain Power Idaho HES Energy Kit Survey (Appendix A) (QE5 2015–2016 and 2013–2014). Don't know and refused responses removed.

Lighting and APS Purchasing Decisions

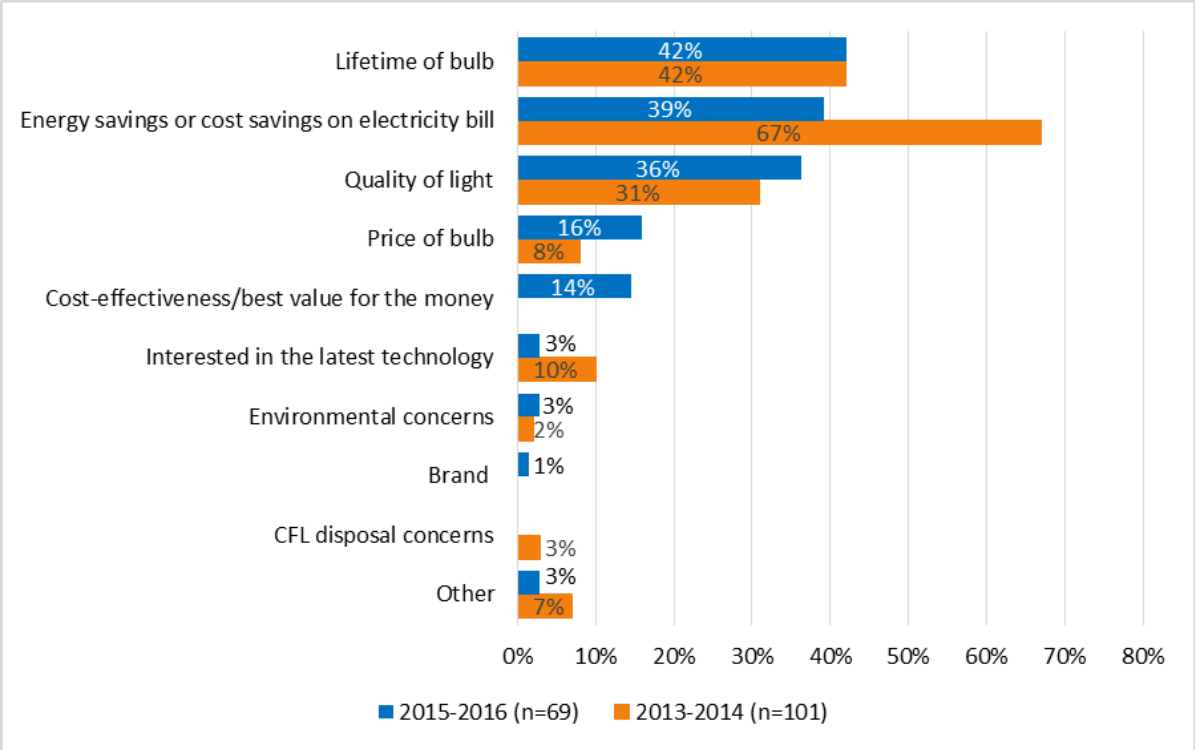
In the general population survey, Rocky Mountain Power's Idaho customers expressed a variety of reasons for purchasing LEDs, most commonly citing the bulb's lifetime (42%), energy savings or cost savings on their bills (39%), and the light quality (36%) as the main reasons for purchasing LEDs over other bulb types. As shown in Figure 11, these reasons remained consistent with 2013–2014 findings, except for two key differences: a significantly smaller percentage of customers identified energy/cost savings or interest in the latest technology as motivating factors during 2015–2016.[39] Of customers purchasing LEDs in the past 12 months (n=67), 79% definitely intended to purchase LEDs over other bulb types. Of the remaining 21; five considered incandescent bulbs, five considered CFLs, and one considered halogen bulbs before purchasing LEDs.

The 44 customers choosing not to buy LEDs most commonly cited the bulbs' cost, with 66% (29 of 44) considering the LEDs expensive. Respondents' second most cited reason was that LEDs did not fit the

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

specific fixtures or applications needed (9 of 44), and the lack of LED availability was the third most common reason (4 of 44). Two participants reported other reasons.

Figure 11. General Population Reasons for Choosing to Buy LEDs (2013–2016)



Source: Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A) (QC7 2015–2016 and 2013–2014). Don't know and refused responses removed. Multiple responses allowed. Energy savings and cost savings on electricity bill were separate responses in 2013–2014; those were combined in 2015–2016.

When asked, even though Cadmus read respondents a description of APS and their function, 76% of general population customers had not heard of APS (n=237). In the last 12 months, 12 customers purchased and installed an average of 2.17 APS. Of these 12 customers, two purchased the APS for energy/cost savings, two purchased it for the equipment protection, and six cited other reasons:

- Controlling multiple sockets
- Environmental concerns
- Interest in the latest technology
- Lowest-cost product
- It was what was available
- APS required by employer

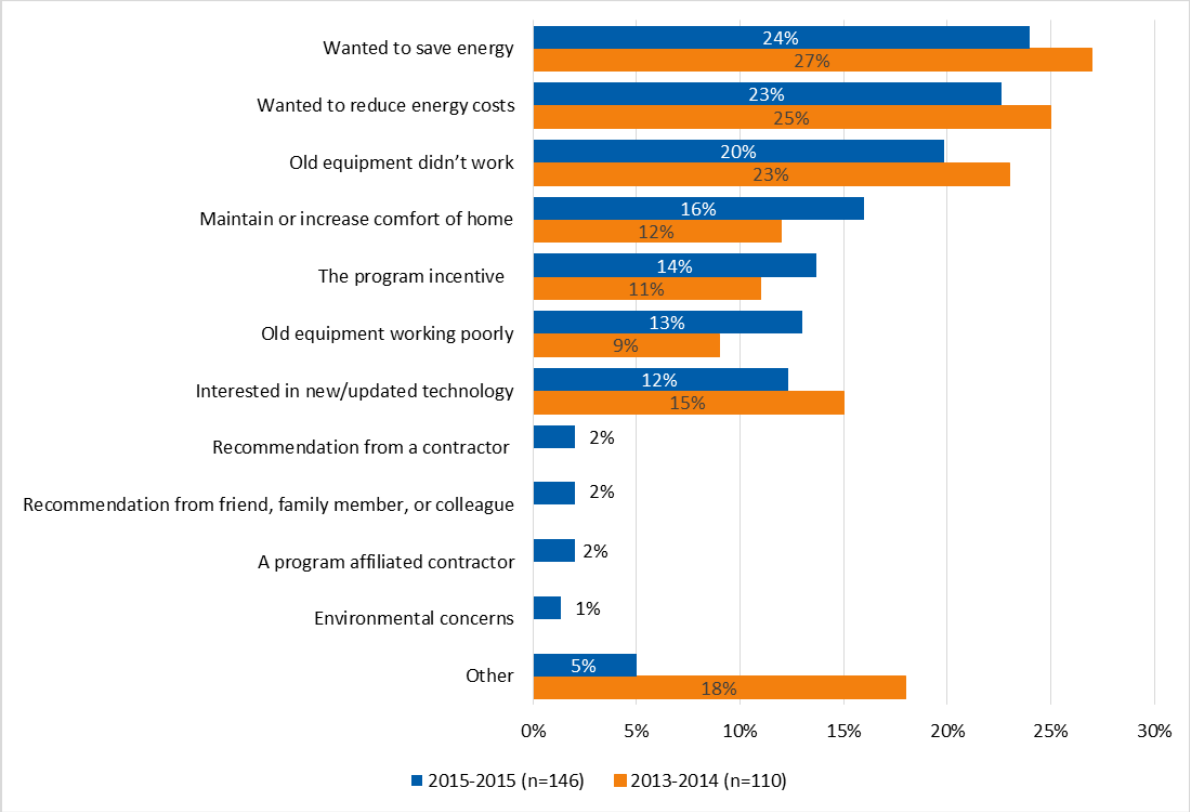
Two customers did not offer reasons.

Non-Lighting Participation Decisions

As shown in Figure 12, Rocky Mountain Power non-lighting participants described a number of different factors influencing their decisions to participate in the HES program. Most commonly, participants cited an interest in saving energy (24%) or reducing energy costs (23%). Customers third most cited response was to replace old non-working equipment (20%).

The "Other" responses included equipment reviews, available tax refunds, or experience with the equipment.

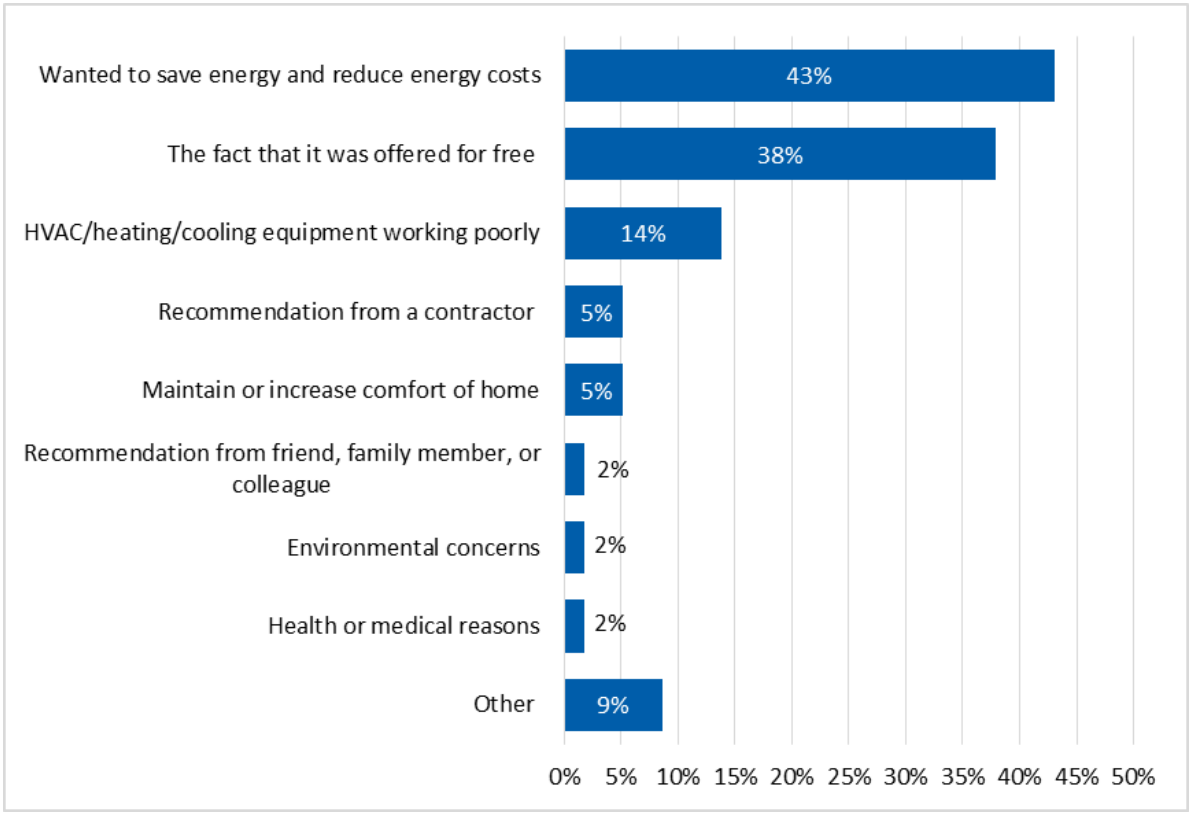
Figure 12. Reasons for Participation (Non-lighting)



Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A) (QC5 2015–2016 and 2013–2014). Don't know and refused responses removed. Multiple responses allowed.

A majority of manufactured homes participants acted to save energy and reduce energy costs (43%), but 38% participated as the service was offered at no cost, and 14% replaced poorly working equipment. The "Other" response included requiring the service offered and getting ducts cleaned, or that it simply seemed like a good idea. Figure 13 shows respondents' reasons.

Figure 13. Participation Reasons (Manufactured Homes)



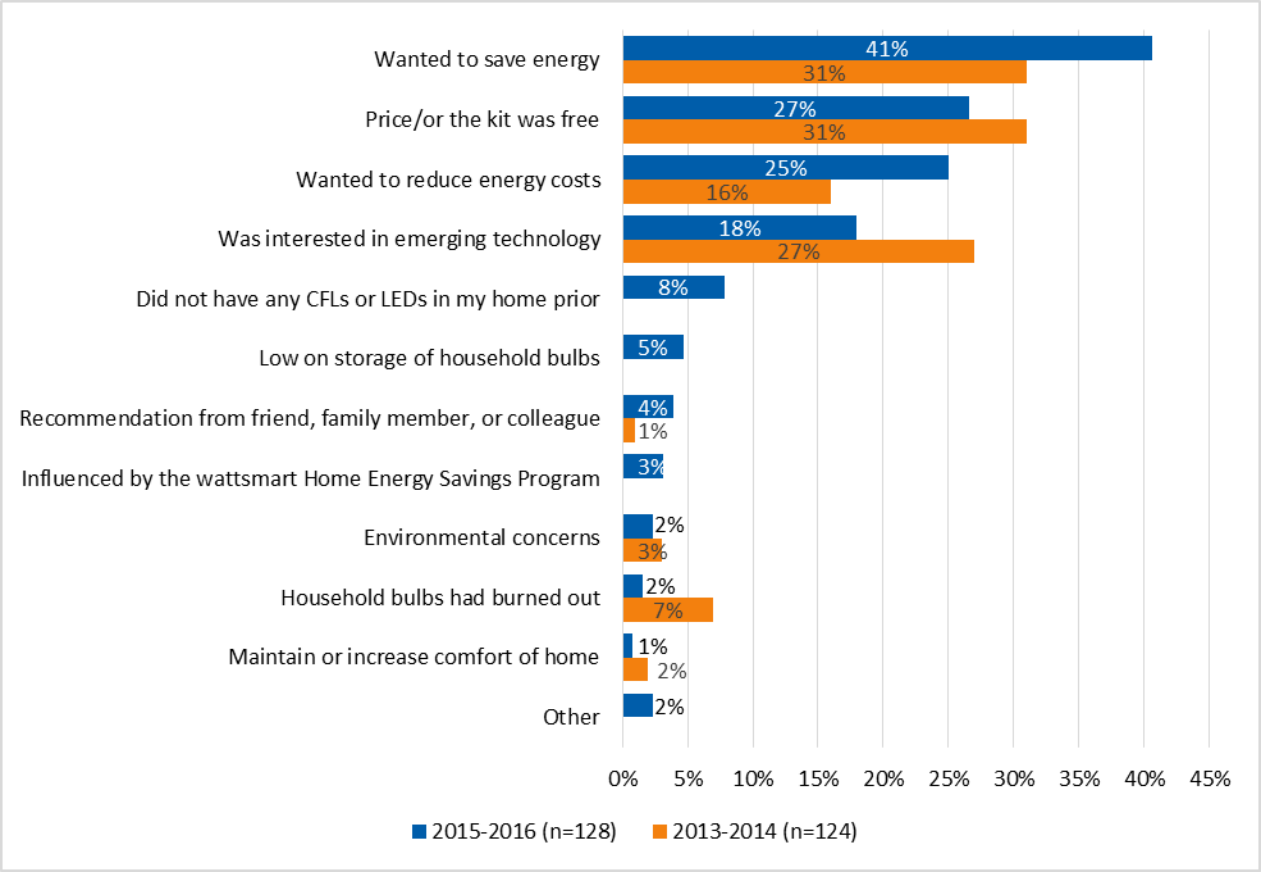
Source: Rocky Mountain Power Idaho HES Residential Manufactured Homes Participant Survey (Appendix A) (QB5). Multiple responses allowed (n=58).

Kit Purchasing Decisions

Rocky Mountain Power customers expressed a variety of reasons for applying for the HES ***watt***smart Starter Kit, most commonly citing energy savings (41%) and price (27%) as their main reasons. Many customers also were motivated to apply for a kit to reduce their energy costs (25%), interest in the emerging technology (18%), or wanting to try the various energy efficiency measures included in the kits. Between 2013–2014 and 2015–2016, the program saw significant changes in the number of customers citing energy savings, energy costs, and the desire to acquire new technology.[40] Figure 14 illustrates the various reasons why customers were motivated to request a kit.

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

Figure 14. Reasons for Requesting a *watt*smart Starter Kit



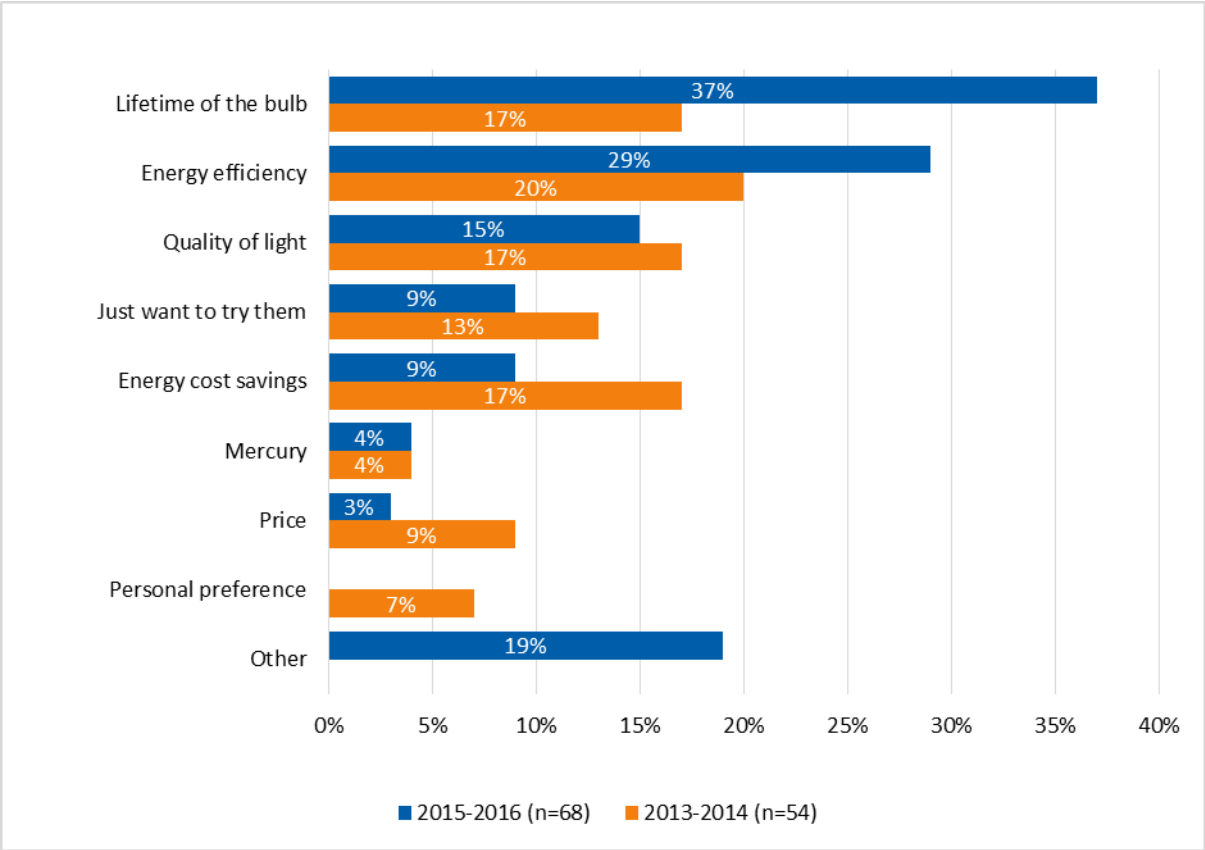
Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (QE10). Don't know and refused removed. Multiple responses allowed.

During the application process, customers could upgrade their kits from CFLs to LEDs for $4.99 (down from $19.99 in 2013–2014). Of 68 customers paying to upgrade their kits, top motivating factors included bulb lifetimes (37%), energy efficiency (29%), and quality of light (15%). Customers also noted their curiosity to try LEDs, energy cost savings, lack of mercury, or bulb prices as motivating factors in upgrading their kits. Customers cited bulb lifetimes significantly more than in 2013–2014.[41]

Thirty-seven percent (n=65) of respondents already planned to purchase the similar type of bulbs they received in the kits, and 27 customers already averaged 11.5 LEDs in their homes at the time they signed up for the kit. Figure 15 shows reasons that customers upgraded their kits to include LEDs rather than CFLs.

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

Figure 15. Reasons for LED Upgrade



Source: Rocky Mountain Power Idaho HES Residential Energy Kit Survey (Appendix A) (QB20 2015–2016 and 2013–2014). This was asked as an open-ended question, multiple response allowed.

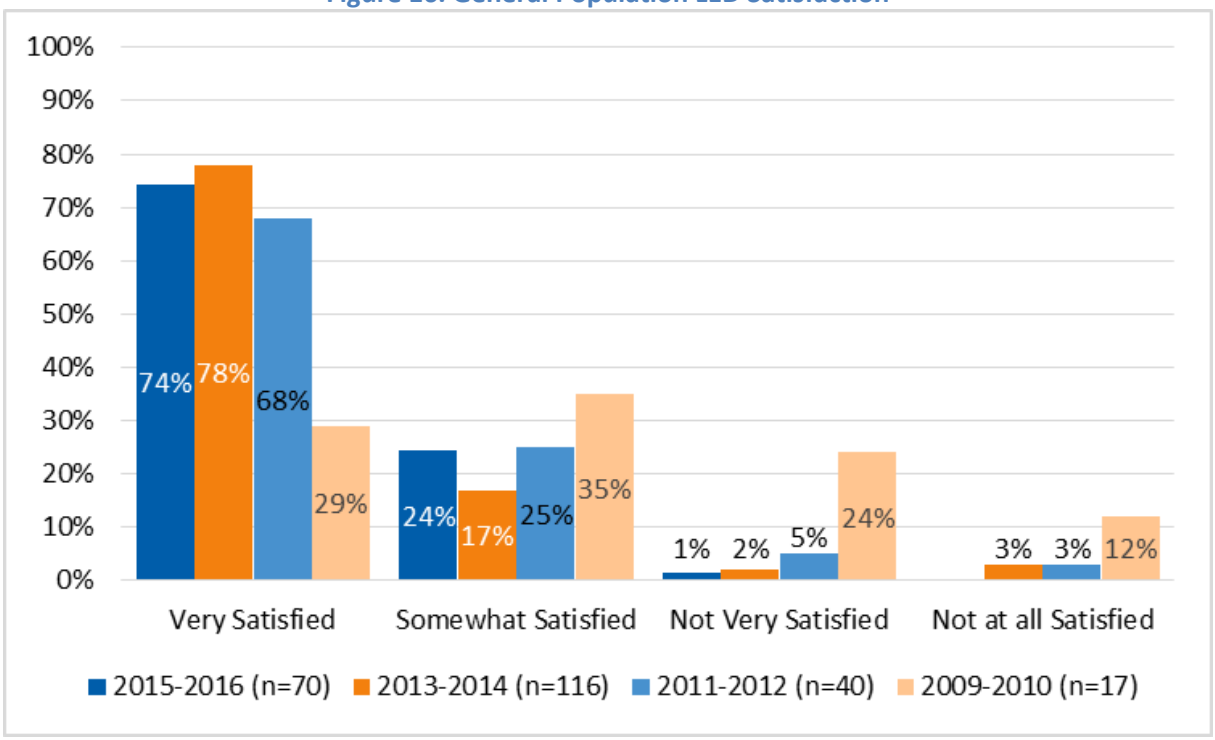
Cadmus asked customers selecting CFL kits why they chose not to upgrade their kits to include LEDs. Of 24 customers responding to this question, three knew of the upgrade option, but two did not upgrade due to cost, and one was unfamiliar with LEDs. Ten customers said they would have upgraded had they known of the option. In the 2013–2014 evaluation period, 19 customers (of 24) found upgrading the kit cost-prohibitive, and eight customers would have upgraded had they known of the option.

Satisfaction

Lighting and APS

As shown in Figure 16, general population customers purchasing LEDs expressed satisfaction levels similar to those recorded from 2011–2014, with 74% very satisfied and 24% somewhat satisfied with products purchased in 2015–2016. All 12 general population customers buying APS in the last 12 months were very satisfied with their purchases.

Figure 16. General Population LED Satisfaction



Source: Rocky Mountain Power Idaho HES Residential General Population Survey (Appendix A) (QC16 2015–2016, QC14 2013–2014, QM8 2011-2012, QM5 2009-2010). Don't know and refused responses removed.

Non-lighting

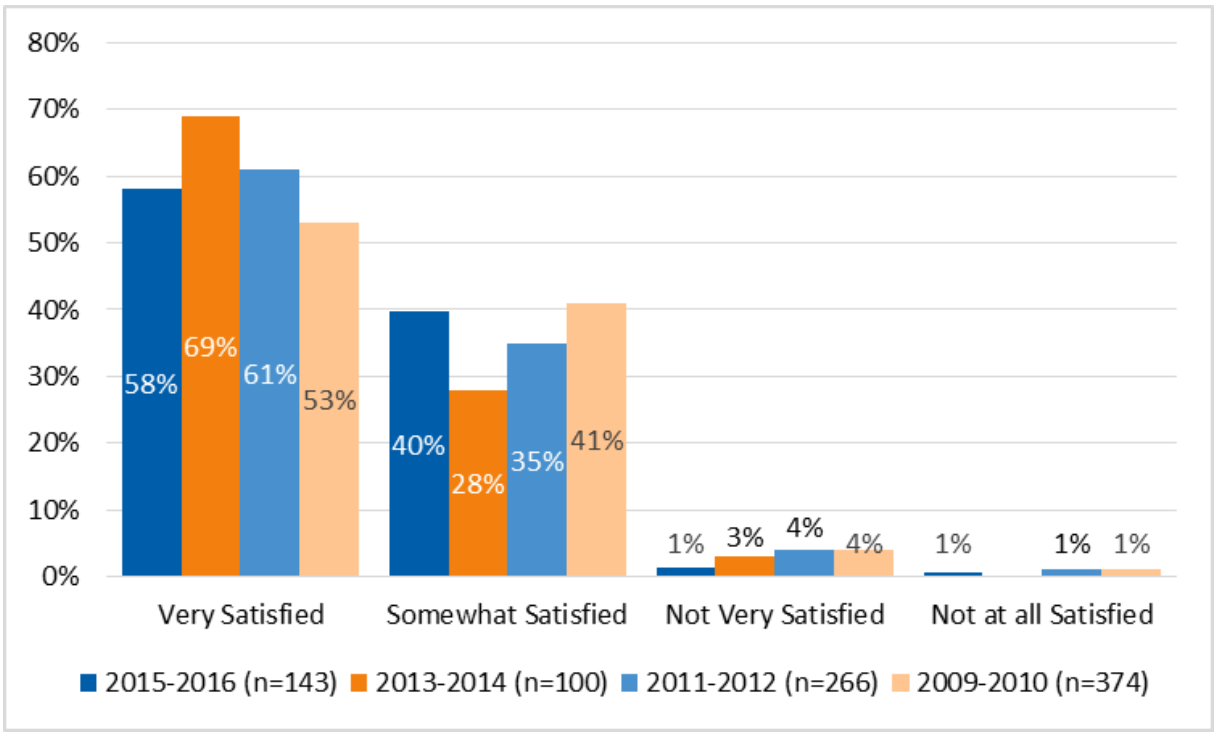
Non-lighting customers overwhelmingly expressed satisfaction with the HES program, with 98% of participants reporting they were very satisfied or somewhat satisfied. Satisfied participants offered the following comments:

- "I am very satisfied because Rocky Mountain Power helped us save energy."
- "It just was easy to navigate, seemed like things spelled out, it was not a hassle."
- "Because it was fairly easy to fill out the paperwork and it was a good benefit for our house and it made it more comfortable."
- "It was easy and unexpected."

Only one dissatisfied customer provided a comment on their program experience, stating: "It didn't work. They never refunded [sic] the money."

Though satisfaction has remained relatively consistent since 2009, the 2015–2016 program year demonstrated a shift in satisfied responses from very satisfied to somewhat satisfied relative to the previous evaluation (58% very satisfied and 40% somewhat satisfied in 2015–2016, compared to 69% and 28% in 2013–2014). Figure 17 illustrates the trends year over year.

Figure 17. Non-lighting Satisfaction with HES Program



Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A) (QE10 2015–2016 and 2013–2014, QF9 2011-2012 and 2009-2010). Don't know and refused responses removed.

Program participation appears to have positive or neutral effects on most customers' perceptions of Rocky Mountain Power. When asked whether their participation in the HES program changed their satisfaction with Rocky Mountain Power, 28% of non-lighting participants said it increased their satisfaction, 68% said it stayed the same, and 4% said it decreased.

In addition to their overall satisfaction with the HES program, non-lighting customers expressed high satisfaction levels with measures they installed, their contractors, and incentive amounts they received. As shown in Sixty percent of participants hired contractors to install measures for which they received program incentives; 85% of these participants reported being very satisfied with their contractors, and 11% were somewhat satisfied. Participants were less satisfied with incentive amounts they received, with 55% reporting they were very satisfied and 39% reporting they were somewhat satisfied. Just 6% 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 58% of respondents reporting it very easy to fill out and 32% reporting it somewhat easy. Participants reporting difficulties with filling out the application (10%) noted the following challenges:

- "Finding the information was harder than usual."
- "Took two to three tries to get it right, had to do with the programming."

Figure 18 (below), 81% of non-lighting customers said they were very satisfied with measures installed, and 16% said they were somewhat satisfied.

Sixty percent of participants hired contractors to install measures for which they received program incentives; 85% of these participants reported being very satisfied with their contractors, and 11% were somewhat satisfied. Participants were less satisfied with incentive amounts they received, with 55% reporting they were very satisfied and 39% reporting they were somewhat satisfied. Just 6% said they were not very or not at all satisfied.

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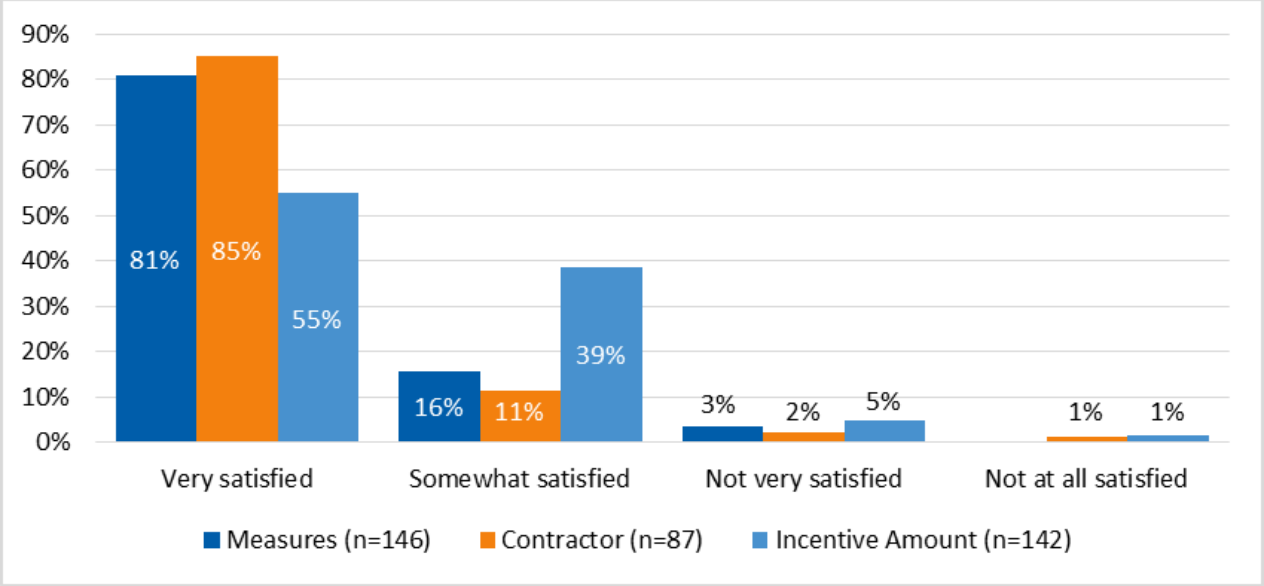
- "Finding the information was harder than usual."
- "Took two to three tries to get it right, had to do with the programming."

Figure 18. Non-Lighting Satisfaction with Measures, Contractors, Incentive Amounts



Source: Rocky Mountain Power Idaho HES Residential Non-lighting Survey (Appendix A) (QE1, QE3, QE6). Don't know and refused responses removed.

Participants in MHDS reported high satisfaction levels with the professionalism and attitude of contractors performing the measure, with 83% very satisfied and 16% somewhat satisfied (n=58). All participants expressed satisfaction with the application process (100%, n=57). On average, seven days passed between arranging the appointment and the contractor's first visit to the home (n=39), though the time ranged from the same day to 31 days later. On average, contractors completed the work in four days (n=18).

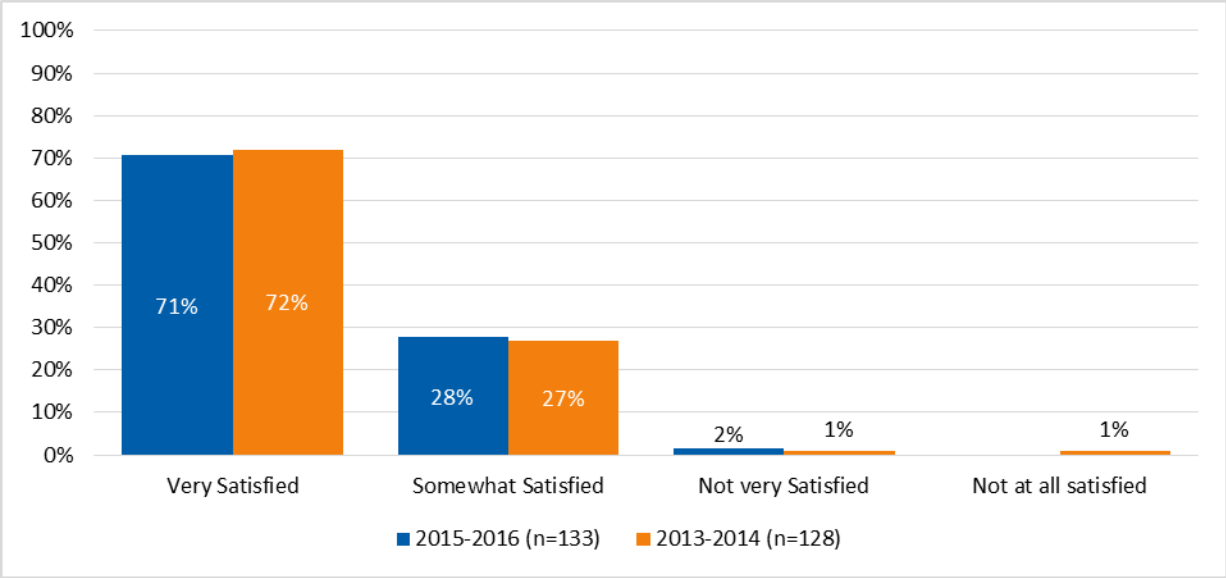
Though 41% of respondents found their homes more comfortable after duct sealing, 59% noticed no change (n=54). About one-third (33%) of manufactured homes participants said duct testing and sealing increased their satisfaction with Rocky Mountain Power, 61% said their satisfaction levels stayed the same, and 5% said the program caused their satisfaction to decrease (n=57).

wattsmart Starter Kits

Program Satisfaction

As shown in Figure 19, nearly all kit recipients expressed satisfaction with their kit experience: 98% reporting they were very or somewhat satisfied with the kit. Satisfaction levels remained about equal to the 2013–2014 cycle.

Figure 19. Energy Kit Participant Overall Satisfaction



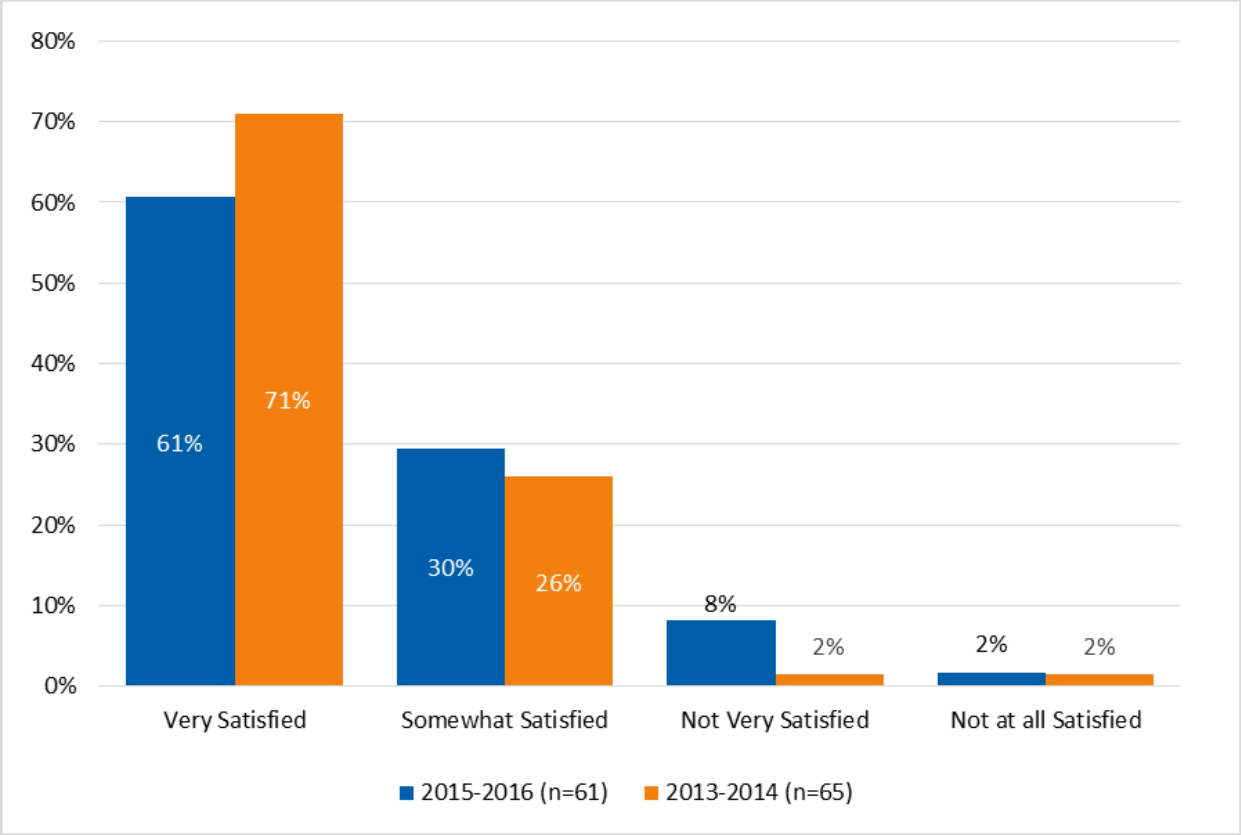
Source: Rocky Mountain Power Idaho HES Residential Kit Survey (Appendix A) (QE4 2015–2016 and 2013–2014). Don't know responses were removed.

Satisfaction with Kit Measures

Kit recipients also reported high satisfaction levels with the kit components. As 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 only answered questions pertaining to their specific kit's contents.

Sixty-one percent of CFL kit respondents were very satisfied with CFLs they received, and 30% were somewhat satisfied, as shown in Figure 20.

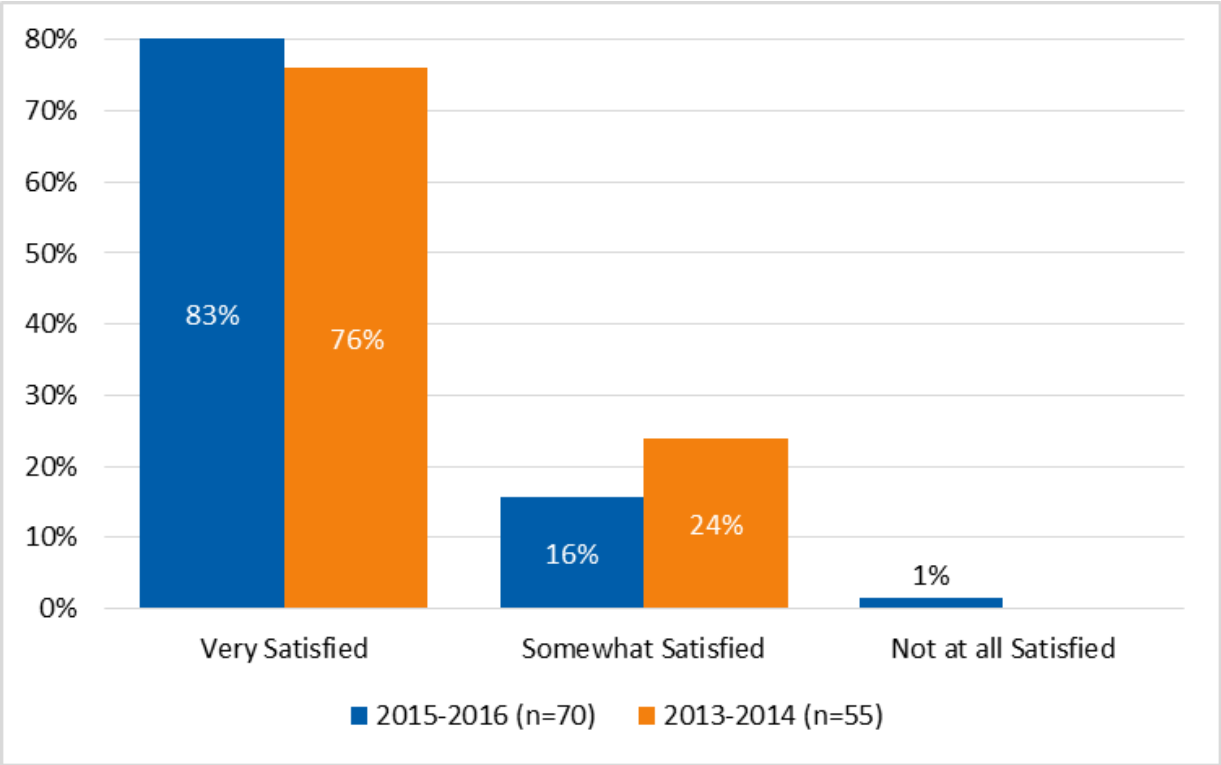
Figure 20. Satisfaction with CFLs in wattsmart Starter Kit



Source: Rocky Mountain Power Idaho HES Residential Kit Survey (Appendix A) (QB6 2015–2016 and 2013–2014). Don't know and refused responses removed.

Customers also expressed high satisfaction levels with LEDs in their kits, with 83% very satisfied and 16% somewhat satisfied, as shown in Figure 21.

Figure 21. Satisfaction with LEDs in Energy Kits

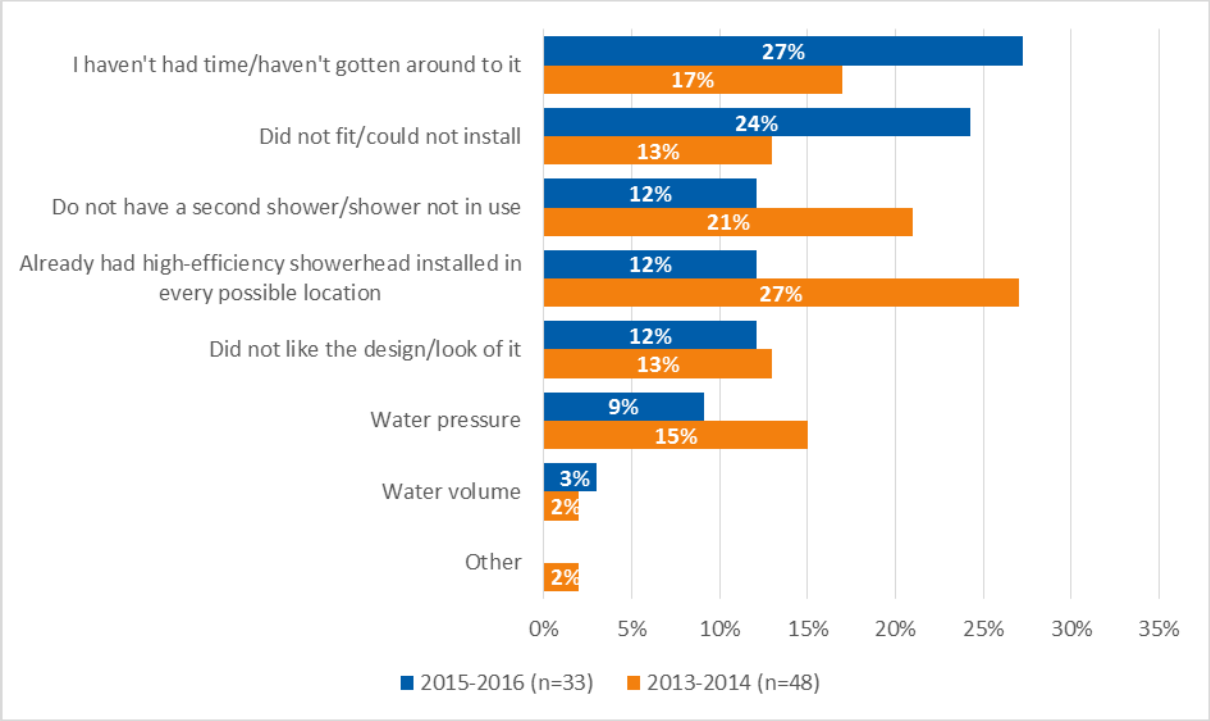


Source: Rocky Mountain Power Idaho HES Residential Kit Survey (Appendix A) (QB21 2015–2016 and 2013–2014). Don't know and refused responses removed.

Energy kit participants expressed satisfaction with the number for CFL and LED bulbs provided: 70% of customers receiving a CFL kit (n=62) and those receiving an LED kit (n=69) said they were very satisfied with the number of bulbs in the kit.

Less than one-half (38%, n=74) of customers installed both high-efficiency showerheads provided. Of customers reporting they did not install all showerheads provided, 27% (n=33) said they had not yet installed the showerheads, in some cases due to an ongoing bathroom remodel. It is possible that some of these showerheads will be installed in the future. The second most common response was that respondents could not install the showerhead or the showerhead did not fit. The majority (88%) of these customers put the unused showerheads in storage. Figure 22 shows other responses and comparisons to the
2013–2014 evaluation responses. Although response patterns in 2015-2016 differed from 2013-2014, differences were not statistically significant.

Figure 22. Reasons for Not Installing High-Efficiency Showerheads



Source: Rocky Mountain Power Idaho Residential Kit Survey (Appendix A) (QC2 2015–2016 and 2013–2014). Don't know removed. Multiple responses allowed.

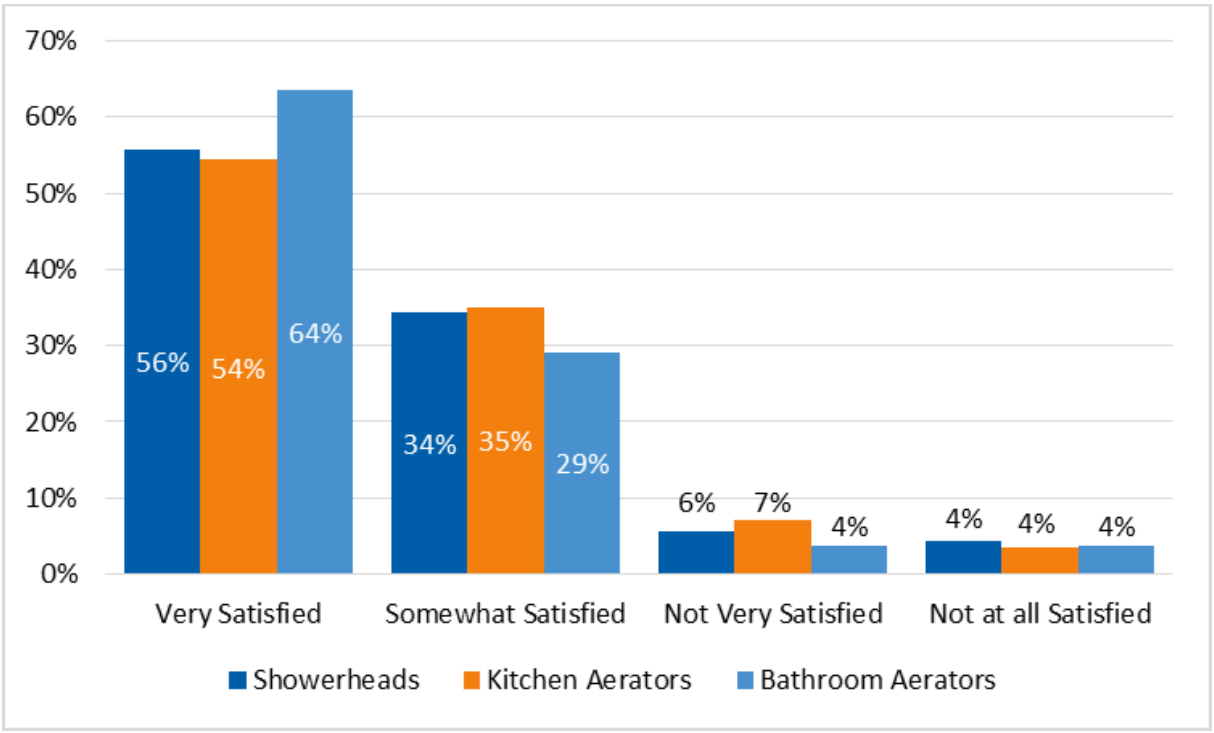
Despite the low installation rates, customers expressed satisfaction with the showerheads received: 56% were very satisfied with the showerhead; and 34% said they were somewhat satisfied. Further, 82% found it very easy or somewhat easy to install the showerheads.

Customers also reported lower installation rates for kitchen and bathroom faucet aerators than CFLs or LEDs. Only 60% of respondents said they installed the kitchen faucet aerator in their homes, most commonly because respondents said the kitchen faucet aerators did not fit (41%), followed by already having aerators installed in all possible locations (28%). Twenty-one percent did not like the design or the water pressure, or had another reason for not installing the aerator. The remaining 10% had yet to install them, with 74% of respondents not installing the kitchen aerator saying the unit was in storage.

Forty-one percent of respondents installed all bathroom aerators they received. Respondents report the most common reason for not installing bathroom aerators was the respondent had installed them yet (38%, n=29). Another 38% already had aerators installed in all possible locations (21%) or said the aerator did not fit (17%). Thirteen percent did not like some aerator features—either the design or function (10%) or the water pressure (3%). The remaining 10% had other reasons or did not clearly indicate their reasons. The great majority (90%) of bathroom aerators not installed were in storage.

Kit recipients expressed satisfaction levels with aerators similar to those of showerheads: 59% were very satisfied with the measure; and 27% were somewhat satisfied. Figure 23 shows satisfaction levels with each water measure.

Figure 23. Water Measure Satisfaction



Source: Rocky Mountain Power Idaho HES Residential Kit Survey (Appendix A) (QC4, QD4, QD12 2015–2016 and 2013–2014).

Customers found the kit application easy to fill out, with 76% of respondents reporting it very easy to fill out and 19% reporting it somewhat easy. Participants experiencing difficulty with filling out the application noted the following:

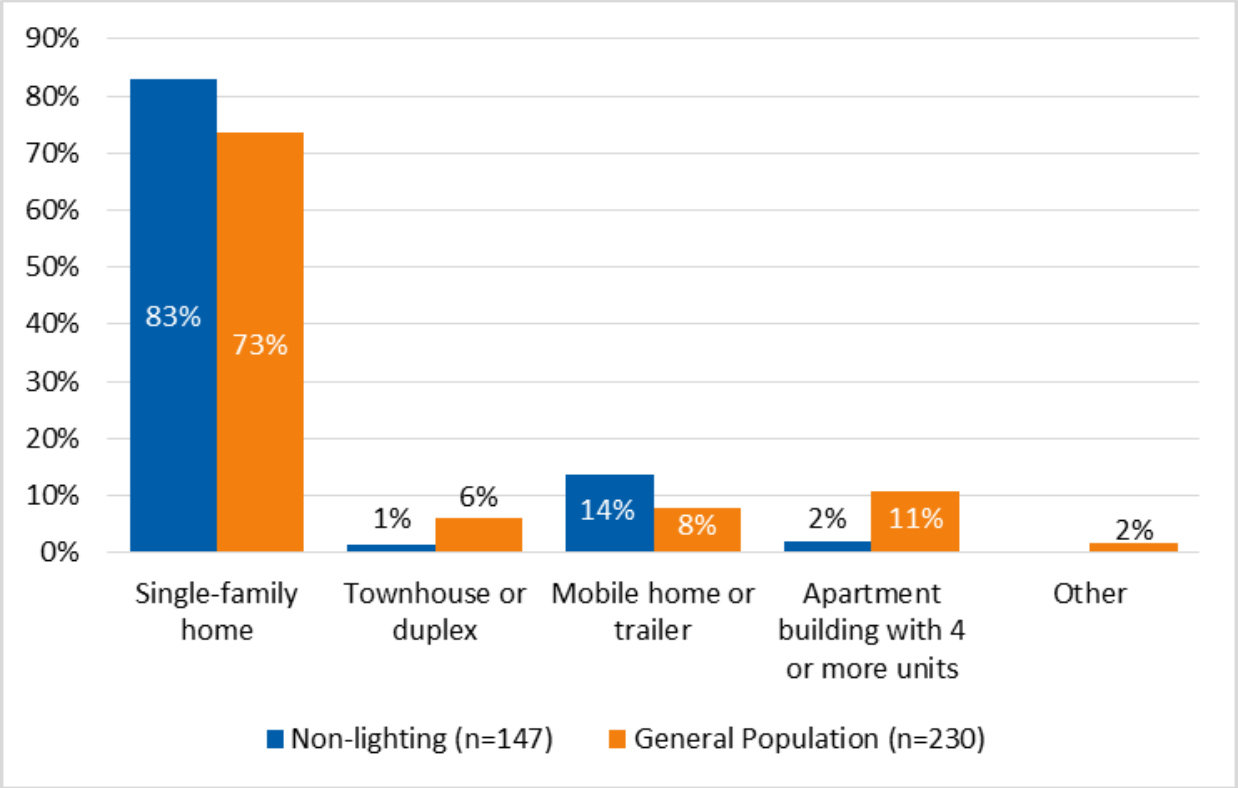
- "Wasn't working, wasn't as simple as it should be at the time."
- "My grandson took care of it for me."

Customer Demographics

Housing Characteristics

As shown in Figure 24, most general population and non-lighting participants surveyed lived in single-family homes, with a small percentage of customers residing in townhomes, mobile homes, apartments, or other home types.

Figure 24. General Population and Non-Lighting Residence Types

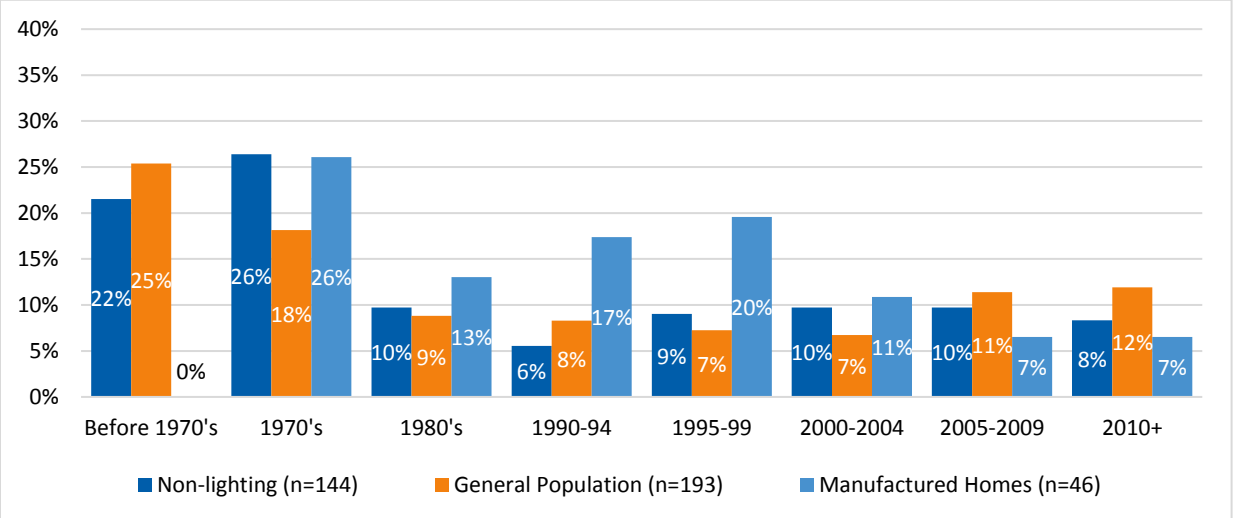


Source: Rocky Mountain Power Idaho HES Residential General Population and Non-lighting Surveys (Appendix A) (QG1 General Population, QH1 Non-lighting). Don't know and refused responses removed. Apartment buildings break down as follows: 4% were four units or less, 7% were five or more units.

In all survey groups, the majority of respondents were homeowners. Non-lighting participants had the highest homeownership rate at 95% (n=147), followed by manufactured homes respondents (84%, n=56), and the general population (77%, n=230). Nearly all manufactured home respondents had a home of 2,000 sq. ft. or less (91%, n=46), while 40% of non-lighting participants had homes over 2,500 sq. ft.

Figure 25 shows survey respondents in the general population and non-lighting groups reported similar home vintages for all vintage categories except the 1970s (which had significantly fewer general population responses than non-lighting responses). Manufactured home participants did not report pre-1970 vintage homes, compared to 22% and 25% of non-lighting and general population homes, respectively. Manufactured homes also were more likely than the other two groups to have been built in the 1990s, with 37% of manufactured homes falling in this category, compared to 15% of non-lighting and general population homes.

Figure 25. Non-Lighting, General Population, and Manufactured Home Age



Source: Rocky Mountain Power Idaho HES Residential General Population and Non-lighting and Manufactured Homes Participants Surveys (Appendix A) (QG3 General Population, QH4 Non-lighting, QG6 Manufactured Homes). Don't know and refused responses removed.

Fuel and Equipment Characteristics

All manufactured homes participants (100%, n=56) used electricity to heat their water, compared to 65% (n=132) of non-lighting participants and 48% (n=225) of the general population. Twenty-eight percent of non-lighting participants used natural gas to heat their water, as did 40% of the general population. The remainder of non-lighting and general population respondents used fuel oil, propane, or some other fuel.

Most general population customers used forced air (60%, n=214) or baseboard heating systems (17%), with the average age of all heating systems reported as 13.3 years. Most general population customers also used central air conditioning (32%) and/or room air conditioners (11%, n=217, multiple responses allowed), though 44% reported no cooling systems. Cooling systems averaged 7.8 years old across all cooling equipment types.

The majority of manufactured homes participants heated their homes with an electric furnace (92%, n=59), with an average age of all heating systems at 16.7 years. Window air conditioners were the most common form of cooling equipment in manufactured homes, used by 41% of respondents (n=59), followed by evaporative coolers, used by 10% of respondents. Thirty-four percent of respondents reported not having cooling equipment. Cooling systems averaged 5.7 years old.

During summer, manufactured home participants set their thermostats at an average of 69.0 degrees before duct sealing (n=26) and an average of 72.7 degrees after duct sealing (n=9). During winter, participants set their thermostats at an average of 69.5 degrees before duct sealing (n=56) and an average of 70.2 degrees after duct sealing (n=33).

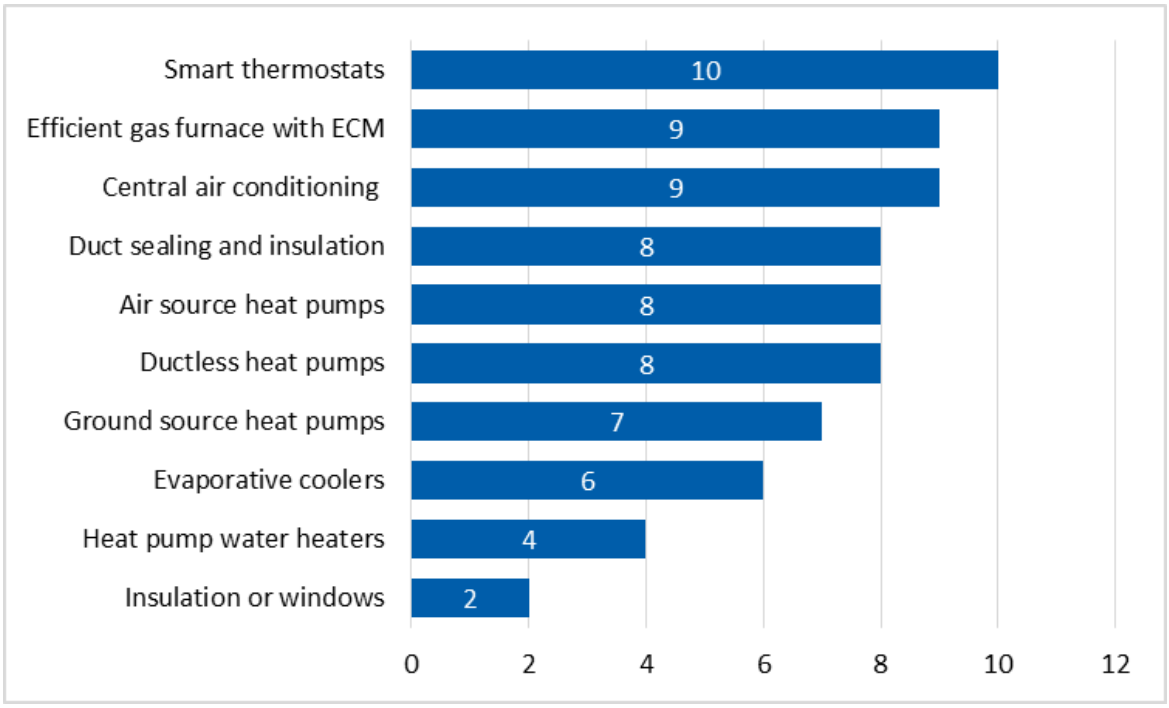
Heating and Cooling Contractors Response

Cadmus interviewed 10 HVAC trade allies that provided program-eligible equipment and services to Rocky Mountain Power's HES non-lighting participants during 2015 or 2016. These trade allies represented companies doing business for periods ranging from six to 125 years, with two to 50 employees.

Company Engagement with HES

The trade allies said their companies had been involved with the HES program ranging from less than six months to 10 years. They learned of the program in a variety of ways (e.g., contacted by a Rocky Mountain Power representative or e-mail; through customers wanting a program incentive; through DOE's website). Figure 26 illustrates the number of respondents installing program-eligible heating and cooling measures. Only two trade allies said they referred customers to another vendor when customers request equipment they do not install.

Figure 26. HES Eligible Equipment Installed by Surveyed Trade Allies



Source: Rocky Mountain Power Idaho HES Heating and Cooling Contractor Interviews (Appendix A) (QB5). (n=10)

Seven of 10 respondents received training through the HES program over the last three years, and found the PTCS certification, heat pump commissioning, and duct leakage testing very useful. One respondent considered the HVAC and lighting training somewhat useful. One trade ally completing an online tutorial did not find it very useful and asked for a better explanation of how to determine, via the website, which equipment qualified for the program. A trade ally that rated the PTCS training very useful also said the

training that allows contractors to become certified after only a one-half day class was insufficient to teach attendees everything they needed to know.

Customer Outreach and Marketing

Trade allies characterized customers purchasing high-efficiency equipment as follows:

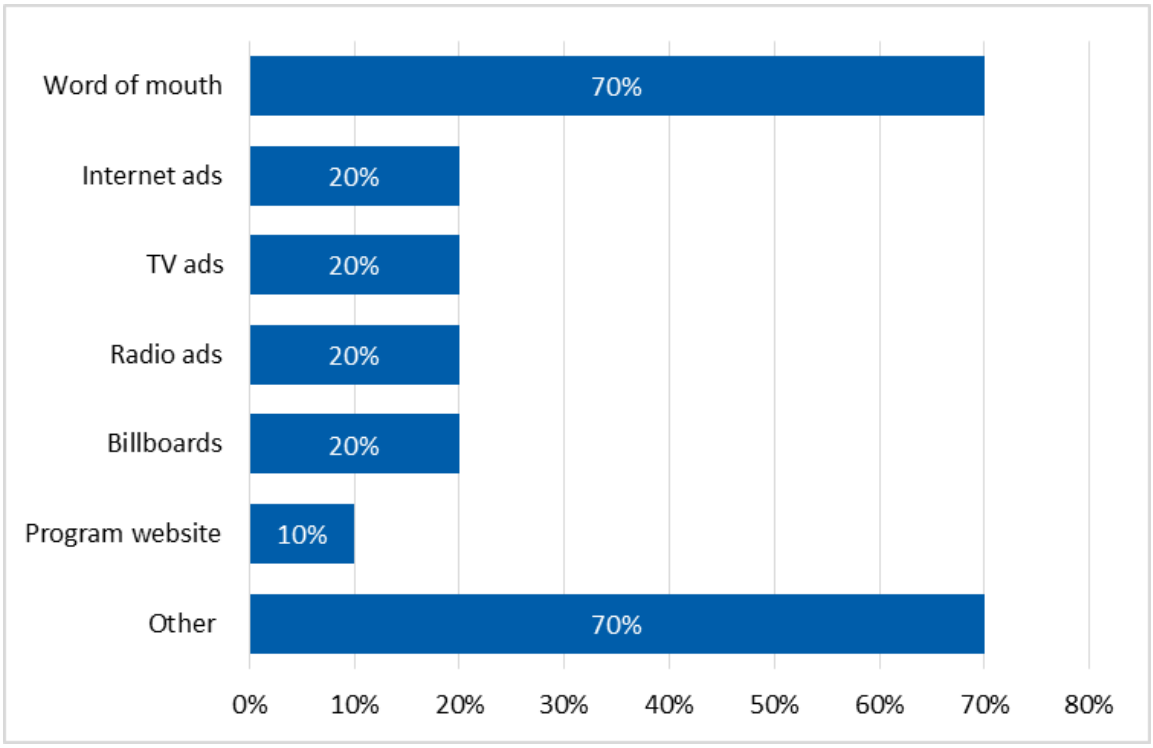
- Not price sensitive
- Wanting to save money and or energy (are "energy-wise")
- Building mid- to high-end custom homes
- Middle-aged; higher income

One trade ally said all customers would purchase high-efficiency equipment.

Trade allies overwhelmingly said customers learned about their businesses by word-of-mouth. As shown in Figure 27, customers also learned of trade allies through advertisements. The large "Other" category included the following:

- Leads provided by Rocky Mountain Power or CLEAResult
- Home Advisor (an online tool used to identify contractors)
- Advertisements placed on company trucks
- Trade shows
- Sponsorships at local schools

Figure 27. Ways Customers Learned about Trade Ally's Business



Source: Rocky Mountain Power Idaho HES Heating and Cooling Contractor Interviews (Appendix A) (QC1). Multiple responses allowed. (n=10)

The trade allies represented a mix or rural vs. urban customers. While five trade allies reported they served predominately rural customers, (70%–100% of their customer base), three served a mixed customer base (averaging 25%–50% rural), and two served predominately urban populations (0%–5% rural); the majority (7 of 10) said they did not promote the HES program differently to rural customers.

Eight trade allies said they promoted the HES program to their customers frequently or all of the time, during scheduled service calls to a customer's home, through outbound sales calls, when customers called their businesses, or via radio and print advertisements. Two of these trade allies noted that even though they promoted the program frequently, they did not promote it more as they were not confident about program details and eligibility qualifications. Those not promoting the program frequently cited the financial risk, paperwork, and time required to do so. Trade allies said Rocky Mountain Power could help them increase program awareness and activity among their customers through the following actions:

- Adopting a more "down-to-earth approach" for rural customers
- Providing more information about equipment eligible for incentives
- Incentivizing more geothermal equipment options
- Providing trade allies with more program information and program materials
- Simplifying the paperwork

One trade ally receiving lead lists from Rocky Mountain Power asked for a narrower selection, with fewer gas customers.

Three of 10 trade allies reported using HES program materials in marketing the program to their customers (e.g., incentive overview flier, incentive application, customized flier, trade ally logo), rating the materials as somewhat useful. Trade allies not using program materials said many of their customers did not qualify as resided outside of Rocky Mountain Power's territory or were building a new home. One trade ally had not seen any program materials. Trade allies suggested tailoring materials to low-income customers, educating customers about cost-savings benefits, and doing more to promote heat pumps directly to customers.

Application Process

A majority of the trade allies (six of nine) reported helping their customers complete the incentive application frequently or all the time. Three of these respondents reported encountering the following challenges:

- Unclear equipment eligibility requirements
- Numbers of supporting documents required (e.g., energy savings calculations, contractor invoices)
- Time required to complete the application

- Time waiting for incentive payments

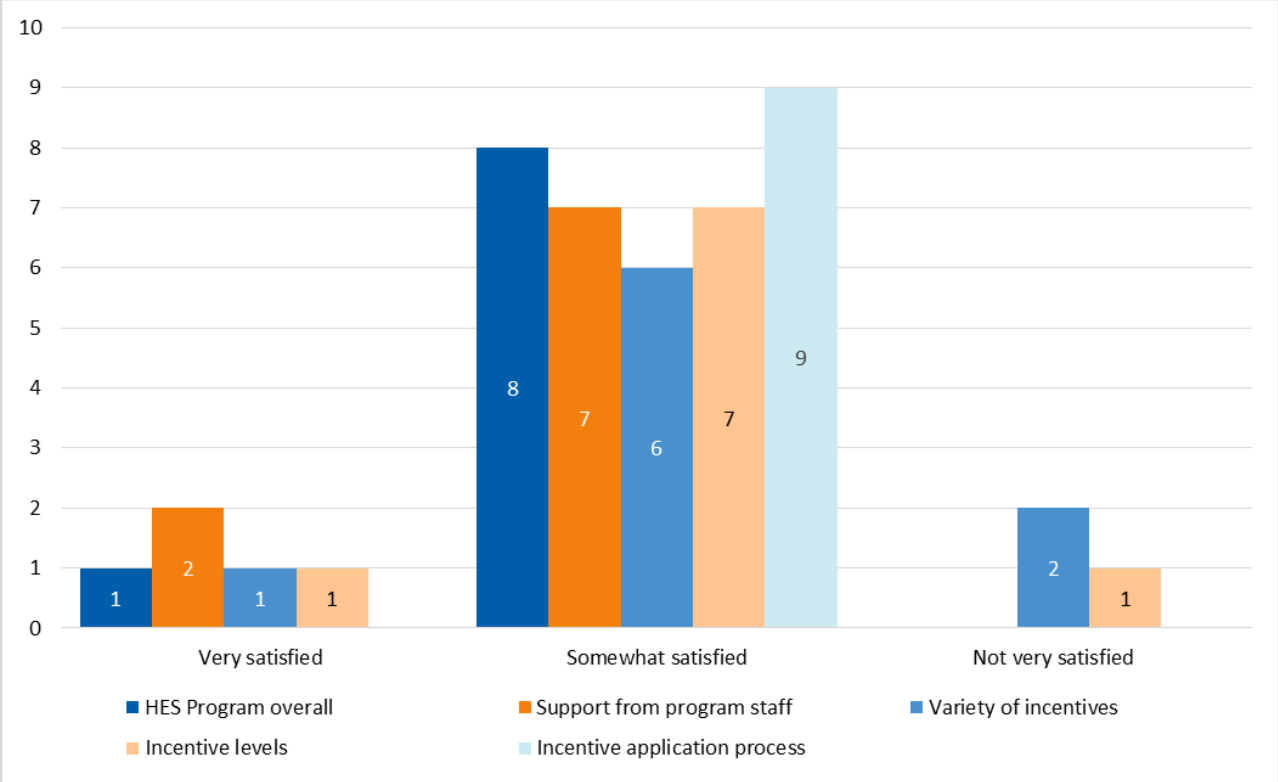
Seven trade allies reported using the online application form, with three very satisfied and four somewhat satisfied with the online form; one respondent suggested a simpler online form would be an improvement.

Trade Ally Satisfaction

Nine trade allies reported their satisfaction levels with five HES program aspects; eight reported being somewhat satisfied with the HES program overall, and one reported being very satisfied.

Trade allies reported mixed satisfaction levels for the remaining four program aspects; as illustrated in Figure 28, most reported they were somewhat satisfied.

Figure 28. Satisfaction with HES Program Aspects



Source: Rocky Mountain Power Idaho HES Heating and Cooling Contractor Interviews (Appendix A) (QE4, QE5, QE6, QE7 and QE8). (n=9 for each program aspect)

Trade allies reporting they were somewhat or not very satisfied provided further comment regarding program features with which they were less than very satisfied. These included requests for incentives on more equipment types, and higher incentives for geothermal equipment and central air conditioners. One respondent said: "Some of the [central air conditioning] incentives, like $75 cash back, are not worth the hassle of filing the paperwork."

Benchmarking

This section describes findings drawn from Cadmus' benchmarking review of comparable programs offered by utilities across the United States.

In conducting the benchmarking, Cadmus sought to achieve the following objectives:

- Establish consistent definitions of upstream, midstream, and downstream; so programs could be characterized consistently in these terms
- Collect information on specific residential programs of interest to Rocky Mountain Power; this research specifically focused on the following program and measure categories: lighting, non-lighting, and new construction

The main report presents findings at a high level. Appendix H. Benchmarking provides additional detail on programs, channels, and measures.

Definitions

As Rocky Mountain Power specifically expressed interest in delivery channels used to implement residential programs, Cadmus developed definitions of descriptive terms used consistently in this report to characterize program delivery.

Cadmus found a primary distinction between upstream, midstream, and downstream programs: whether a payment, made at some point in the supply chain, had to be passed through to the end customer. In practice, this meant midstream and upstream program participants only had to pay the measure price after applying discounts. In contrast, participants in downstream programs had to pay the full price of a measure, at which point they could apply for a rebate. If the program determined that they qualified, the rebate could be paid.

Cadmus summarizes these definitions as follows:

- **Upstream Programs**: implemented as agreements between the program and the product's manufacturers. Through these agreements, specific products (lighting for all instances Cadmus identified) are offered at reduced prices to distributors and retailers. The distributor or retailer must pass the entire product discount to buyers, resulting in target products offered at below-market prices. Cadmus notes that upstream programs typically do not enforce buyer requirements (e.g., use in a residence, use within the service territory). Consequently, product use outside of the service territory (i.e., leakage) and cross-sector sales (into nonresidential applications) raise concerns for upstream lighting programs. Such programs may offer compensation to distributors or retailers through Sales Performance Incentive Funds (SPIF) or bonuses.
- **Midstream Programs**: implemented as agreements between a program and a range of market intermediaries, including distributors, retailers, and contractors. As noted, midstream intermediaries must apply a defined rebate amount to the measure's retail price, and intermediaries may receive a separate SPIF or bonus for their program role. Unlike upstream

programs, however, midstream programs sometimes enforce program requirements (e.g., use of the measure in a residence, use of the measure in the service territory), reducing the potential for leakage or cross-sector participation. Midstream program examples include those allowing retailers to offer instant rebates on home appliances and those allowing HVAC installers to offer discounted prices that target high-efficiency equipment.

- **Downstream Programs:** offered on targeted products after purchase. When the buyer applies for the rebate, the program verifies that the intended use meets program requirements, sometimes even including verification that the buyer has a gas or electric account with a sponsoring utility.

Cadmus notes that midstream programs offer an advantage in enabling program administrators to wield greater influence on products stocked by distributors, retailers, and contractors than downstream programs. This factor often proves important as programs work to support adoption of new technologies (e.g., heat pump clothes dryers in markets where products would otherwise not be available or recommended by installers).

Further, for new home programs, the homebuilder serves as the primary participant. As the builder retains the incentive payment (i.e., no adjustment to home price required), these meet Cadmus' definitions for downstream programs.

Upstream: Lighting

Cadmus reviewed residential lighting programs offered by four other utilities, comparing these to Rocky Mountain Power's program, as shown in Table 71.

Table 71. Summary of Upstream Lighting Programs

Utility/PA, State	Administrator	Measures	Program Year	Measure Quantity	Net MWh[1]	kWh/ Measure[2]
Rocky Mountain Power, ID	CLEAResult	CFLs, LEDs, Fixtures	2015–2016	137,152	898	6.5
Ameren, MO	ICF	LEDs	2016	917,013	24,418	27
EmPOWER, MD	ICF, Honeywell	CFLs, LEDs, Fixtures	1/1/2016–5/31/2016	2,442,683	47,519	20
Salt River Project, AZ	SRP	CFLs	6/1/2016–5/31/2017	693,595	30,488	44
PPL, PA	Ecova	LEDs	6/1/2015–5/31/2016	1,419,223	39,278	28

[1]Net MWh—values determined by evaluators—derived from final evaluation reports.

[2]Differences in net kWh per measure between HES and other benchmarked programs is due to variance in engineering algorithm inputs (such as ISR, HOU, WHF, and NTG) in each evaluation. See Appendix H. Benchmarking for more detail.

Program administrators expected savings could be substantially affected when second lighting standard tiers (included in EISA) become effective.

Midstream and Downstream: Non-lighting

Cadmus reviewed residential programs focused on measures other than lighting, as offered by four other utilities and the Energy Trust of Oregon. Table 72 summarizes these programs' key aspects.

Table 72. Summary of Midstream and Downstream Non-Lighting Programs

Utility/PA, State	Year	Measures	Delivery Notes
Ameren, MO	2016	HPWHs, Room ACs, Room Air Purifiers, Pool Pumps, Smart T-stats	**Downstream:** Participants receive rebates by mail after application approval
EmPOWER, MD	1/1/16–5/31/16	Clothes W+D, Pool Pump, Refrigerators, HPWHs AS/GS Heat pumps, Central ACs, Furnaces	**Downstream/Midstream Mix:** Retail locations are the primary channel for HPWHs, and pool pumps are available from trade allies (instant rebates to customers)
PPL, PA	PY7	Refrigerators, HPWHs, Efficient WHs	**Downstream:** Participants receive rebates by mail after approval of their applications
PSE, WA	2013–2015	APS, Refrigerators, Clothes W+D, Smart T-stats, Energy Reports, Insulation, Air/Duct Sealing, Heat System	**Downstream/Midstream Mix** (single-family, multifamily up to four units): Low-income weatherization; direct-install downstream rebates; midstream rebates through retailers and contractors
Energy Trust, OR	2015	Smart T-stats, Energy Reports, Kits, Heat Pumps, Pool pumps, HPWHs Insulation, Air/Duct Sealing	**Downstream/Midstream Mix:** Recent effort to increase midstream engagement (distributor SPIFs, information sessions); instant incentives through trade allies; specialized offers for moderate-income rental properties

New Construction Programs

Cadmus reviewed residential new construction programs offered by three other utilities and a similar program offered by the Energy Trust of Oregon, with key program aspects summarized in Table 73.

Note that, due to relatively small new construction volumes in Idaho, Rocky Mountain Power does not operate a dedicated new construction program in this service territory. Instead, the HES program offers a whole-home performance measure.

Table 73. Summary of New Construction Programs

Utility/PA, State	Admin.	Measure(s)	Program Year	Homes	Gross MWh[1]	kWh/ Home[1]	Notes
SRP, AZ	SRP	ES V3	FY17	6,613	32,079	4,851	ENERGY STAR Homes have over a 70% market share in the Phoenix area
EmPOWER, MD	ICF	ES V3.1 guidelines; at least 90% of lamps use CFLs, LEDs	1/1/2016–5/31/2016	1,987	4,061	2,044	New single-family homes account for most program savings (53% of total), followed by new townhomes, accounting for 30% of the total
Focus On Energy, WI[2]	WECC	Level 1 15% above code Level 2 25% Level 3 35% Level 4 45%	2016	2,400	4,735	1,973	Distribution of homes completed in 2016: Level 1: 18% Level 2: 62% Level 3: 15%
Energy Trust, OR	CLEAResult	Energy Trust developed the performance-based EPS track in 2008, in response to a more stringent state building code	2015	4,192	3,420	816	The program continues to perform well, with the market share of program homes in Oregon increasing from 21% in 2013 to 36% in 2015; the program attained its electric and gas savings goals for both 2014 and 2015

[1] Gross MWh—values determined by evaluators—derived from final evaluation reports and were used to calculate kWh/home.

[2] Measures shown for the Focus On Energy program reflect a 5% increase in efficiency for all tiers (implemented in 2016). The program is currently being redesigned, with updates to be introduced in October 2017. No verified net savings were attributed to this program in PY 2016.

ENERGY STAR certification alone did not ensure savings. A recent evaluation of an ENERGY STAR homes program offered by Wisconsin's Focus on Energy did not achieve electric savings and achieved only small gas savings. Consequently, Focus on Energy is redesigning the program to incent construction to energy neutral with varying levels of percent better than code. This approach is expected to deliver greater savings while pushing the residential construction market towards more efficient building strategies.

Generally, program participation depends on factors more likely to occur in urban areas (e.g., the presence of high-volume "production" builders, access to an efficiency raters pool, available inventories of efficient equipment, and subcontractors—such as HVAC technicians, insulation specialists, electricians, and plumbers—skilled in efficient home construction).

The Energy Trust of Oregon's 2014–2015 process evaluation specifically discussed challenges facing program participation in rural eastern Oregon. Cadmus notes that similar challenges constrain participation in new home programs within Rocky Mountain Power's Idaho territory. As discussed, Rocky Mountain Power offers new construction measures through the HES program within this service territory.

Cost-Effectiveness

In assessing HES program cost-effectiveness, Cadmus analyzed program benefits and costs from five different perspectives, using Cadmus' DSM Portfolio Pro model.[42] 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. 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 74 summarizes the five tests' components.

[42] 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 74. 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 75 provides selected cost-analysis inputs for each year, including evaluated energy savings, discount rated, line losses, inflation rates, and total program costs.

Table 75. Selected Cost Analysis Inputs

Input Description	2015	2016	Total
Evaluated Gross Energy Savings (kWh/year)[1]	2,873,324	1,140,037	4,013,361
Discount Rate	6.66%	6.66%	N/A
Line Loss	11.47%	11.47%	N/A
Inflation Rate[2]	1.9%	1.9%	N/A
Total Program Costs	**$694,685**	**$598,377**	**1,293,062**

[1] Savings are realized at the meter, while benefits account for line loss.

[2] 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 the study's evaluated energy savings and measure lives from sources such as the RTF.[43] For all analyses, Cadmus used avoided costs associated with Rocky Mountain Power's 2015 *IRP Eastside Decrement Values*.[44]

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

Table 76 presents the 2015–2016 program cost-effectiveness analysis results, including the evaluated NTG (but not accounting for non-energy impacts [except those represented by the 10% conservation

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

[44] PacifiCorp's *Class 2 DSM Decrement Study* details the IRP decrements. August 8, 2015. Available online: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2015/2015_Class_2_DSM_Decrement_Study.pdf

adder included in the PTRC]). For this scenario, the HES program only proved cost effective from the PCT perspective. The TRC served as the primary criterion for assessing cost-effectiveness in Idaho, which had a 0.92 benefit-cost ratio for the combined years' net savings.

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

Table 76. HES Program Cost-Effectiveness Summary for 2015–2016 Net (Excluding Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.061	$1,552,801	$1,572,704	$19,903	1.01
TRC No Adder	$0.061	$1,552,801	$1,429,731	($123,070)	0.92
UCT	$0.050	$1,255,699	$1,429,731	$174,032	1.14
RIM		$3,897,010	$1,429,731	($2,467,279)	0.37
PCT		$1,214,016	$3,826,652	$2,612,636	3.15
Lifecycle Revenue Impacts ($/kWh)					$0.000047076
Discounted Participant Payback (years)					2.03

Table 77 presents the 2015 program cost-effectiveness analysis results, including the evaluated NTG, but not accounting for non-energy impacts (except those represented by the 10% conservation adder included in the PTRC). For this scenario, the HES program proved cost-effective from all test perspectives except for the RIM test.

Table 77. HES Program Cost-Effectiveness Summary for 2015 Net (Excluding Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.051	$861,127	$1,016,057	$154,930	1.18
TRC No Adder	$0.051	$861,127	$923,689	$62,561	1.07
UCT	$0.041	$694,685	$923,689	$229,004	1.33
RIM		$2,441,917	$923,689	($1,518,228)	0.38
PCT		$738,380	$2,528,875	$1,790,494	3.42
Lifecycle Revenue Impacts ($/kWh)					$0.000030483
Discounted Participant Payback (years)					1.42

Table 78 presents the 2016 program cost-effectiveness analysis results, including evaluated NTG, but not accounting for non-energy impacts (except those represented by the 10% conservation adder included in the PTRC). For this scenario the HES program proved cost-effective only from the PCT perspective.

Table 78. HES Program Cost-Effectiveness Summary for 2016 Net (Excluding Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.084	$737,739	$593,719	($144,020)	0.80
TRC No Adder	$0.084	$737,739	$539,744	($197,995)	0.73
UCT	$0.068	$598,377	$539,744	($58,633)	0.90
RIM		$1,552,003	$539,744	($1,012,258)	0.35
PCT		$507,313	$1,384,209	$876,896	2.73
Lifecycle Revenue Impacts ($/kWh)	$0.000019373				
Discounted Participant Payback (years)	2.68				

Table 79 provides the annual program non-energy impacts from the appliance, lighting, and kit product categories.

Table 79. HES Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted	Net Energy Benefits	Source
Clothes Washer - 2015	$3,104.26	PTRC, TRC, PCT	Water, Detergent, and Sewer	Idaho TRL
Kits – 2015	$56,281.71	PTRC, TRC, PCT	O&M	Idaho TRL
Light Bulbs – CFL - 2015	$36,892.46	PTRC, TRC, PCT	O&M	Idaho TRL
Light Bulbs – LED - 2015	$9,893.29	PTRC, TRC, PCT	O&M	Idaho TRL
Clothes Washer - 2016	$1,818.75	PTRC, TRC, PCT	Water, Detergent, and Sewer	Idaho TRL
Kits – 2016	$10,193.03	PTRC, TRC, PCT	O&M	Idaho TRL
Light Bulbs – CFL - 2016	$4,078.06	PTRC, TRC, PCT	O&M	Idaho TRL
Light Bulbs – LED - 2016	$8,244.41	PTRC, TRC, PCT	O&M	Idaho TRL

Table 80 presents the 2015–2016 program cost-effectiveness analysis results, including the evaluated NTG and accounting for non-energy impacts. For this scenario, the HES program proved cost-effective from all perspectives, except the RIM and UCT tests, and achieved a 1.47 benefit-cost ratio for the combined years' net savings TRC test.

Table 80. HES Program Cost-Effectiveness Summary for 2015–2016 Net (Including Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.061	$1,552,801	$2,429,425	$876,623	1.56
TRC No Adder	$0.061	$1,552,801	$2,286,452	$733,650	1.47
UCT	$0.050	$1,255,699	$1,429,731	$174,032	1.14
RIM		$3,897,010	$1,429,731	($2,467,279)	0.37
PCT		$1,214,016	$5,115,120	$3,901,104	4.21
Lifecycle Revenue Impacts ($/kWh)	$0.000047076				
Discounted Participant Payback (years)	1.57				

Table 81 presents the 2015 program cost-effectiveness analysis results, including the evaluated NTG and accounting for non-energy impacts. For this scenario, the HES program proved cost-effective from all perspectives except for RIM.

Table 81. HES Program Cost-Effectiveness Summary for 2015 Net (Including Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.051	$861,127	$1,700,860	$839,733	1.98
TRC No Adder	$0.051	$861,127	$1,608,492	$747,364	1.87
UCT	$0.041	$694,685	$923,689	$229,004	1.33
RIM		$2,441,917	$923,689	($1,518,228)	0.38
PCT		$738,380	$3,495,662	$2,757,281	4.73
Lifecycle Revenue Impacts ($/kWh)					$0.000030483
Discounted Participant Payback (years)					0.92

Table 82 presents the 2016 program cost-effectiveness analysis results, including evaluated NTG and accounting for non-energy impacts. For this scenario the HES program only proved cost effective from the PTRC and PCT perspectives.

Table 82. HES Program Cost-Effectiveness Summary for 2016 Net (Including Non-Energy Impacts)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.084	$737,739	$777,087	$39,347	1.05
TRC No Adder	$0.084	$737,739	$723,112	($14,627)	0.98
UCT	$0.068	$598,377	$539,744	($58,633)	0.90
RIM		$1,552,003	$539,744	($1,012,258)	0.35
PCT		$507,313	$1,727,314	$1,220,002	3.40
Lifecycle Revenue Impacts ($/kWh)					$0.000019373
Discounted Participant Payback (years)					1.90

Conclusions and Recommendations

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

- ***watt*smart Kit Participant Phone Numbers:** As the ***watt***smart kit measure administrator did not collect kit participant phone numbers or e-mail addresses, Rocky Mountain Power filled in available data using its own customer database. While a small detail in operating the program efficiently, this created additional strain on evaluation efforts and on Rocky Mountain Power to update program administrator data with kit participants' phone numbers.

  Recommendation: Require that ***watt***smart kit program administrators collect kit participant phone numbers and e-mail addresses for kit program survey data collection activities. *[As of October 2017, the program administrator reported that customer e-mail addresses and phone numbers were mandatory online field entries for customers applying for kits.]*

- **Upstream Lighting Point-of-Sale Merchandizing Data:** Program tracking data did not include complete information about high-visibility product placements or merchandising within retail locations (only the second half of 2016 and only one retailer). Though decreasing the price of efficient lighting products primarily drives sales, merchandising also can generate substantial sales lift. Without complete data, Cadmus cannot attribute merchandizing's effect on the program.

  Recommendation: Track dates and locations for the program's merchandising and product placements. Providing model numbers, store locations, dates, and display types (e.g., end caps, pallet displays) allows more precise estimates of program-generated sales lift.

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. Logic Model

Appendix G. Measure Category Cost-Effectiveness

Appendix H. Benchmarking

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Appendix A. Survey Instruments and Data Collection Tools

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CADMUS

PacifiCorp HES Program Management Interview Guide
PY 2015-2016

Name:

Title:

Interviewer:

Date of Interview:

Introduction

The purpose of the interview is to collect background and insight on the design and implementation of the HES program, from your perspective. We will use input from a variety of staff involved with the program to describe how the program worked during 2015 and 2016, 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. How long have you been involved?
2. Who are the other key PacifiCorp staff involved in the 2015 and 2016 program period and what are their roles?

Program Goal and Objectives:

3. How would you describe the main objective of the 2015 and 2016 HES Program?
4. In general, how did the program perform in 2015 and 2016, relative to what you expected? Did any measure not meet, or exceed, participation targets? If appropriate, please review state by state.
5. 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)?

Program Design:

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

6. Were there any major changes in program design in 2015 and 2016 relative to 2013 and 2014? For example, with regard to eligible measures, eligible customers, delivery channel, or other aspects of program design? [For each change: what led to the change? Was the objective of the change realized, in your opinion? Verify the following are discussed:
    a. Upstream
        i. Adding LEDs/reducing CFLs
        ii. Adding APS
    b. Rebates
        i. Eliminating lighting fixtures
        ii. Changes to clothes washers, other appliances]
7. How did the program differ among the five states in 2015 - 2016?
8. According to staff interviews in 2014, the HES program is designed to deliver prescriptive efficiency measures across residential market segments, which might include low- and standard income, rural and urban, etc. How did the program target different segments within the residential market in 2015 - 2016?
    a. How has the program's approach to serving multifamily customers changed over the past two years, if at all?
    b. How has the program's approach to serving the new single family homes market changed over the past two years, if at all?
9. [If not answered above] In 2013-2014, the program introduced kits and Simple Steps retailer participation for lighting. How did these initiatives perform in 2015-2016?
10. What do you think are the program's most notable successes in the 2015-2016 period?
11. Conversely, what aspects of the program do you think did not work as well as anticipated?
12. What barriers or challenges did the program face in 2015-2016? What was done/what is planned to address them?
13. Could you describe [PacifiCorp's/CLEAResult's] QA/QC processes in 2015-2016? [Probe: what are PC/CLEAResults methods for validating Trade Ally workmanship, verifying rebate application information, review of program data tracking, or other QC?]

14. Now I would like to know about any changes you anticipate for the 2017-18 cycle. Let's start with eligible measures. What measures do you think you might add to the program, or expand to new states? What measures might be eliminated, or pulled out of certain states? Are there any measures that you are planning to research for possible inclusion in the future?
15. Are there any other changes you anticipate for 2017-18? These might include changes to rules for participating retailers or trade allies, changes to application forms or processing, or new marketing approaches.

Program Marketing

These next questions will go into more detail on particular aspects of program implementation, starting with marketing.

16. Do you have a marketing plan from 2015-2016 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 ***watt***smart vs program specific (HES)?
    d. Is marketing targeted to specific segments of the population? If so, how is it tailored to different groups?
17. Did any of the marketing in 2015-2016 represent a change from previous years? Which strategies were new, and why did you adopt those new strategies?
18. Did you track marketing effectiveness? What did you track?
    a. What was the most effective marketing channel? (Why do you say this?)
    b. What do you think is the most important messaging, by retail channel?

Customer Experience

Thank you. Next I'd like to learn more about the customer's experience, and how you monitor that.

19. Do 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? Feedback may come through exit surveys, call center reports, or other channels.)

20. What feedback did you receive from customers about the program? (Probe: incentive levels, timing for project approvals, incentive payments, satisfaction with studies, trade allies, etc.)
21. What are the most common questions you get from customers about the program?
22. What do you think participants are most pleased with, in terms of their experience with the program?
23. What do you think they are least please with? Why do you say that?
24. Do you monitor customer satisfaction ratings by contractor?
25. Please describe the process to complete, submit, correct and approve a rebate application. (Probe: responsible party, method of submittal, check recipient.)
26. Were any changes made to the rebate application forms in 2015 or 2016? (Note: recommendations from last evaluation included reviewing applications for duct sealing and insulation applications for opportunities to streamline, and offering additional training for contractors to mitigate data entry error issues (UT 2013-14 Report))
27. Does CLEAResult have a target application processing time? What is the average time to process an application?
28. Are you aware of any common application errors, or parts of the application that customers have difficulty completing?
29. Do you track the rate of application errors? Have you noticed any change in the number of customer or contractor errors on rebate applications since 2014?

Trade Ally Experience

Now I'd like to discuss Trade Allies.

30. Please tell me about how the program works with trade allies. What are trade ally roles and responsibilities with regard to the program?
31. How many trade allies participated in the program, by state? (I can follow up later for the exact figures.) Was this more or fewer than the 2013-14 cycle?
32. How did the program recruit trade allies (contractors and retailers)? [Probe: program staff have indicated that it has been difficult to recruit trade allies this year.]
33. Do you feel you had sufficient trade allies to support the program? Why or why not?

34. What barriers have the trade allies said they encounter with the program, if any?
    a. How has the program addressed these barriers?
35. What kind of training was required and/or offered for trade allies? How frequently and on what topics? How was training distributed across states?
36. What marketing resources or sales training id the program provide to trade allies?
37.

Data Tracking and Savings

These last questions ask about data tracking activities.

38. Please tell us about program data tracking for each channel: upstream, rebates, and kits.
39. Did the data tracking systems in place meet your needs? Why or why not?
40. How do PacifiCorp program staff receive tracking data during the year? Does CLEAResult send reports, or do they have access to real-time data, such as through an online portal?
41. How do PacifiCorp and CLEAResult Program staff monitor progress against savings goals? (Probe: how often is progress reviewed? Is it reviewed at the measure level, or channel level? Is it reviewed in the same manner for all states?)
42. How were savings deemed for each program measure? How often were the unit energy savings values updated in the tracking data?]

Closing

43. Cadmus has budgeted for benchmarking research for the 2015-2016 process evaluation. We would like to know what aspects of program design or performance you would be interested in comparing to other programs around the country. Typically, this might include participation level, incentive levels, comparison of eligible measures, or other aspects of program design or performance.
44. Are there other topics you are interested in learning more about from our evaluation this year?

Thank you very much for your time today!

PacifiCorp Home Energy Savings *watt*smart Starter Kit Survey (2016 Participants)

*Audience: This survey is designed for PacifiCorp residential customers in Idaho, Utah, California, Wyoming and Washington who received energy efficiency kits through HES in 2016. The primary purpose of this survey is to collect information on receipt of the kit, installation and satisfaction of kit items, **watt**smart/Homes Energy Savings Program awareness and satisfaction. This survey will be administered through telephone calls.*

Quota: 35 completed surveys for CFLs and 35 for LEDs for each state (ID, UT, CA, WY and WA) (350 total)

Topics	Researchable Questions	Survey Questions
Receipt of kit	Did the customer receive (or recall receiving) the ***watt***smart 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, D3, D9D11
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,D2, D3
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,D4-D5,E1-E4,E10
Program awareness	How did the customer hear about the ***watt***smart Home Energy Savings Starter Kit? Are kit recipients familiar with Home Energy Savings program (Home Energy Savings)? Have they received other incentives from ***watt***smart?	E5, E6, E7
NTG	What is the freeridership and spillover associated with this program.	B8-B14, B23-B26, C6-C8, D6-D8, D14-D16, 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, California: Pacific Power

Idaho, Utah, Wyoming: Rocky Mountain Power

[KIT TYPE]

Kit Name	Kit Type	Quantity CFLs	Quantity LEDs	Quantity Kitchen Aerators	Quantity Bath Aerators	Quantity Showerheads	Cost of Kit
Basic 1	1	4	0	1	1	1	$0
Basic 2	2	4	0	1	2	2	$0
Better 1	3	4	0	1	1	1	$4.99
Better 2	4	4	0	1	2	2	$4.99
Best 1	5	0	4	1	1	1	$4.99
Best 2	6	0	4	1	2	2	$4.99
CFL Only	7	4	0	0	0	0	$0
LED Only	8	0	4	0	0	0	$4.99

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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 *WATT*SMART 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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"]***

2. Yes
3. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**
98. Don't Know
99. Refused

A6b. One kitchen faucet aerator

4. Yes
5. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**
98. Don't Know
99. Refused

A6c. **[BATHROOM FAUCET AERATOR QUANTITY]** bathroom faucet aerator(s)

6. Yes
7. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**
98. Don't Know
99. Refused

A6d. **[SHOWERHEAD QUANTITY]** showerhead (s)

8. Yes
9. 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= 7 AND A5=1] OR [KIT TYPE=8 AND A5=2 AND CORRECTED BULB TYPE IS CFL] OR [KIT TYPE = 1-4 AND A6A=1] OR [KIT TYPE= 5-6 AND A6A=2 AND CORRECTED BULB TYPE IS CFL] OTHERWISE SKIP TO B15]

[IF [A5 = 98 OR 99] OR [A6.A6A = 98 OR 99] OR [IF A6.A6A = 2 AND THE CORRECTED QUANTITY IS ZERO] OR [A5=2 AND THE CORRECTED QUANTITY IS 0] THEN SKIP TO SECTION C]

B1. Of the ***[CORRECTED CFL QUANTITY]*** 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 ***[[CORRECTED CFL QUANTITY]-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 [CORRECTED CFL QUANTITY] -B1.1– B2.1>0 (CONTINUE)]

B4. Why wasn't/weren't the ***[QUANTITY NEVER INSTALLED: [CORRECTED CFL QUANTITY]-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 ***watt***smart 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. **[ASK IF KIT TYPE = 7]** Were you aware of the option to upgrade your kit from CFLs to LED bulbs for $4.99?

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 $4.99, 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 =8 AND A5=1] OR [KIT TYPE=7 AND A5=2 AND CORRECTED BULB TYPE IS LED] OR [KIT TYPE = 1-4 AND A6A=2 AND CORRECTED BULB TYPE IS LED] OR [KIT TYPE = 5-6 AND A6A=1] OTHERWISE SKIP TO SECTION C]

B15. Of the ***[CORRECTED LED QUANTITY]*** 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 ***[[CORRECTED LED QUANTITY]-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 [corrected led quantity] - B15.1- B16 >0 (CONTINUE)]

B18. Why wasn't/weren't the ***[QUANTITY NEVER INSTALLED: [CORRECTED LED QUANTITY] - 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 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 , 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 CAND D IF KIT TYPE = 1-6, OTHERWISE SKIP TO SECTION E]

C. High-Efficiency Showerheads

[IF A6D= 98 OR 99, OR IF A6D = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO SECTION D]

C1. How many of the ***[CORRECTED SHOWERHEAD QUANTITY]*** high-efficiency showerhead(s) you received are currently installed in your home?

1. Record _____ ***[IF RESPONSE = CORRECTED SHOWERHEAD QUANTITY, SKIP TO C4]***
98. Don't know ***[SKIP TO C5]***

C2. Why is/are the ***[CORRECTED SHOWERHEAD QUANTITY - INSERT C1.1 QUANTITY]*** high-efficiency showerhead(s) not currently installed?? **[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

[IF A6B = 98 OR 99, OR IF A6B = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO D9]

D1. Is the kitchen faucet aerator you received in the kit currently installed in your home?

1. Yes ***[SKIP TO D4]***
2. No ***[CONTINUE]***
98. Don't know ***[SKIP TO D5]***

D2. 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

D3. 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

D4. 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

D5. **[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

D6. 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)

D7. 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)

D8. **[ASK IF D7 = 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)

[IF A6C = 98 OR 99, OR IF A6C = 2 AND THE CORRECTED QUANTITY IS ZERO THEN SKIP TO SECTION E]

D9. How many of the ***[CORRECTED BATHROOM FAUCET AERATOR QUANTITY]*** bathroom faucet aerator(s) you received are currently installed in your home?

1. Record_____ ***[IF RESPONSE = CORRECTED BATHROOM FAUCET AERATOR QUANTITY, SKIP TO D12***
98. Don't know ***[SKIP TO D13]***

D10. Why is/are the ***[CORRECTED BATHROOM FAUCET AERATOR QUANTITY]*** bathroom faucet aerator(s) not currently installed? **[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

D11. 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

D12. 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

D13. **[IF D9.1 = 0 OR D9= 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

D14. 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)

D15. 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)

D16. **[ASK IF D15 = 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 ***watt***smart 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 watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart Home Energy Savings Program
16. Other **[RECORD]**
98. Don't Know
99. Refused

F. Spillover

F1. Since receiving the ***watt***smart Home Energy Savings Starter Kit have you added any other energy efficient equipment or services in your home that were not incentivized through the ***watt***smart 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 receiving the Kit? ***[IF NEEDED: WE ARE INTERESTED IN KNOWING ABOUT ANY EQUIPMENT OR SERVICES YOU ADDED TO YOUR HOME, BESIDES THOSE INCLUDED IN THE KIT, FOR WHICH YOU DID NOT RECEIVE AN INCENTIVE THROUGH THE WATTSMART HOME ENERGY SAVINGS PROGRAM. PROMPT IF NEEDED] MULTIPLE RESPONSE***

1. Clothes Washer **[RECORD QUANTITY]**
2. Refrigerator **[RECORD QUANTITY]**
3. Dishwasher **[RECORD QUANTITY]**
4. Windows **[RECORD QUANTITY IN SQ FT]**
5. Light 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. LED bulbs **[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 = 19 (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. 2015
2. 2016
4 2017
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 ***watt***smart 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 **[IF KIT TYPE = 1-6, ASK "ARE YOU AWARE THAT YOU HAVE TO HAVE AN ELECTRIC WATER TO RECEIVE ANY FAUCET AERATORS OR SHOWERHEADS?" (RESPONSE OPEN END)]**
3. Fuel oil **[IF KIT TYPE = 1-6, ASK "ARE YOU AWARE THAT YOU HAVE TO HAVE AN ELECTRIC WATER TO RECEIVE ANY FAUCET AERATORS OR SHOWERHEADS?" (RESPONSES OPEN END)]**
4. Other **[OPEN ENDED, WRITE RESPONSE] [IF KIT TYPE = 1-6, ASK "ARE YOU AWARE THAT YOU HAVE TO HAVE AN ELECTRIC WATER TO RECEIVE ANY FAUCET AERATORS OR SHOWERHEADS?" (RESPONSE OPEN END)]**

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

PacifiCorp Manufactured Homes Duct Sealing 15-16 Participant Survey

Audience: This survey is designed for PacifiCorp residential customers in California, Idaho, and Washington that participated in the manufactured homes duct sealing offer in 2016.

Purpose: this survey will collect information on HES program awareness, motivations to participate, satisfaction, freeridership and spillover effects. This survey will be administered through telephone calls.

Quota: Aim for the following number of completed surveys for each state (CA, ID, and WA)

	Sample (survey quota)
CA	15
ID	59
WA	15

Topics	Researchable Questions	Survey Questions
Program Awareness and Participation Decisions	How did the customer learn about the duct sealing retrofit measure? What role did the website play in informing the customer? Why did the customer choose to participate?	Section B
Behavioral Changes	Has customer heating or cooling behavior changed since the duct sealing? Has the customer noticed a difference in home comfort?	Section C
Satisfaction	With the contractor? With the process to sign up and time it took to complete the work? With the offer overall?	Section D
Net-to-Gross	Self-reported freeridership and spillover	Section E and Section F
Demographics	Customer household information for statistical purposes	Section G

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

[UTILITY]
Washington and California: Pacific Power

Idaho: Rocky Mountain Power

[YEAR OF PARTICIPATION]

[SITE ADDRESS]

A. Introduction

A1. **[TO RESPONDENT]** Hello, I'm ***[INSERT FIRST NAME]*** and I am calling from ***[INSERT SURVEY FIRM]*** on behalf of ***[INSERT UTILITY].*** We are exploring the impacts of ***[INSERT UTILITY]'S*** energy efficiency improvement offerings in your area. I would like to ask you some questions about your recent participation in the duct sealing offer from ***[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 DUCT SEALING OFFER 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 THE FREE DUCT SEALING THAT YOU RECEIVED.

(SALES CONCERN: I AM NOT SELLING ANYTHING; WE WOULD SIMPLY LIKE TO LEARN ABOUT YOUR EXPERIENCE WITH THE PROGRAM. YOUR RESPONSES WILL BE KEPT CONFIDENTIAL. IF YOU WOULD LIKE TO TALK WITH SOMEONE FROM THE WATTSMART HOME ENERGY SAVINGS PROGRAM TO VERIFY THE LEGITIMACY OF THIS STUDY, PLEASE CALL NIKKI KARPAVICH AT 801-220-4439.)

(WHO IS DOING THIS STUDY: [INSERT UTILITY], YOUR ELECTRIC UTILITY, IS CONDUCTING EVALUATIONS OF SEVERAL OF ITS EFFICIENCY PROGRAMS, INCLUDING THE WATTSMART HOME ENERGY SAVINGS PROGRAM.)

(WHY YOU ARE CONDUCTING THIS STUDY: STUDIES LIKE THIS HELP [INSERT UTILITY] BETTER UNDERSTAND CUSTOMERS' NEEDS AND INTEREST IN ENERGY PROGRAMS AND SERVICES.)

A2. Our records show that in ***[INSERT YEAR], [INSERT UTILITY]*** provided you with a free inspection and sealing of your HVAC ducts. We're talking with customers about their experiences with this offer. 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 participate?

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 ***[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. Program Awareness & Participation Decisions

B1. How did you first hear about ***[INSERT UTILITY]***'s ***watt***smart Home Energy Savings program? **[IF NEEDED: "THIS IS THE NAME OF THE PROGRAM YOU PARTICIPATED IN TO TEST AND SEAL YOUR HVAC DUCTS."] [DO NOT PROMPT. RECORD ONLY THE FIRST WAY HEARD ABOUT THE PROGRAM.]**

1. Property Operator
2. A program affiliated contractor
3. Bill Inserts
4. Neighbor/family/friends/word-of-mouth
5. Rocky Mountain Power/Pacific Power Representative
6. Rocky Mountain Power/Pacific Power website
7. ***watt***smart Home Energy Savings website
8. Home Energy Reports
9. Home and Garden Shows
10. Social Media/Internet Advertising/Online Ad
11. Newspaper/Magazine/Print Media
12. Other website
13. Radio
14. Retailer/Store
15. Social Media
16. Sporting event
17. TV
18. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B2. ***[ASK IF E5 <> 6 0R 7, OTHERWISE SKIP TO B3]*** Prior to participating in the duct sealing offer, did you visit the ***[INSERT UTILITY]*** ***watt***smart Home Energy Savings program website to learn about the details of the offer? **[DO NOT READ RESPONSES]**

1. Yes
2. No

B3. ***[ASK IF E5 = 6 0R 7, OR IF B2 = 1, OTHERWISE SKIP TO E10]*** How helpful did you find the website—would you say it was … **[READ]**

1. Very helpful ***[SKIP TO E10]***
2. Somewhat helpful
3. Not very helpful
4. Not at all helpful
98. **[DO NOT READ]** Don't Know[SKIP TO B5]
99. **[DO NOT READ]** Refused[SKIP TO B5]

B4. ***[ASK IF B3= 2, 3, OR 4. OTHERWISE SKIP TO E10]*** 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
3. Make program information more clear and concise
4. Incorporate more visual information and less text
5. Provide easier access to customer service or FAQs
6. Other **[RECORD]**

B5. Please think back to the time when you were deciding to participate in the duct sealing offer**.** What factors motivated you to have your ducts tested and sealed through the ***watt***smart Home Energy Savings Program**?** **[DO NOT READ. INDICATE ALL THAT APPLY. ONCE THEY RESPONDENT HAS FINISHED, SAY: "ARE THERE ANY OTHER FACTORS?"]**

1. HVAC/heating/cooling equipment working poorly
2. Health or medical reasons
3. Maintain or increase comfort of home
4. The fact that it was offered for free
5. Wanted to save energy and reduce energy costs
6. Environmental concerns
7. Recommendation from friend, family member, or colleague
8. Recommendation from a contractor
9. Other **[RECORD]**

98. Don't Know
99. Refused

B6. What type of heating system do you primarily use? Do you use… **[READ]**

1. Electric Furnace
2. Gas Furnace
3. Boiler
4. Air Source Heat Pump
5. Ground Source Heat Pump
6. Wood or Pellet Stove
7. Baseboard electric heaters
8. Portable electric heaters
9. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B7. How many years old is the heating system?

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

B8. What type of central cooling system do you primarily use? Do you use a… **[READ, MULTIPLE CHOICES ALLOWED]**

1. Evaporative Cooler
2. Air Source Heat Pump
3. Ground Source Heat Pump
4. Whole house fan
5. Central Air Conditioner (other than those listed above)
6. Window Air Conditioner
7. No central cooling system ***[SKIP TO C3]***
8. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

B9. How many years old is your current cooling system?

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

C. Behavioral Changes

C1. Prior to having your ducts inspected and sealed, at what temperature did you typically set your thermostat for cooling in the summer? If you change the setting regularly, please estimate the average setting.

1. **[RECORD RESPONSE]**
2. Don't use thermostat in the summer/don't have central cooling ***[SKIP TO C3]***
98. Don't Know ***[SKIP TO C3]***
99. Refused ***[SKIP TO C3]***

C2. And since having your ducts inspected and sealed, at what temperature do you typically set your thermostat for cooling in the summer?

1. **[RECORD RESPONSE]**
2. Same/no change
98. Don't Know
99. Refused

C3. Prior to having your ducts inspected and sealed, at what temperature did you typically set your thermostat for heating in the winter? If you change the setting regularly, please estimate the average setting.

1. **[RECORD RESPONSE]**
2. Don't use thermostat in the winter/don't have central heating ***[SKIP TO C5]***
98. Don't Know ***[SKIP TO C5]***
99. Refused ***[SKIP TO C5]***

C4. And since having your ducts sealed, at what temperature do you typically set your thermostat for heating in the winter?

1. **[RECORD RESPONSE]**
2. Same/no change
98. Don't Know
99. Refused

C5. In general, have you noticed any difference in your home thermal comfort since having your ducts sealed? Do you feel… **[READ]**

1. More comfortable
2. Less comfortable
3. No change

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D. Satisfaction

D1. Thank you. Now I would like to ask a few questions about your satisfaction with the duct sealing retrofit in your home. ***HOW SATISFIED WERE YOU WITH THE PROFESSIONALISM AND ATTITUDE OF THE CONTRACTOR THAT PERFORMED THE DUCT TESTING AND SEALING?*** **[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

D2. **[IF D1 = 3 OR 4]** Why were you not satisfied with the contractor that performed the duct testing and sealing?

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

D3. How easy or difficult did you find the process to sign up for the initial duct testing appointment? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Easy
2. Somewhat Easy
3. Somewhat difficult **[PROBE: WHY DO YOU SAY THAT? RECORD]**
4. Very difficult **[PROBE:WHY DO YOU SAY THAT? RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D4. About how many days passed from when you first set up an appointment to have your ducts tested and sealed, and when a contractor first visited your house?

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

D5. About how many days passed from when the contractor first visited your house and when they completed the work?

1. **[RECORD]**
2. None, the work was completed in the same day
98. Don't know
99. Refused

D6. All in all, how many visits did the contractor (or contractors) make to your house to complete the work?

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

D7. Did your participation in ***[INSERT UTILITY]***'s duct sealing offer 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

E. Freeridership

Now I'd like to talk with you a little more about the duct sealing project.

E1. When you first heard about the duct sealing offer from ***[INSERT UTILITY] THROUGH THEIR watt***smart Home Energy Savings program, had you already been planning to have your ducts sealed?

1. Yes
2. No ***[SKIP TO E7]***
98. Don't Know ***[SKIP TO E7]***
99. Refused ***[SKIP TO E7]***

E2. Would you have had your ducts tested and sealed without the ***watt***smart Home Energy Savings program?

1. Yes
2. No ***[SKIP TO E5]***
98. Don't Know
99. Refused

E3. Let me make sure I understand: without the program would you have had your ducts both tested and sealed?

1. Yes, I would have had the ducts both tested and sealed
2. I would have had the ducts sealed, without the testing
3. I would have had the ducts tested, but not necessarily sealed
4. No, I would not have had any work done on my ducts at all ***[SKIP TO E5]***
98. Don't Know
99. Refused

E4. Without the program incentive would you have had this work on your ducts done**… [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

E5. ***[ASK IF E2=2 OR E3=4]*** To confirm, when you say you would not have had your ducts tested and sealed without the program**,** do you mean you would not have had any work done to your duct system at all?

1. Yes
2. No
98. Don't Know
99. Refused

E6. ***[ASK IF E5= 2, 98 OR 99]*** Can you clarify what work you might have done to your duct system without the program?

1. **[RECORD RESPONSE]**

E7. In your own words, please tell me the influence the ***watt***smart Home Energy Savings program incentive had on your decision to test and seal your ducts**?**

1. **[RECORD RESPONSE]**

F. Spillover

F1. Since participating in the duct sealing offer, have you added any other energy efficient equipment or services in your home that were not incentivized through the ***watt***smart Home Energy Savings Program? **[IF NEEDED: IN OTHER WORDS, HAVE YOU PURCHASED ANY HIGH-EFFICIENCY EQUIPMENT OR APPLIANCES, OR MADE ANY EFFICIENCY UPGRADES, THAT YOU PAID FOR YOURSELF AND FOR WHICH YOU DID NOT RECEIVE A REBATE FROM THE UTILITY.]**

1. Yes
2. No ***[SKIP TO G1]***
98. Don't Know ***[SKIP TO G1]***
99. Refused ***[SKIP TO G1]***

[IF F1 = 2, 98 OR 99 SKIP TO G1]

F2. What high-efficiency energy-saving equipment or services have you purchased since participating in the duct sealing offer? ***[LIST OF OTHER ELIGIBLE APPLIANCES AND MEASURES OFFERED IN THE PROGRAM OTHER THAN DUCT TESTING AND SEALING. 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 Tankless 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 = 19, 98 OR 99 SKIP TO G1. REPEAT F3 THROUGH F5 FOR ALL RESPONSES TO F2]

F3. In what year did you purchase the ***INSERT MEASURE TYPE FROM F2]***?

1. 2015
2. 2016
3. 2017
4. Other ***[RECORD YEAR]***
98. Don't Know
99. Refused

F4. Did you receive an incentive for the ***[INSERT MEASURE TYPE FROM F2]?***

1. Yes **[PROBE : Who paid you the incentive for the [MEASURE]?]**
2. No
98. Don't Know
99. Refused

F5. How influential would you say the ***watt***smart Home Energy Savings program was in your decision to add the ***[INSERT MEASURE FROM F2]*** to your home? Was it… **[REPEAT FOR EACH MEASURE LISTED IN F2]**

1. Highly Influential
2. Somewhat Influential
3. Not very influential
4. Not at all influential
98. Don't Know
99. Refused

G. Demographics

I have just a few more questions about the house at ***[SITE ADDRESS]***. Again, all your answers will be strictly confidential.

G1. Do you own this home, or are you the renter?

1. Own
2. Rent
3. Other **[RECORD]**
98. Don't Know
99. Refused

G2. Is this your primary residence?

1. Yes
2. No
98. Don't Know
99. Refused

G3. ***[IF G2=2]*** Is the home occupied year-round?

1. Yes
2. No
98. Don't Know
99. Refused

G4. ***[IF G3=2]*** How many months of the year is the home occupied, on average?

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

G5. How many people currently live in your home?

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

G6. About when was this home 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

G7. Approximately how many square feet is the home in which the ***DUCT SEALING WAS PERFORMED***? **[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

G8. 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

G9. Can you tell me which of the following categories applies to your total household income for the year 2016? Please stop me when I get to the right one.

1. Under $20,000
2. $20,000 to under $30,000
3. $30,000 to under $40,000
4. $40,000 to under $50,000
5. $50,000 to under $60,000
6. $60,000 to under $80,000
7. $80,000 to under $100,000
8. $100,000 to under $120,000
9. $120,000 or more
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

PacifiCorp HES General Population Survey

Audience: This survey is designed for PacifiCorp residential customers in Utah, Idaho, Washington, Wyoming and California. 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)

Topics	Researchable Questions	Survey Questions
Awareness	Are respondents aware of LED lighting products? Are respondents aware of advanced power strip products?	B1, D1
Installation	What percent of LEDs purchased in the past 12 months were installed in the home? Where were the purchased LEDs installed (room)? What percent of purchased advanced power strips in the past 12 months were installed in the home? Where are the purchased advanced power strips installed (entertainment center or home office)?	C1, C9, C14 D6, D10, D14
Removal and Storage	What percent of LEDs purchased in the past 12 months were removed and why? What percent of LEDs purchased in the past 12 months are in storage for future use? What percent of advanced power strips in the past 12 months were removed and why? What percent of advanced power strips purchased in the past 12 months are in storage for future use?	C10-C13 D11-D13
Satisfaction with LEDs and advanced power strips	How satisfied are respondents with their LEDs? What do they like or dislike about them? How satisfied are respondents with their advanced power strips? What do they like or dislike about them?	C4-C7, C11, C16, C17 D12, D15, D16
Program Awareness	Are respondents aware of the PacifiCorp programs? How did they hear about them? Have respondents visited the Home Energy Savings Website?	Section E
Nonparticipant Spillover	What actions are respondents taking to save energy? Did they receive a rebate from PacifiCorp during the 2015-2016 program period for other equipment purchased? How influential were the PacifiCorp programs in their decision to install the equipment?	Section F
Demographics	How do awareness /activities/behaviors vary by demographic characteristics?	Section G

- 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 energy use and would like to ask you some questions about your household's lighting and appliances. 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 15 to 20 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 APPLIANCE ENERGY USE)

(**Sales concern:** I am not selling anything; we would simply like to learn about your household lighting and appliance 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 and household equipment and appliances 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. Awareness and Purchase of LEDs

B1. Before this call today, had you heard of light emitting diode light bulbs or L-E-D **[SAY THE LETTERS L-E-D]** for short? **[IF NEEDED: THESE BULBS HAVE REGULAR SCREW BASES THAT FIT INTO MOST HOUSEHOLD SOCKETS.]**

1. Yes
2. No

B2. Have you purchased any regular screw base light bulbs in the last twelve months? **[IF NEEDED, REGULAR SCREW BASE LIGHT BULBS ARE THOSE THAT FIT INTO MOST HOUSEHOLD SOCKETS. PLEASE DON'T INCLUDE BULBS YOU MAY HAVE RECEIVED FOR FREE AS PART OF A KIT.]**

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

B3. What kind of regular screw base light bulbs did you purchase in the last twelve months? **[READ RESPONSE OPTIONS AND SELECT ALL THE APPLY]**

1. CFLs **[IF NEEDED: THESE ARE SPIRAL SHAPED INSIDE AND FIT INTO MOST HOUSEHOLD SOCKETS]**
2. ***LED LIGHT BULBS*** **[IF NEEDED: THESE ARE THE NEWEST TECHNOLOGY BULBS THAT FIT INTO MOST HOUSEHOLD SOCKETS]**
3. ***INCANDESCENT LIGHT BULBS*** **[IF NEEDED: THESE ARE THE OLDEST TECHNOLOGY BULBS WITH THE ELEMENT INSIDE]**

4. ***HALOGEN LIGHT BULBS*** **[IF NEEDED: THESE ARE GAS-FILLED INCANDESCENT BULBS THAT FIT INTO MOST HOUSEHOLD SOCKETS]**
5. Other: ***[RECORD VERBATIM]***
98. **[DON'T READ]** Don't Know ***[SKIP TO SECTION D]***
99. **[DON'T READ]** Refused ***[SKIP TO SECTION D]***

B4. ***[ASK IF B3<>2]*** Why did you not choose to purchase LEDs to meet your lighting needs?

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

[IF B3<>2 SKIP TO SECTION D]

C. LED Installation and Satisfaction

C1. In the last 12 months, how many regular screw base *LEDs* did you or your household purchase? Please try to estimate the total number of *individual LED bulbs you purchased*, as opposed to packages. Don't include LEDs you may have received for free as part of a kit. **[IF "DON'T KNOW," PROBE: "IS IT LESS THAN OR MORE THAN FIVE BULBS?" WORK FROM THERE TO GET AN ESTIMATE.**

1. **[RECORD # OF LEDS: NUMERIC OPEN END]** ***[IF C1.1= 0 SKIP TO SECTION D]***
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 SECTION D]***
99. Refused ***[SKIP TO SECTION D]***

C2. As far as you know, were any of the ***[C1.1]*** LEDs you purchased part of a ***[INSERT UTILTY]*** sponsored discount?

1. Yes
2. No
98. Don't Know
99. Refused

C3. ***[ASK IF C2= 1, OTHERWISE SKIP TO C4]*** 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

C4. When you purchased those LED bulbs, did you intend to definitely purchase LEDs, or did you consider any other bulb types?

1. I wanted LEDs ***[SKIP TO C7]***
2. Considered other bulb types
98. Don't Know ***[SKIP TO C7]***
99. Refused ***[SKIP TO C7]***

C5. ***[ASK IF C4=2]*** What other types of bulb did you consider? **[IF NEEDED: OTHER COMMON TYPES OF REGULAR SCREW BASE BULBS INCLUDE INCANDESCENT, HALOGEN, AND CFLS]** ***[SELECT ALL THAT APPLY]***

1. Incandescent bulbs
2. Halogen bulbs
3. CFL bulbs
4. Other **[RECORD]**
5. Any type/was not concerned with bulb type ***[SKIP TO C7]***
98. Don't know
99. Refused

C6. What types of regular screw base bulb, if any, would you be unwilling to purchase? **[IF NEEDED: OTHER COMMON TYPES OF REGULAR SCREW BASE BULBS INCLUDE INCANDESCENT, HALOGEN, AND CFL BULBS]** **[SELECT ALL THAT APPLY]**

1. There were no types I would NOT have purchased
2. Would not have purchased incandescent bulbs
3. Would not have purchased halogen bulbs
4. Would not have purchased CFLs
5. Other **[RECORD]**
98. Don't know
99. Refused

C7. What ***[IF C3=1 SAY "OTHER"]*** factors were most important to you when you made the decision to purchase the LED bulbs? **[DO NOT READ. MULTIPLE RESPONSES ALLOWED]**

1. Energy savings or cost savings on electricity bill
2. Price of bulb
3. Cost-effectiveness/best value for the money
4. Environmental concerns
5. CFL disposal concerns
6. Quality (brightness, color) of light
7. Lifetime of bulb
8. Interested in the latest technology
9. Brand (i.e., Philips, Sylvania, etc.)

10. ENERGY STAR
11. There were no other choices
12. Other **[RECORD]**
98. Don't Know
99. Refused

C8. Do you know how many, if any, of the LEDs you purchased are ENERGY STAR certified? **[IF NEEDED: ENERGY STAR CERTIFIED BULBS HAVE THE ENERGY STAR LABEL ON THE PACKAGE. SOME, BUT NOT ALL, LEDS ARE ENERGY STAR CERTIFIED.]**

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

C9. Now I'd like to ask you a few questions about the ***[C1.1]*** 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 C13]***
98. Don't Know ***[SKIP TO C16]***
99. Refused ***[SKIP TO C16]***

C10. Have you since removed any of those LED bulbs from the sockets?

1. Yes **[ASK "HOW MANY DID YOU REMOVE?" RECORD # OF LEDS]**
2. No ***[SET C10.1=0 AND SKIP TO C13]***
98. Don't Know ***[SKIP TO C16]***
99. Refused ***[SKIP TO C16]***

C11. ***[ASK IF C10= 1, OTHERWISE SKIP TO C13]*** What were the reasons you removed the ***[C10.1]*** purchased LEDs from the sockets? **[QUANTITIES SHOULD ADD TO C10.1, 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

C12. ***[ASK IF C10= 1, OTHERWISE SKIP TO C13]*** What type of light bulb did you replace the removed LEDs with? **[MULTIPLE RESPONSES ACCEPTED]**

1. Incandescent bulb
2. Halogen bulb
3. CFL
4. Other: ***[RECORD VERBATIM]***
98. Don't know
99. Refused

C13. ***[ASK IF C1.1-C9.1>0]*** Are any of the ***[C1.1]*** LEDs you purchased in the last twelve months currently in storage for later use? (these are bulbs that you never installed)

1. Yes **[ASK: "HOW MANY ARE NOW IN STORAGE?" RECORD # OF LEDS]** ***[IF C13.1=C1.1, SKIP TO C16]***
2. No
98. Don't Know
99. Refused

C14. ***[ASK IF (C9.1-C10.1)>0 OTHERWISE SKIP TO C16]*** Of the ***[C9.1-C10.1]*** ***LED*** bulbs that are currently installed in your home that were purchased during the last twelve months, can you tell me how many are installed in each room in your house? Please try to count only the LED bulbs that were purchased in the last 12 months.

1. All occupied bedrooms **[RECORD]**
2. All unoccupied bedrooms **[RECORD]**
3. Basement **[RECORD]**
4. All bathrooms **[RECORD]**
5. All closets **[RECORD]**
6. Dining **[RECORD]**
7. Foyer **[RECORD]**

8. Garage **[RECORD]**
9. Hallway **[RECORD]**
10. Kitchen **[RECORD]**
11. Office/Den **[RECORD]**
12. Living space including family rooms, living rooms, rec rooms and similar areas **[RECORD]**
13. Storage areas other than closets **[RECORD]**
14. Outside **[RECORD]**
15. Utility room **[RECORD]**
16. Other **[RECORD VERBATIM]**
98. Don't Know
99. Refused

C15. ***[ASK ONLY IF TOTAL BULBS IN C14 PLUS C10.1<C9.1 (IF TOTAL NUMBER OF BULBS LISTED IN EACH ROOM, PLUS THOSE REMOVED DOES NOT MATCH THE NUMBER OF BULBS INSTALLED STATED IN C9.1) OTHERWISE SKIP TO C16]*** Thanks, that accounts for **[TOTAL BULBS IN C14]** of the total quantity that were installed in your home. Can you tell me where the ***[C9.1 MINUS TOTAL BULBS IN C14 MINUS C10.1]*** other bulbs are installed?

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

C16. 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

C17. ***[ASK ONLY IF C16= 3 OR 4]*** Why would you say you are ***[INSERT ANSWER FROM C16]*** 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. Bulb started flickering
11. Bulb did not last/burnt out
12. Other **[RECORD VERBATIM]**
98. Don't Know
99. Refused

D. Advanced Power Strips

D1. Now I would like to ask you a few questions about the use of advanced power strips in your house. Before this call today, had you ever heard of a specific type of power strips called *advanced* power strips? **[EMPHASIS ON "ADVANCED" TO CLARIFY THAT THE QUESTION IS NOT ABOUT REGULAR POWER STRIPS]**

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

D2. ***[ASK IF D1=1 OTHERWISE SKIP TO D3]*** Can you tell me what you know about advanced power strips?

1. ***[RECORD VERBATIM THEN SKIP TO D4]***
98. Don't Know
99. Refused ***[SKIP TO D4]***

D3. ***[ASK IF D1=2, 98 OR D2= 98]*** Let me clarify what I am referring to: Many plugged in electronics continue to use electricity when they are turned off. An *advanced* power strip helps reduce this wasted electricity by utilizing a main outlet and a number of controlled outlets. The power strip senses when the TV or computer plugged into the main outlet is turned off, and automatically eliminates power to the controlled outlets, where any peripheral devices may be plugged in.

Given this clarification, had you heard of advanced power strips before today?

1. Yes
2. No ***[SKIP TO D5]***

D4. Have you purchased any advanced power strips in the last twelve months?

1. Yes ***[SKIP TO D6]***
2. No
98. Don't Know
99. Refused

D5. If you obtain an advanced power strip in the future where would you install it? **[READ RESPONSE OPTIONS AND SELECT ALL THAT APPLY]**

1. Home entertainment center (This is where your main TV is installed, and is typically in the family room or TV room)
2. Home office (This is where your home computer and any peripheral devices are installed)
3. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D6. ***[ASK IF D4=1 OTHERWISE SKIP TO SECTION E]*** In the last 12 months, how many advanced power strips did you or your household purchase?

1. **[RECORD # OF ADVANCED POWER STRIPS]** ***[IF D6.1=0 SKIP TO SECTION E]***
98. Don't Know **[PROBE FOR ESTIMATES; IF UNABLE TO GET AN ANSWER, *SKIP TO SECTION E]***
99. Refused ***[SKIP TO SECTION E]***

D7. Were any of the ***[D6.1]*** advanced power strips you purchased part of a ***[INSERT UTILTY]*** sponsored sale?

1. Yes
2. No
98. Don't Know
99. Refused

D8. ***[ASK IF D7= 1, OTHERWISE SKIP TO D9]*** Did the ***[INSERT UTILTY]*** discount influence your decision to purchase an advanced power strip as opposed to a regular power strip?

1. Yes
2. No
98. Don't Know
99. Refused

D9. What ***[IF D8=1 SAY "OTHER"]*** factors were important in your decision to buy an advanced power strip as opposed to a regular one? **[DO NOT READ. MULTIPLE RESPONSES ALLOWED]**

1. Energy savings or cost savings on electricity bill
2. Good price of the advanced power strip compared to regular power strips
3. Ability to control multiple sockets
4. Environmental concerns
5. Interested in the latest technology
6. Other **[RECORD]**

98. Don't Know
99. Refused

D10. Thinking of the advanced power strip (s) you acquired in the last twelve months, how many did you install in your home since you purchased them?

1. **[RECORD # INSTALLED]**
2. None ***[SKIP TO D13]***
98. Don't Know ***[SKIP TO D13]***
99. Refused ***[SKIP TO D13]***

D11. Have you since removed any of the advanced power strips installed?

1. Yes **[ASK "HOW MANY DID YOU REMOVE?" RECORD #]**
2. No ***[SET D11.1=0 AND SKIP TO D13]***
98. Don't Know ***[SKIP TO D13]***
99. Refused ***[SKIP TO D13]***

D12. What were the reasons you removed the ***[D11.1]*** purchased advanced power strip(s) from the sockets? **[QUANTITIES SHOULD ADD TO D11.1, IF NOT, ASK "WHAT ABOUT THE REMAINING ADVANCED POWER STRIPS YOU REMOVED?] [DO NOT READ, MULTIPLE RESPONSES ALLOWED]**

1. Not working correctly **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
2. Turns appliances/electronics off too early or during use **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
3. Not compatible with my appliances/electronics **[ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
4. **INCONVENIENT/ANNOYING/CONFUSING/FRUSTRATING [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
5. **FLASHING LIGHT IS ANNOYING OR TOO BRIGHT [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
6. **CAUSED DAMAGE TO MY APPLIANCES/ELECTRONICS [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
7. **NO NEED FOR IT ANY MORE [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
8. **DID NOT LOOK GOOD [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
9. Other **[RECORD VERBATIM] [ASK: "HOW MANY DID YOU REMOVE BECAUSE OF THIS?" RECORD # OF ADVANCED POWER STRIPS]**
98. Don't Know
99. Refused

D13. ***[ASK IF D6.1-D10.1>0, OR IF D10=2, 98, OR 99]*** Are any of the ***[D6.1]*** **ADVANCED POWER STRIPS** you purchased in the last twelve months currently in storage for later use?

1. Yes **[ASK: "HOW MANY ARE NOW IN STORAGE?" RECORD #]**
2. No
98. Don't Know
99. Refused

D14. ***[ASK IF D10.1 MINUS D11.1>0]*** Of the ***[D10.1 MINUS D11.1]*** advanced power strip (s) that remain installed in your home, can you tell me where each one is installed? **[READ RESPONSE OPTIONS AND SELECT ALL THAT APPLY]**

1. Home entertainment center (This is where your main TV is installed, and is typically in the family room or TV room) **[RECORD # INSTALLED IN HOME ENTERTAINMENT CENTER]**
2. Home office (This is where your home computer and any peripheral devices are installed) **[RECORD # INSTALLED IN HOME OFFICE]**
3. Other **[RECORD # AND LOCATION VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

D15. How satisfied are you with the advanced power strips 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

D16. ***[ASK ONLY IF D15= 3 OR 4]*** Why would you say you are ***[INSERT ANSWER FROM D15]*** with the advanced power strips? **[DO NOT READ LIST AND RECORD ALL THAT APPLY]**

1. Not working properly
2. Turns appliances/electronics off too early (during use)
3. Not compatible with my appliances/electronics
4. **NOT USER-FRIENDLY**
5. **INCONVENIENT TO USE**
6. **FLASHING LIGHT ANNOYING OR TOO BRIGHT**
7. **CAUSED DAMAGE TO MY APPLIANCES/ELECTRONICS**
8. **NO CHANGE IN ELECTRICITY CONSUMPTION/BILL**
9. **DID NOT LOOK GOOD**
10. Other **[RECORD VERBATIM]**

98. Don't Know
99. Refused

E. Program Awareness

E1. 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 ***[SKIP TO SECTION F]***
98. Don't Know
99. Refused ***[SKIP TO SECTION F]***

E2. One of these ***[INSERT UTILITY]*** programs is the "***watt***smart Home Energy Savings Program" and it provides discounts on CFLs, LEDs, advanced power strips 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 F]***
98. Don't Know ***[SKIP TO SECTION F]***
99. Refused ***[SKIP TO SECTION F]***

E3. Where did you <u>most recently</u> hear about ***[INSERT UTILITY]*****'s *watt*smart Home Energy Savings program? [DO NOT READ LIST. RECORD FIRST RESPONSE. ONE ANSWER ONLY]**

1. Newspaper/Magazine/Print Media
2. Paper or Electronic Bill Inserts
3. Rocky Mountain Power/Pacific Power website
4. ***watt***smart Home Energy Savings website
5. Other website
6. Social media/internet Advertising/online ad
7. Family/friends/neighbor/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
17. Other **[RECORD VERBATIM]**

98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E4. ***[ASK ONLY IF E3<>3 AND E3<>4]*** Have you ever visited the ***watt***smart Home Energy Savings Website?

1. Yes
2. No

E5. ***[ASK ONLY IF E4=1]*** How often do you visit the ***watt***smart Home Energy Savings Website? Would you say you visit the website: **[READ RESPONSE OPTIONS]**

1. More frequently than once a month
2. About once a month
3. About once every six months
4. About once every year
5. Less frequently than once every year

E6. ***[ASK ONLY IF E4=1]*** When you visit the ***watt***smart Home Energy Savings Website, what is typically the purpose of your visit?

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

E7. ***[ASK ONLY IF E4 = 1 OR E3=3 OR 4, OTHERWISE SKIP TO SECTION F]*** 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

E8. 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

F. Nonparticipant Spillover

F1. ***[INSERT UTILITY]*'s** Home Energy Reports portal provides you with detailed information about your home's energy use and helps you discover ways to save money and make your home more energy efficient. Did you use the Home Energy Reports portal in 2015 or 2016?

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

F2. Now, I will read a list of household equipment and upgrades. Please say yes, if you have installed the equipment or upgrade mentioned in 2015 or 2016 and no, if you haven't. **[READ MEASURES AT STEADY PACE IF NO RESPONSE THEN PROBE: IS THAT YES OR NO?]**

Measure Name	1=Yes	2=No	98=Don't know	99= Refused
a) High-efficiency heat pump water heater				
b) High-efficiency Furnace with electronically commutated motor or ECM				
c) High-efficiency Air Source Heat Pump				
d) High-efficiency Ground Source Heat Pump				
e) High-efficiency Ductless Heat Pump				
f) High-efficiency Central Air Conditioner				
g) High-efficiency Evaporative Cooler				
h) ENEGY STAR Room Air Conditioner				
i) ENERGY STAR Clothes Washer				
j) ENERGY STAR Dishwasher				
k) ENERGY STAR Freezer				
l) ENERGY STAR Refrigerator				

Measure Name	1=Yes	2=No	98=Don't know	99= Refused
m) Attic insulation				
n) Wall insulation				
o) Floor insulation				
p) Air sealing **[IF NEEDED: THIS IS CAUKING OR SEALING GAPS TO MAKE THE HOME AIRTIGHT]**				
q) Duct insulation				
r) Duct sealing **[IF NEEDED: THIS IS SEALING ANY GAPS IN DUCT CONNECTIONS]**				
s) Windows				
t) Low-flow showerhead				
u) Low-flow faucet aerator				
v) Smart Thermostat				
w) Ceiling fan				
x) Any other energy-efficient products? [SPECIFY]				

[IF F2.*=1 THEN RANDOMLY SELECT ONE MEASURE FROM F2.* = 1 AND CODE AS SELECTEDMEASURE1]

[IF F2.*= 1 AND MEASURE NAME <> SELECTEDMEASURE1 RANDOMLY SELECT ONE MEASURE FROM F2.* = 1 AND CODE AS SELECTEDMEASURE2]

[IF ALL F2.* = 2 THEN AUTO PUNCH F2 = 97 DID NOT INSTALL ANYTHING AND SKIP TO SECTION G]

[IF ALL F2.* = 98 OR 99 SKIP TO SECTION G]

F3. Did you receive a rebate or discount from ***[INSERT UTILITY]*** for the purchase of ***[SELECTEDMEASURE1]***?

1. Yes
2. No
98. Don't Know
99. Refused

F4. ***[IF SELECTEDMEASURE1=ATTIC INSULATION, OR WALL INSULATION, OR FLOOR INSULATION, OR AIR SEALING, OR DUCT INSULATION, OR DUCT SEALING, SAY "HOW MUCH" OTHERWISE SAY "HOW MANY"] [SELECTEDMEASURE1]*** did you install?

1. ***[RECORD QUANTITY OR AMOUNT WITH UNIT OF MEASUREMENT]***
98. Don't Know
99. Refused

F5. On a 1 to 4 scale, with 1 meaning "not at all influential," to 4, meaning the item was "highly influential," how influential was **[INSERT STATEMENT FROM TABLE BELOW]** on your decision to purchase the ***[SELECTEDMEASURE1]*** ?

Statement	Not at all Influential	Not Very Influential	Somewhat Influential	Highly Influential	Don't Know	Not Applicable
	1	2	3	4	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.						

[SKIP F6 THROUGH F8 IF SELECTEDMEASURE2="NULL"]

F6. Did you receive a rebate or discount from ***[INSERT UTILITY]*** for the purchase of ***[SELECTEDMEASURE2]***?

1. Yes
2. No
98. Don't Know
99. Refused

F7. ***[IF SELECTEDMEASURE2=ATTIC INSULATION, OR WALL INSULATION, OR FLOOR INSULATION, OR AIR SEALING, OR DUCT INSULATION, OR DUCT SEALING, SAY "HOW MUCH" OTHERWISE SAY "HOW MANY"] [SELECTEDMEASURE2]*** did you install?

1. ***[RECORD QUANTITY OR AMOUNT WITH UNIT OF MEASUREMENT]***
98. Don't Know
99. Refused

F8. On a 1 to 4 scale, with 1 meaning "not at all influential," to 4, meaning the item was "highly influential," how influential was **[INSERT STATEMENT FROM TABLE BELOW]** on your decision to purchase the ***[SELECTEDMEASURE2]*** ?

Statement	Not At All Influential	Not Very Influential	Somewhat Influential	Highly Influential	Don't Know	Not Applicable
	1	2	3	4	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.						

F9. ***[ASK IF F3= 2 OR F6 =2 OTHERWISE SKIP TO SECTION G]*** 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]**
9. Don't Know
10. Refused

G. Demographics

G1. Next are a few questions for statistical purposes only. Which of the following best describes your home? **[READ LIST]**

1. Single-family detached house
2. Townhouse or duplex
3. Mobile home or trailer
4. Apartment building with 4 or less units
5. Apartment building with 5 or more units
6. Other **[RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

G2. 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

G3. About when was this building first built? **[READ LIST IF NEEDED]**

1. Before 1970s
2. 1970s
3. 1980s
4. 1990-1994
5. 1995-1999
6. 2000-2004
7. 2005-2009
8. 2010 +
9. OTHER **[RECORD]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

G4. What is the primary heating system 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

G5. How old is the primary heating system? **[RECORD RESPONSE IN YEARS]**

1. **[RECORD 0-97]**
98. Don't Know
99. Refused

G6. What is the primary cooling system for 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

G7. ***[SKIP IF G6= 7,98 OR 99]*** How many years old is your primary cooling system? **[RECORD RESPONSE IN YEARS]**

1. **[RECORD 0-97]**
98. Don't Know
99. Refused

G8. 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

G9. Including yourself and any children, how many people currently live in your home?

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

G10. ***[ASK ONLY IF G9> 1*** AND <98,99***]*** 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. Do you have any additional feedback or comments regarding your household lighting or energy usage?

1. Yes **[RECORD VERBATIM]**
2. No
98. Don't Know
99. Refused

14. [SEX; DO NOT READ]

3. Female
4. Male
98. Don't Know

That concludes the survey. Thank you very much for your time and feedback.

CADMUS

PacifiCorp Home Energy Savings Participant Survey

Audience: This survey is designed for PacifiCorp residential customers in California, Utah, Idaho, Washington, and Wyoming that applied for an incentive through the incentive application process in the first half of 2016. 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: Aim for 60 completed surveys for each state (CA, UT, ID, WA, and WY)

	APPLIANCE	HVAC	Weatherization
	Sample (survey quota)	**Sample (survey quota)**	**Sample (survey quota)**
CA	20 (as many as possible)	86 (20)	3 (as many as possible)
ID	43 (20)	26 (as many as possible)	15 (as many as possible)
UT	400 (20)	400 (20)	400 (20)
WA	129 (20)	210 (20)	48 (20)
WY	58 (as many as possible)	56 (20)	9 (as many as possible)

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 ***watt***smart website (feedback)? Why did the customer purchase the program measure?	Section B
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 C
Net-to-Gross	Self-reported freeridership and spillover batteries	Section E and F
Demographics	Customer household information for statistical purposes	Section G

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

[UTILITY]
Washington and California: Pacific Power

Utah, Wyoming, and Idaho: Rocky Mountain Power

[MEASURE]

[YEAR OF PARTICIPATION]

[MEASURE QUANTITY]

["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
Heat Pump Best Practice Installation	SERVICE
Heat Pump 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	REFRIGERATOR
Room Air Conditioner	ROOM AC
Electric Water Heater	OTHER
Attic Insulation	INSULATION
Wall Insulation	INSULATION
Floor Insulation	INSULATION
Windows	WINDOWS
Smart Thermostat	OTHER

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 ***watt***smart 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 E5]***
2. No **[CONTINUE TO B5]**
98. Don't know ***[SKIP TO E5]***
99. Refused ***[SKIP TO E5]***

[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 E5]***

1. Failed or broken unit ***[SKIP TO E5]***
2. Removed because did not like it ***[SKIP TO E5]***
3. Have not had time to install it yet ***[SKIP TO E5]***
4. In-storage ***[SKIP TO E5]***
5. Back up equipment to install when other equipment fails ***[SKIP TO E5]***
6. Have not hired a contractor to install it yet ***[SKIP TO E5]***
7. Purchased more than was needed ***[SKIP TO E5]***
8. Other **[RECORD]** ***[SKIP TO E5]***
98. Don't Know ***[SKIP TO E5]***
99. Refused ***[SKIP TO E5]***

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 E5]***
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 2015, 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 E5]***
2. No **[CONTINUE TO B13]**
98. Don't know ***[SKIP TO E5]***
99. Refused ***[SKIP TO E5]***

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 E5]***

1. Failed or broken unit ***[SKIP TO E5]***
2. Removed because did not like it ***[SKIP TO E5]***
3. Have not had time to install it yet ***[SKIP TO E5]***
4. In-storage ***[SKIP TO E5]***
5. Back up equipment to install when other equipment fails ***[SKIP TO E5]***
6. Have not hired a contractor to install it yet ***[SKIP TO E5]***
7. Purchased more than was needed ***[SKIP TO E5]***
8. Other **[RECORD]** ***[SKIP TO E5]***
98. Don't Know ***[SKIP TO E5]***
99. Refused ***[SKIP TO E5]***

C. Program Awareness & Purchase Decisions

C1. How did you first hear about ***[INSERT UTILITY]***'s ***watt***smart 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. ***watt***smart Home Energy Savings website
18. Other **[RECORD VERBATIM]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C2. ***[ASK IF E5 <> 13 0R 17, OTHERWISE SKIP TO B3]*** Have you been to the ***[INSERT UTILITY]*** ***watt***smart Home Energy Savings program website? **[DO NOT READ RESPONSES]**

1. Yes
2. No

C3. ***[ASK IF E5 = 13 OR 17, OR IF B2 = 1, OTHERWISE SKIP TO E10]*** Was the website… **[READ]**

1. Very helpful ***[SKIP TO E10]***
2. Somewhat helpful
3. Somewhat unhelpful
4. Very unhelpful
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

C4. ***[ASK IF B3= 2, 3, OR 4. OTHERWISE SKIP TO E10]*** 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 D10]***
98. Don't Know ***[SKIP TO D10]***
99. Refused ***[SKIP TO D10]***

D2. Approximately how many loads of clothes does your household wash in a typical week **[IF MEASURE TYPE = CLOTHES WASHER, SAY "WITH THE NEW CLOTHES WASHER"]**?

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

D3. ***[ASK IF MEASURE TYPE = CLOTHES WASHER, OTHERWISE SKIP TO D7]*** How does the number of wash loads you do now compare to the number that you did with your old clothes washer? Is it the same or different? **[DO NOT READ RESPONSES]**

1. Same ***[SKIP TO D7]***
2. Different **[CONTINUE TO D4]**
98. Don't Know ***[SKIP TO D7]***
99. Refused ***[SKIP TO D7]***

D4. ***[ASK IF D3 = 2]*** How many loads per week did your household do on average week before you installed the new clothes washer?

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

D5. Is your new washer smaller, bigger, or the same size as your older one?

1. Smaller
2. Bigger
3. Same Size
98. Don't Know
99. Refused

D6. Is your new washing machine top loading or front loading?

1. Top-Loading
2. Front-Loading
98. Don't Know
99. Refused

D7. What percentage of your loads do you dry using a clothes dryer? **[READ CATEGORIES IF NEEDED]**

1. Never ***[SKIP TO B6]***
2. LESS THAN 25%
3. 25-50%
4. 50-75%
5. 75- 99%
6. Always or 100%
98. Don't know ***[SKIP TO B6]***
99. Refused ***[SKIP TO B6]***

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. Is your dryer powered by electricity or natural gas?

1. Electricity
2. Natural Gas
3. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't know
99. **[DO NOT READ]** Refused

[if MEASURE type= heating skip to B8 or heating/cooling skip toD20]

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 B8]***
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 TOD24]*** 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

IF MEASURE TYPE WINDOWS SKIP TO E1

D15. ***[ASK IF MEASURE TYPE = LIGHTING] [UTILTY]*** provides incentives for several different kinds of light fixtures. Were any of the light fixtures that you received an incentive for recessed ceiling or can light fixtures?

1. Yes
2. No
98. Don't Know
99. Refused

D16. ***[ASK IF MEASURE TYPE = LIGHTING AND D15 =1]*** What kind of lightbulb(s) did your recessed ceiling or can fixture(s) replace? Were they….[READ LIST]

1. Standard shaped bulbs **[IF NEEDED: THIS IS A TYPICAL HOUSEHOLD INCANDESCENT, CFL OR LED BULB, SOMETIMES REFERRED TO AS A-SHAPED AND SPREADS LIGHT IN ALL DIRECTION]**
2. Reflector or flood lightbulbs **[IF NEEDED: THIS IS A BULB THAT POINTS LIGHT IN ONE DIRECTION]**
3. No lightbulbs replaced
4. **[DO NOT READ]** Other **[SPECFICY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

[FOR QUESTIONS D17 - D25 USE THE FOLLOWING SKIP PATTERN
FOR MEASURE TYPES OTHER, CLOTHES WASHER, ROOM AC, AND LIGHTING: READ QUESTIONS D17 – D19 THEN SKIP TO E1;

FOR MEASURE TYPE REFRIGERATOR ASK D17 TO D19 THEN SKIP TO E1
FOR MEASURE TYPE HEATING: READ QUESTIONS D20 TO D23 THEN SKIP TO E1
FOR MEASURE TYPE COOLING: READ QUESTIONS D24 TO D25 THEN SKIP TO E1;
FOR MEASURE TYPE HEATING/COOLING: READ QUESTIONS D20 TO D22 AND D24 TO D25 THEN SKIP TO E1;
FOR MEASURE TYPES WINDOWS, SEALING, INSULATION AND SERVICE: SKIP TO E1]

D17. Was the purchase of your new ***[INSERT MEASURE](S)*** intended to replace **[AN]** old ***[INSERT MEASURE TYPE]***?

1. Yes **[CONTINUE TO D18]**
2. No ***[SKIP TO E1]***
98. Don't Know ***[SKIP TO E1]***
99. Refused ***[SKIP TO E1]***

D18. ***[ASK IF MEASURE TYPE = REFRIGERATOR AND IF D17 = 1]*** Is your refrigerator bigger, smaller, or the same size as the one it may have replaced?

1. Smaller
2. Bigger
3. Same Size
4. Did not replace an existing unit
98. Don't Know
99. Refused

D19. ***[ASK IF D17 = 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]***

[Ask D20 to D23 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

D23. ***[ASK IF MEASURE TYPE = HEATING OTHERWISE SKIP TO D24]*** Did you also replace an air conditioner when you installed the new furnace?

1. Yes
2. No
98. Don't Know
99. Refused

[Ask D24 to D25 if MEASURE type = cooling or heating/cooling]

D24. 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

D25. 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 D1 = 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 ***watt***smart 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 ***watt***smart 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 ***watt***smart 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 E2]***
98. Don't Know ***[SKIP TO E2]***
99. Refused ***[SKIP TO E2]***

F2. Ok. Had you already purchased or installed the new ***[INSERT MEASURE](S)*** before you learned about the incentive from the ***watt***smart Program?

1. Yes
2. No ***[SKIP TO E2]***
98. Don't Know ***[SKIP TO E2]***
99. Refused ***[SKIP TO E2]***

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 E6]***
2. No
98. Don't Know
99. Refused

[IF F3= 1 SKIP TO E6]

F4. Would you have purchased the same ***[INSERT MEASURE](S)*** without the incentive from the ***watt***smart Home Energy Savings program?

1. Yes ***[SKIP TO F6]***
2. No
98. Don't Know
99. Refused

[IF E2 = 1 THEN SKIP TO F6]

F5. ***[ASK IF E2 = 2, -98 OR -99]*** Help me understand, would you have purchased something without the ***watt***smart 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 E5]***
98. Don't Know ***[SKIP TO E6]***
99. Refused ***[SKIP TO E6]***

[IF F5 = 2 SKIP TO E5. IF F5 = -98 OR -99 SKIP TO E6]

F6. ***[ASK IF E2= 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 E2= 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 E2= 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 E6]

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 E5 = 1 SKIP TO E6]

F10. ***[ASK IF E5 = 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 E5= 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 E5 = 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 ***watt***smart Home Energy Savings Program?

1. Yes
2. No
98. Don't Know
99. Refused

[IF F1 = 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 F2 = 12 (ONLY), -98 OR -99 SKIP TO H1. REPEAT F3 THROUGH F5 FOR ALL RESPONSES TO F2]

G3. In what year did you purchase ***[INSERT MEASURE TYPE FROM F2]***?

1. 2015
2. 2016
3. Other ***[RECORD YEAR]***
98. Don't Know
99. Refused

G4. Did you receive an incentive for ***[INSERT MEASURE TYPE FROM F2]?***

1. Yes **[PROBE AND RECORD]**
2. No
98. Don't Know
99. Refused

G5. How influential would you say the ***watt***smart Home Energy Savings program was in your decision to add the ***[INSERT MEASURE FROM F2]*** to your home? Was it… **[REPEAT FOR EACH MEASURE LISTED IN F2]**

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.

Rocky Mountain Power Home Energy Savings Program
Heating and Cooling Contractor Interview Guide (WY, ID)

To obtain insights about their experiences with the Home Energy Savings Program and interactions with customers, Cadmus is conducting in-depth interviews with participating heating and cooling contractors. We will address the topics identified in the following table.

Researchable Questions		
Key Research Topics	**Areas of Investigation**	**Section**
Firmographics	Determine respondent and company characteristics	I
Engagement	Awareness of Home Energy Savings Program	J
	Breadth of program participation	
	Formal and informal training from program staff	
Marketing to Customers	Customer awareness of contractor's company and Home Energy Savings Program	K
	Contractor marketing tactics	
	Use of trade ally and program-developed marketing materials	
Market and Participation Barriers	Effect of rural territory on program awareness	L
	The extent that contractors assist with application paperwork, and challenges with the application	
Satisfaction	Satisfaction with the application process, program support and the program overall	M

Contractor interviews will be structured, but open-ended, to allow contractors to highlight program successes and challenges from their perspective. Conversations will be 20-30 minutes long. Respondents will receive a $50 gift card as a reward for their participation.

Quota: Aim for the following number of completed interviews in each state (WY and ID)

	Sample (interview quota)
WY	10
ID	10

Variables Needed

- Contractor company name
- Contractor contact
- Company address
- Contact email address

Interview date:	
Interviewer initials:	
Trade ally company name:	
Interviewee name:	

[THE INTRODUCTION IS DESIGNED TO FIND THE CORRECT PERSON AND MAKE THE INTENDED RESPONDENT FEEL COMFORTABLE COMPLETING AN INTERVIEW.]

Hello, this is _____ from Cadmus, a national research firm. I am conducting research for Rocky Mountain Power on how they can better help customers utilize its Home Energy Savings Program. Rocky Mountain Power is interested in hearing from contractors involved in their Home Energy Savings Program. We would like to have a quick chat with you to learn more about your experience with the program in 2015 and 2016. It should take about 20 minutes, and we would send you a $50 Visa gift card as a thank you for your time.

We're looking to speak to the person at your company who is most familiar with the Home Energy Savings Program. **[IF NEEDED: WE'RE LOOKING FOR THE PERSON WHO WAS MOST INVOLVED, SUCH AS THE PERSON WHO TALKED TO CUSTOMERS ABOUT ROCKY MOUNTAIN POWER REBATES; WHO HELPED FILL OUT REBATE APPLICATIONS FOR CUSTOMERS.]**

[IF NEEDED REINTRODUCE YOURSELF AND STATE WHY YOU ARE CALLING] Our records show that you recently helped customers install new heating or cooling equipment through the program. Does that sound familiar?

Rocky Mountain Power is interested in hearing about your experience doing this work, and getting your ideas on how to improve the process. Is now a good time? **[IF NO, SCHEDULE CALL-BACK]**

[IF NEEDED: IF YOU WOULD LIKE TO CONTACT ROCKY MOUNTAIN POWER TO VERIFY THE LEGITIMACY OF THIS STUDY, PLEASE CONTACT NIKKI KARPAVICH AT 801-220-4439.

I. Firmographics

I'd like to first ask a few questions about you and your company.

I1. What is your role within the company? **[DO NOT READ LIST, SELECT ALL THAT APPLY]**

1. (Owner)
2. (Technician/installer)
3. (Sales representative)
4. (Marketing manager)
5. (Office manager)
6. (Finance manager/controller)
7. (Other **[SPECIFY: _____]**)

98. (Don't know)
99. (Refused)

I2. How long have you been in that role for this company?

1. Record response **[SPECIFY NUMBER OF YEARS OR MONTHS]**

I3. How long has the company been in business?

1. Record response **[SPECIFY NUMBER OF YEARS OR MONTHS]**

I4. How many employees do you have at this location?

1. Record response **[NUMERICAL]**

J. Engagement

This next set of questions are about your involvement with the program.

J1. How did your company hear about Rocky Mountain Power's Home Energy Savings Program?

1. Record response **[SPECIFY]**

J2. How long has your company been involved with this program?

1. Record response **[SPECIFY NUMBER OF YEARS OR MONTHS]**

J3. Approximately what percentage of your residential customers receive service from Rocky Mountain Power?

1. Record response **[SPECIFY PERCENTAGE]**

J4. What percentage of those customers buy equipment that is eligible for the Home Energy Savings Program's HVAC rebates?

1. Record response **[SPECIFY PERCENTAGE]**

J5. I'm going to read the list of equipment and products eligible for the Home Energy Savings Program incentives. Please tell me whether your company installs these types of equipment or products. **[READ LIST, MARK 1 FOR YES OR 0 FOR NO]**

1. Central air conditioning
2. Ductless heat pumps
3. Ducted heat pumps
4. Ground source heat pumps
5. Evaporative coolers
6. Heat pump water heaters
7. Efficient gas furnace with ECM
8. Insulation or windows
9. Duct sealing and insulation
10. Smart thermostats
11. Any other measures? **[SPECIFY: _____]**
98. Don't know
99. Refused

[IF J5 = "NO" FOR ANY MEASURE, ASK, AND REPEAT FOR MULTIPLE "NO" RESPONSES]

J6. If a customer asks for ***[MEASURE FROM J5]***, do you refer them to a company who sells that product?

1. Yes **[IF WILLING, SPECIFY REFERRAL COMPANY/RETAILER: _____]**
2. No
98. Don't know
99. Refused

J7. Have you received any formal or informal training from HES program implementation staff in the past three years?

1. Yes **[SPECIFY: PLEASE DESCRIBE THE TRAINING(S)]**
2. No **[SKIP TO SECTION K]**
3. I did not receive training but our staff did **[SPECIFY: PLEASE DESCRIBE THE TRAINING(S)]** **[SKIP TO SECTION K]**

[ASK IF J7= 1]

J8. How useful was the training in providing the information you needed? **[READ LIST 1-4]**

1. Very useful
2. Somewhat useful
3. Not too useful
4. Not at all useful

98. (Don't know)
99. (Refused)

[ASK IF J8 = 3 OR 4]

J9. Do you have any recommendations for improving the training you received?

1. Record response **[SPECIFY: _____]**

K. Marketing to Customers

Now we'd like to ask about your company's marketing tactics and materials.

K1. What are the primary ways that customers learn about your business? **[DO NOT READ LIST; PROBE AND RECORD MULTIPLE RESONSES]**

1. Word of mouth
2. Program website
3. Trade ally's website
4. Contractor referral website(s) (i.e., Angie's List, Home Advisor)
5. Print ads
6. Billboards
7. Radio ads
8. TV ads
9. Home shows, customer-facing events
10. Social media (Facebook, Twitter)
11. Other **[SPECIFY:_____]**

98. (Don't know)
99. (Refused)

K2. Do you use Home Energy Savings Program materials such as the incentive overview flier or the incentive application to market program offerings?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[IF K2= 2]

K3. Why don't you use the program materials or application form to market the program to customers?

1. Record response **[SPECIFY REASON]**

[IF K2= 1]

K4. Which materials do you use most?

1. Record response **[SPECIFY MATERIALS]**

[IF K2= 1]

K5. How useful are these materials to you in upselling customers to select high efficiency equipment? Would you say… **[READ LIST 1-4]**

1. Very useful
2. Somewhat useful
3. Not too useful
4. Not at all useful
98. (Don't know)
99. (Refused)

[IF K5= 2, 3, OR 4]

K6. How could Rocky Mountain Power improve its marketing materials and help you make more high-efficiency sales?

1. Record response: **[SPECIFY HOW]**

K7. How often do you promote the Home Energy Savings Program to customers in Rocky Mountain Power's service territory? **[READ LIST 1-5]**

1. All the time
2. Frequently
3. Sometimes
4. Seldom
5. Never
6. It depends **[ASK TO ELABORATE]**
98. (Don't know)
99. (Refused)

[ASK IF K7=1, 2]

K8. What are the primary ways you promote the Home Energy Savings Program to your Rocky Mountain Power customers? **[DO NOT READ LIST; PROBE AND RECORD MULTIPLE RESONSES]**

1. (Customer calls my business to inquire)
2. (During a scheduled service call to the customer's home)
3. (Email)
4. (Home show)
5. (Mail flyers or brochures)
6. (Radio)
7. (Outbound sales call)
8. (TV)
9. (Word-of-mouth/Referrals from other customers)
10. (Other) [SPECIFY_____]

98. (Don't know)
99. (Refused)

[ASK IF K7= 3, 4, 5]

K9. Why don't you promote the program more often? **[DO NOT READ LIST, PROBE FOR MULTIPLE RESPONSES]**

1. Not confident about the details of the programs or who is eligible
2. Most of my customers are not in Rocky Mountain Power territory
3. Too much paperwork
4. Don't like the equipment or products that are eligible for the program
5. Too much of a financial risk for me or my customers
6. Too time consuming
7. Other **[RESPONSE: _____]**

98. (Don't know)
99. (Refused)

K10. What are the types of customers who purchase high efficiency equipment?

1. **[RECORD RESPONSE, PROBE FOR BUDGET, HOMEOWNERSHIP, YEARS IN HOME, AGE OF OLD EQUIPMENT**]

L. Market and Participation Barriers

These next questions are about any barriers you see to your company and your customers' participation in the Home Energy Savings Program.

L1. What percentage of your service territory is considered rural versus urban?

1. **[RECORD RESPONSE**]

[if L1>0%]

L2. Do you promote the Home Energy Savings Program differently to your rural customers?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[IF L2=1]

L3. How so? **[SPECIFY, RECORD RESPONSE]**

L4. What could Rocky Mountain Power do to help you increase program awareness or activity among all your customers?

1. Record response **[SPECIFY, PROBE FOR MORE THAN ONE SUGGESTION]**

L5. In 2015 and 2016, how often did you or someone on your staff assist the customer in completing the incentive application? Would you say… **[READ LIST 1-5]**

1. All the time
2. Frequently
3. Sometimes
4. Seldom
5. Never
98. (Don't know)
99. (Refused)

[IF L5= 1, 2, 3, OR 4]

L6. Did you encounter challenges with the incentive application in 2016?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[IF L6=1]

L7. How often did you run into challenges with the incentive application process in 2015 and 2016? **[READ LIST 1-5]**

1. All the time
2. Frequently
3. Sometimes
4. Seldom
5. Never
98. (Don't know)
99. (Refused)

[IF L7= 1, 2, 3]

L8. What were your most frequent challenges with the incentive application process? **[DO NOT READ LIST; PROBE AND RECORD MULTIPLE RESONSES]**

1. Equipment eligibility requirements are unclear
2. Too much information required
3. Too many supporting documents required (e.g., energy savings calculations, contractor invoices)
4. Takes too much time
5. Too many requirements for eligible equipment
6. Difficult to get a hold of program staff when I had questions
7. Other **[RESPONSE: _____]**

98. (Don't know)
99. (Refused)

M. Satisfaction

My last set of questions are about your satisfaction with the program and its components.

M1. Have you used the online application form?

1. Yes
2. No

98. (Don't know)
99. (Refused)

[IF M1= 1]

M2. How satisfied were you with the online application form? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

[if M2>2]

M3. How could Rocky Mountain Power improve the online application form?

1. Record response **[SPECIFY: _____]**

Thank you. I'm now going to ask you about your satisfaction with several aspects of the program in 2015 and 2016. Respond as "not applicable" if you are not familiar with this program aspect.

[REPEAT SCALE, RECORD RESPONSES FOR EACH; 98 FOR DK/NA]

M4. With the rebate application process, were you:

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

M5. With the variety of incentives available, were you:

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

M6. With the incentive levels offered, were you:

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

M7. With the support you receive from program staff, were you:

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

M8. With the program overall, were you:

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied

[if M4>2 or M5>2 or M6>2 or M7>2 or M8>2, repeat if more than one instance]

M9. **WHAT IS THE REASON YOU GAVE THIS RATING FOR THE *[PROGRAM ASPECT FROM 0 OR M5 OR M6 OR M7 OR M8]?***

1. Record response **[SPECIFY: _____]**

[if 0>2 or M5>2 or M6>2 or M7>2 or M8>2, repeat if more than one instance]

M10. **HOW COULD ROCKY MOUNTAIN POWER IMPROVE YOUR SATISFACTION WITH THE *[PROGRAM ASPECT FROM 0 OR M5 OR M6 OR M7 OR M8]***?

1. Record response **[SPECIFY: _____]**

N. Conclusion and Gift Card Information

Thank you for answering these questions about your experience with the Home Energy Savings Program. I just have a few final questions so I can send you your $50 gift card.

N1. I would like to confirm your name and address so that we can send you the card. **[READ NAME AND STREET ADDRESS] IS** this alright, or is there a different address where we should send the gift card?

1. Yes
2. No **[SPECIFY: _____]**
98. (Don't know)
99. (Refused)

N2. Do you have any other comments or questions for Rocky Mountain Power at this time? **[OPEN-ENDED, PROBE FOR SPECIFICS]**

1. **[RECORD VERBATIM: _____]**
98. (Don't know)
99. (Refused)

This completes the survey. Your gift card should arrive within 4 weeks. If you would like, you can take down the project manager's name and number if you don't receive the card by then, or if you have any questions. You can call Kari Heinrich, Cadmus, at 608-807-2349.

We appreciate your participation and thank you for your time. Have a good **[EVENING/DAY]**.

Appendix B. Lighting Impacts

This appendix contains further details on the following lighting topics, as introduced in the report's main body:

1. Delta Watts
2. Demand Elasticity Modeling

Where applicable, Cadmus followed the Uniform Methods Protocol for lighting impact evaluations.[1]

Delta Watts Lumen Bins

Table B1 through Table B6 provide lumen bins by the lamp types applied in the gross evaluated lighting evaluation (e.g., CFLs, LEDs, light fixtures). The tables include evaluated baseline wattages by year and by total lamp quantities sold in 2015–2016.

Table B1. Lumen Bins and Quantities for Standard Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
0–309	25	0
310–449	25	236
450–799	29	5,088
800–1,099	43	101,135
1,100–1,599	53	10,935
1,600–1,999	72	8,563
2,000–2,600	72	0

Table B2. Lumen Bins and Quantities for Globe Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
250–349	25	118
350–499	29	541
500–574	43	21
575–649	53	87
650–1,099	72	135
1,100–1,300	72	0

[1] Available online at: http://www1.eere.energy.gov/wip/pdfs/53827-6.pdf

Table B3. Lumen Bins and Quantities for Decorative Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
70–89	10	8
90–149	15	0
150–299	25	546
300–499	29	1,061
500–699	43	0

Table B4. Lumen Bins and Quantities for EISA-Exempt Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
310–449	25	0
450–799	40	0
800–1,099	60	0
1,100–1,599	75	0
1,600–1,999	100	3
2,000–2,600	150	49

Table B5. Lumen Bins and Quantities for D > 20 Reflector Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
300–639	30	244
640–739	40	1,112
740–849	45	623
850–1,179	50	12
1,180–1,419	65	395
1,420–1,789	75	0
1,790–2,049	90	0
2,050–2,579	100	0
2,580–3,429	120	0

Table B6. Lumen Bins and Quantities for BR30, BR40, ER40 Reflector Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
300–399	30	13
400–449	40	0
450–499	45	28
500–649	50	113
650–1,179	65	5,635
1,180–1,419	65	18
1,420–1,789	75	48
1,790–2,049	90	0
2,050–2,579	100	0
2,580–3,429	120	0

Watts vs. Lumen ENERGY STAR Linear Fits

Figure B1 through Figure B8 show watts versus lumens from the ENERGY STAR database for eight different lamp categories, representing standard, reflector, and specialty LED and CFL lamps. When lumens could not be determined for a particular bulb model, Cadmus used these linear fits to obtain that bulb's lumen output.

Figure B1. Median Lumens vs. Wattage for ENERGY STAR-Qualified Standard CFLs

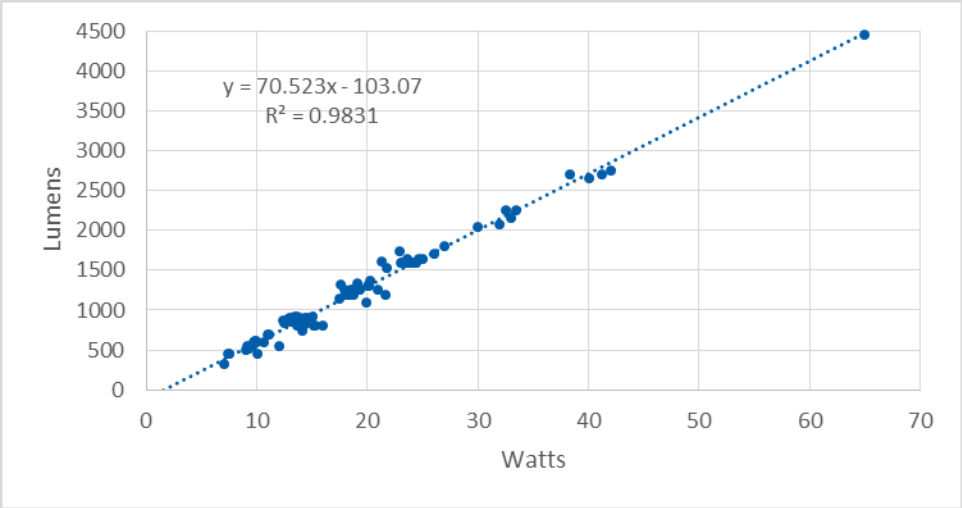


Figure B2. Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector CFLs

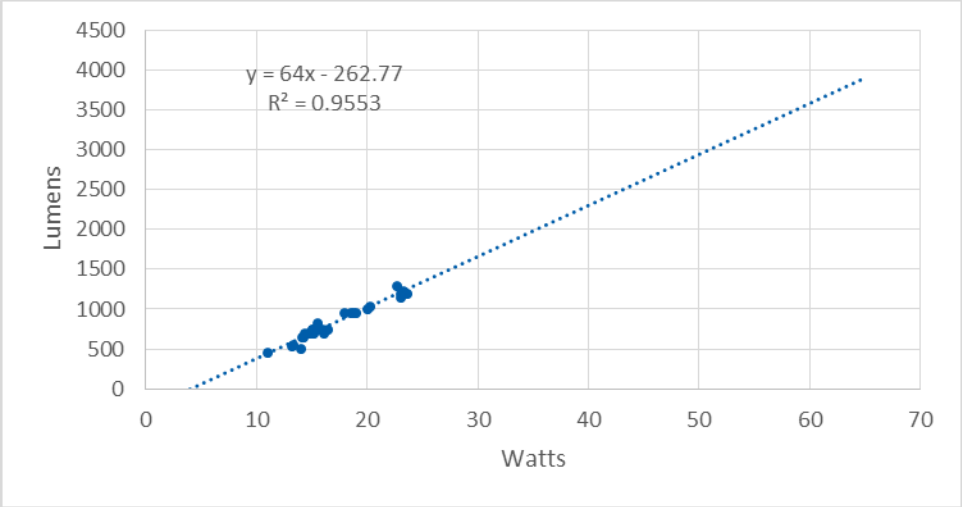


Figure B3. Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty CFLs

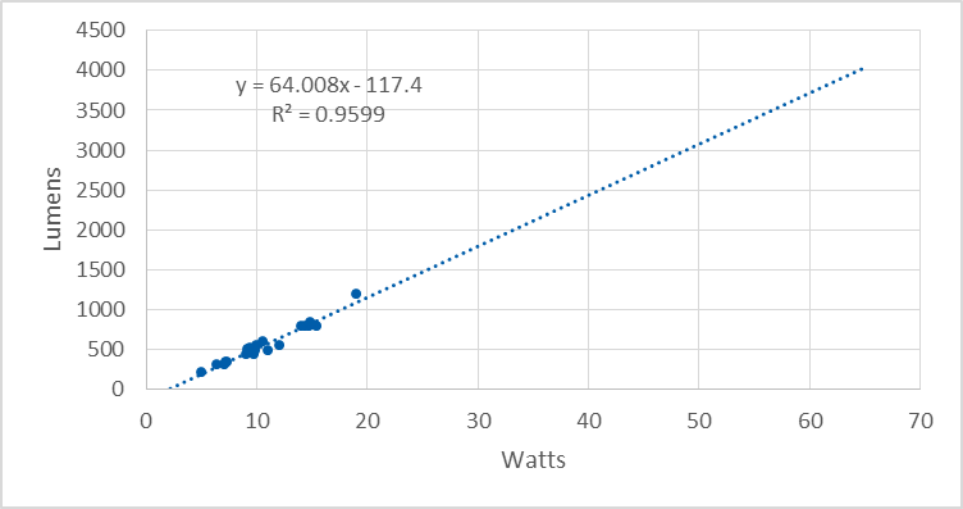


Figure B4. Median Lumens vs. Wattage for ENERGY STAR-Qualified CFL Fixtures

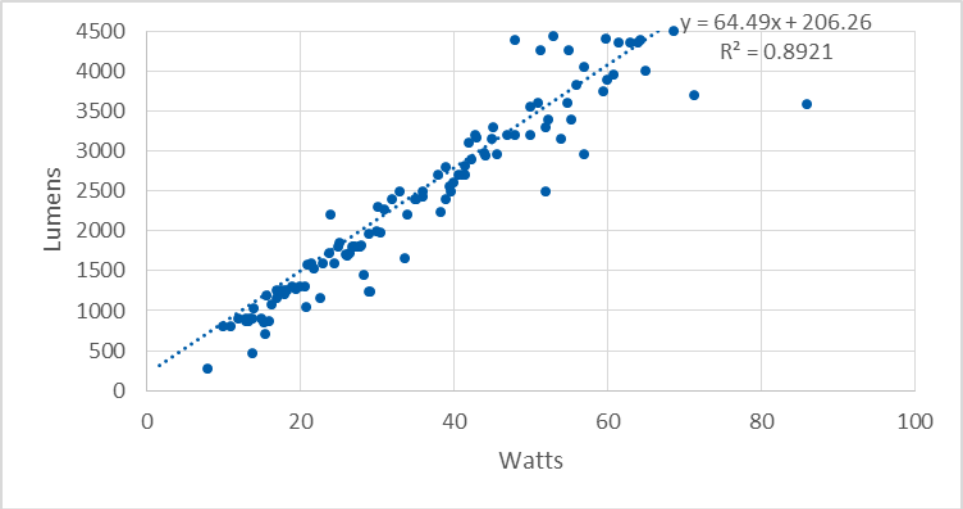


Figure B5. Median Lumens vs. Wattage for ENERGY STAR-Qualified Standard LEDs

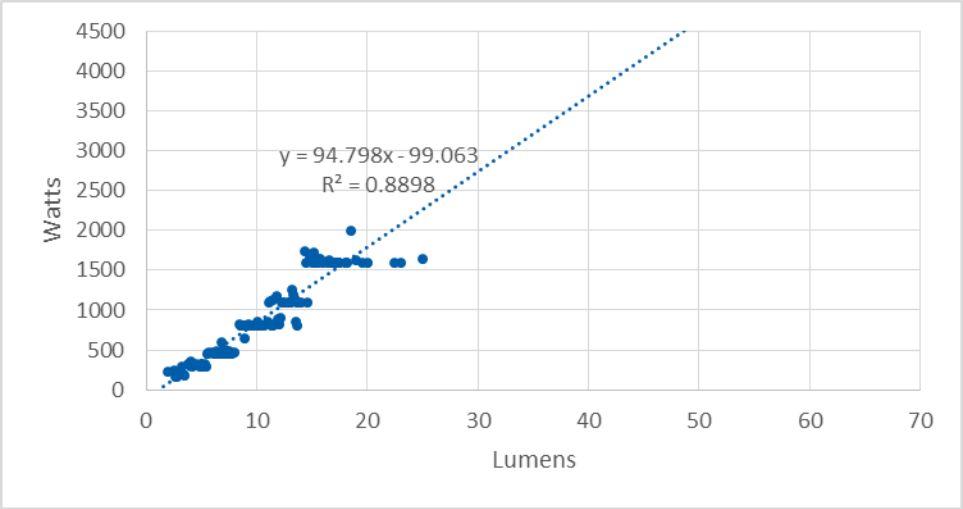


Figure B6. Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector LEDs

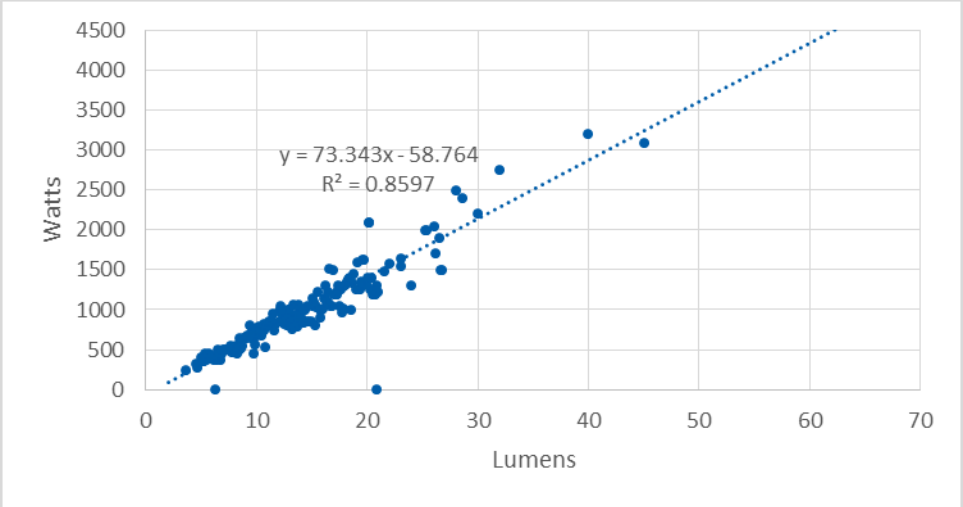


Figure B7. Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty LEDs

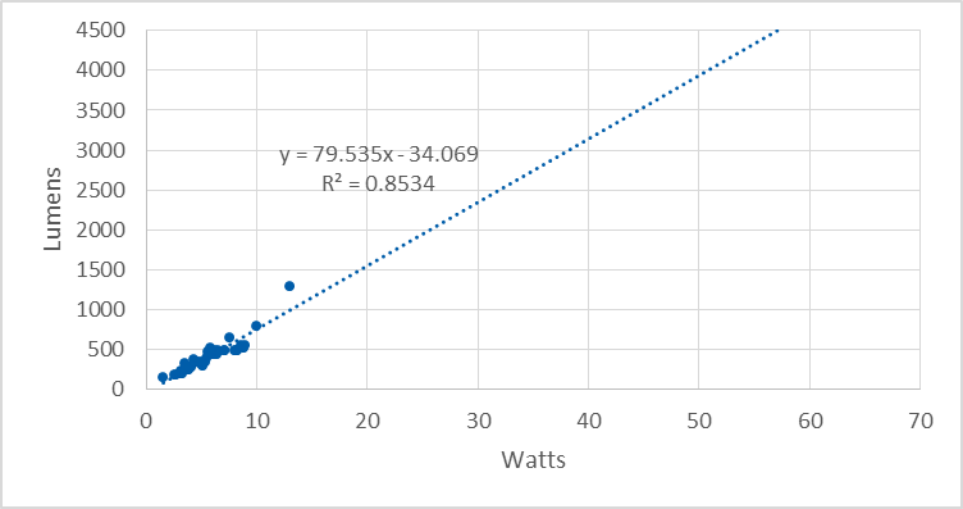
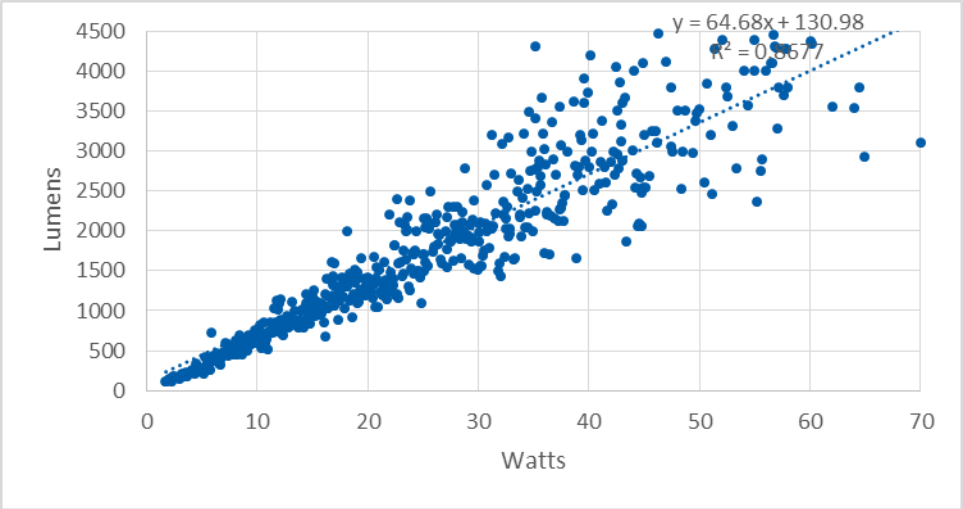


Figure B8. Median Lumens vs. Wattage for ENERGY STAR-Qualified LED Fixtures



Demand Elasticity Modeling

As lighting products incur price changes and promotions 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 2015 and 2016. The following description details the methodology and analysis results.

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 buydown 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)
- Estimate freeridership by comparing modeled baseline sales with predicted program sales

After estimating variable coefficients, Cadmus used the resulting model to predict the following:

- Sales that would occur *without* the program's price impact
- 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 multiplied predicted bulb sales by evaluated savings values, calculated through this evaluation to estimate program savings and savings without the program's price impact.

Input Data

As the demand elasticity approach relies exclusively on program data, a model's robustness depends on data quality. The sales and pricing data provided for the 2015 and 2016 program years were sufficient and improved from previous program years.

Price Variation

Price and sales variations were measured across all bulbs within a given retail location and bulb type category by taking the sales-weighted average price per bulb for all products within the retail location and the bulb category and the sum of bulb sales with the retailer/bulb category designations. For example, all 60-watt incandescent-equivalent general purpose LEDs within a specific Wal-Mart storefront location were combined into one category, regardless of manufacturer or pack size. Each monthly observation in the data reflected the average price per-bulb and the total bulb sales within that specific location.

Defining these cross-sections for the model increased the observed variation levels in price and sales by not only capturing changes in a product's own price (for a given bulb model number) but also changes in the bulb's average price due to changes in pack size (e.g., a three-pack is introduced and displaces single-pack bulb sales, thus lowering the average price per bulb) or the introduction of new, comparable products to the program.

Table B7 shows the representativeness of data included in the model for each year as well as data combined for the evaluation cycle.

Table B7. Share of Sales Represented in Model

Year	Bulb Type	Total Sales	Share Represented by Year	Share Represented Combined
2015	CFL	86,823	78%	79%
2016	CFL	13,558	85%	
2015	LED	15,623	44%	67%
2016	LED	13,578	94%	

In both years and across both technologies, sales included in the model used to estimate elasticities represented a majority of sales. Representativeness for CFLs remained consistently high across 2015 and 2016. Representation for LEDs increased significantly in 2016.

Promotional Displays

The program administrator did 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.[2]

Evaluations in other jurisdictions have found that product merchandising can generate sales lift between 60% and 120%. Capturing and providing this detail level ensures that the program receives credit for all activities. Capturing which products are displayed or featured in each store location would provide the best opportunity to capture these impacts. Cadmus recommends collecting and providing these data for future evaluations.

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 time fixed-effects in the model. These fixed effects were unique to each retail channel and represented differences from average monthly sales within each retail channel.

Historically, Cadmus has used a seasonal trend derived from national sales from a major lighting products manufacturer for comparing program sales with the expected share of annual sales to occur within each month. As shown in Figure 9 and Figure 10, however, neither LED nor CFL sales followed the expected seasonal pattern, with a large peak in March and August 2015 and much smaller peaks during the same months in 2016. Interestingly, CFL prices peaked in 2015 during March, which coincided with

[2] To the degree that product merchandising and prices co-vary, elasticity estimates may capture some sales lift generated by merchandising. As data, however, were not available for incorporation into the model, separate impacts could not be estimated.

the largest sales peak. Nothing in the provided tracking data indicated the program drove the March 2015 increase in sales.

Both technologies exhibited the highest sales in June 2015, with sales tapering off and achieving much smaller peaks in fall 2015. CFL sales dropped sharply in 2016, and price changes did not correspond with sales changes through 2016.

LED sales also peaked in March 2015, which again coincided with an increase in the observed prices, and were much lower in 2016 until October, though prices again increased as sales increased.

Ultimately, including the seasonal sales trend from the national retailer produced positive elasticities for CFLs, leading to extreme negative net-to-gross estimates. Given this result and the atypical monthly sales pattern observed, the seasonal trend provided by the national retailer did not serve as an appropriate control in the model, and Cadmus opted for the time fixed-effects.

In addition to the fixed-effects, Cadmus added dummy variables for specific months, retailers, and bulb types where anomalous changes in sales were observed. These changes were unrelated to any program activity Cadmus observed in the data. Therefore, the dummy variables absorbed impacts from these events as to not bias the price elasticities.

Figure 9. CFL Sales and Prices by Month

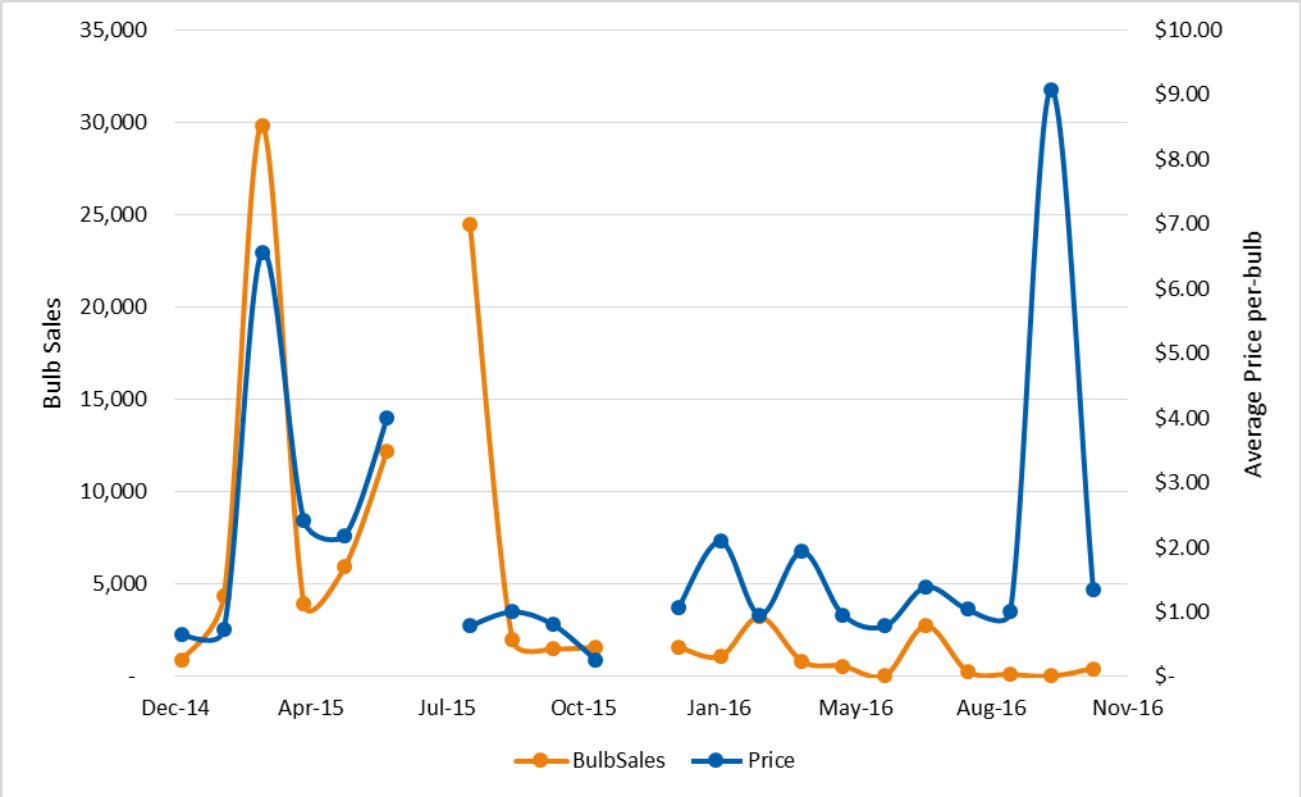
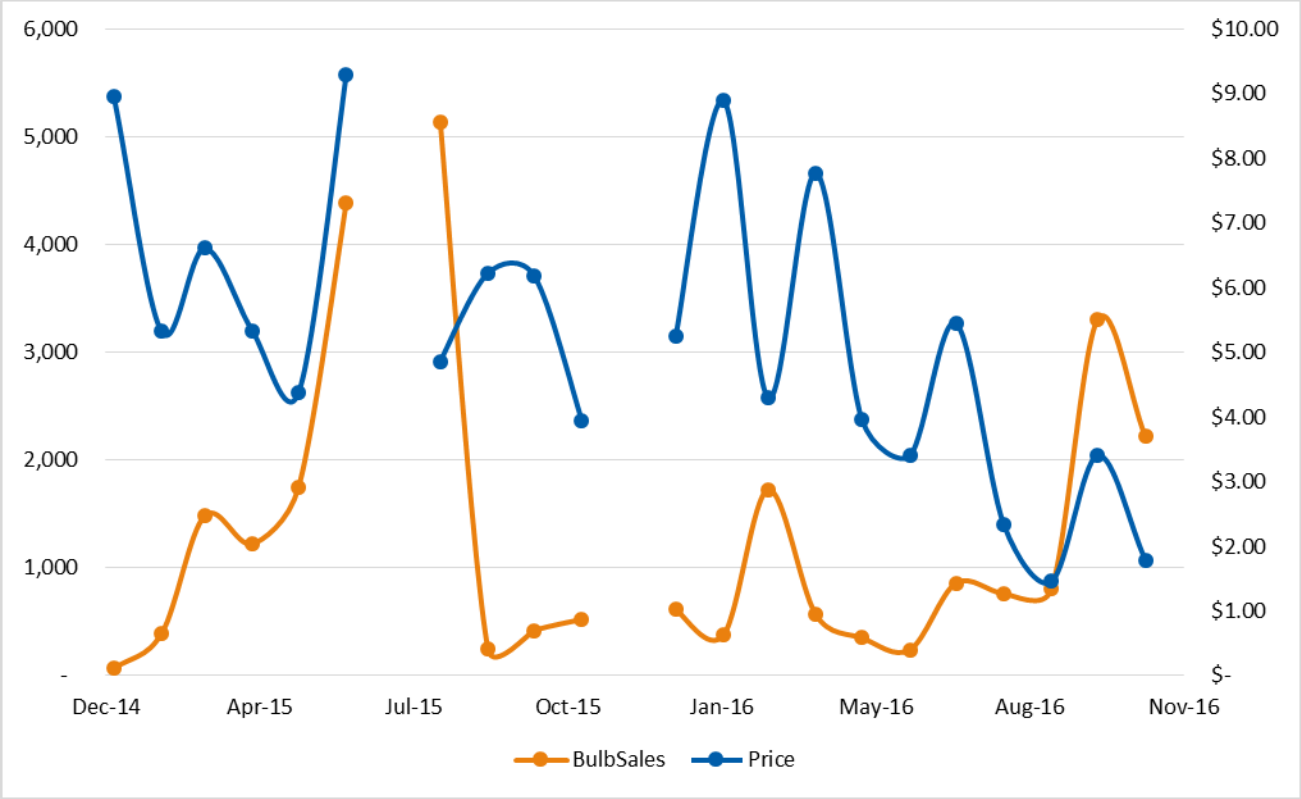


Figure 10. LED Sales and Prices by Month



Model Specification

Cadmus modeled bulb, pricing, and promotional data using an econometric model that addressed 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. Cadmus, however, analyzed the 2015 and 2016 data separately, producing two similar—though distinct—models. This involved testing a variety of specifications to ascertain price impacts (i.e., the main instrument affected by the program) on bulb demand.

Cadmus estimated the following equation for the 2015 model (for bulb model *i*, in month *t*):

$$\ln(Q_{it}) = \sum_{\pi}(\beta_{\pi} ID_{\pi,\mathrm{i}}) + \sum_{\theta}\left(\beta_{\theta,i,j}\left[ln(P_{it}) * (Retail\ Channel_{\theta,\mathrm{i}}) * (Bulb\ Category_{\theta,\mathrm{j}})\right]\right) + \sum_{\theta}\left(\beta_{ti}\left[Sales\ Month_t * (Retail\ Channel_{\theta,\mathrm{i}})\right]\right) + \beta_3 * LED * \mathrm{Retailer}_i \mathrm{Month}_t + \varepsilon_i + \gamma_t$$

Where:

ln	=	Natural log
Q	=	Quantity of bulbs sold during month *t*
P	=	Sales-weighted retail price per-bulb (after markdown) in month *t*
Retail Channel	=	Retail category (Club, DIY, Mass Market)
$Retailer_iMonth_t$	=	Dummy variable indicating an anomalous sales event for retailer *i* in month *t*; 0 otherwise
LED	=	Dummy variable equaling 1 if a product is an LED bulb; 0 otherwise
ID	=	Dummy variable equaling 1 for each unique retail channel, bulb technology, and bulb category; 0 otherwise
ε_i	=	Cross-sectional random-error term
γ_t	=	Time series random-error term

Due to slight differences in the 2016 model, Cadmus estimated elasticities within each retail channel separately (rather than estimating price elasticities separately within each retail channel, technology, and bulb type combination). The evaluation added a partial slope term for LED bulbs and standard, general-service bulbs. Partial slope terms measured the average incremental change in slope across all bulbs and *across* retail channels rather than *within* them.

Cadmus estimated the following equation for the 2016 model (for bulb model *i*, in month *t*):

$$\ln(Q_{it}) = \sum_{\pi}(\beta_{\pi} ID_{\pi,\mathrm{i}}) + \sum_{\theta}\left(\beta_{\theta,i,j}\left[ln(P_{it}) * (Retail\ Channel_{\theta,\mathrm{i}})\right]\right) + \sum_{\theta}\left(\beta_{ti}\left[Sales\ Month_t * (Retail\ Channel_{\theta,\mathrm{i}})\right]\right) + \beta_{i,t} * Retailer_i Month_t + \beta_3\ ln(P_{it}) * LED + \varepsilon_i + \gamma_t$$

Where:

ln	=	Natural log
Q	=	Quantity of bulb packs sold during the month
P	=	Sales-weighted retail price per-bulb (after markdown) in month t
Retail Channel	=	Retail category (Club or non-Club store)
LED	=	Dummy variable equaling 1 if a product is an LED bulb; 0 otherwise

Retailer*i*Month*t* = Dummy variable indicating an anomalous sales event for retailer i in month t; 0 otherwise[3]

ID = Dummy variable equaling 1 for each unique retail channel, bulb technology, and bulb category; 0 otherwise

ε_i = Cross-sectional random-error term

γ_t = Time series random-error term

The model specification assumed a negative binomial distribution, which provided accurate predictions for a small number of high-volume sale bulbs (assuming that a normal distribution would underestimate these).

Using the following criteria, Cadmus ran numerous model scenarios to identify the best parsimony and explanatory power:

- Model coefficient p-values (keeping values less than <0.1)[4]
- Explanatory variable cross-correlation (minimizing where possible)
- Model Akaike's Information Criteria (AIC) (minimizing between models)[5]
- Minimizing multicollinearity
- Optimizing model fit

Overall, the model predicted sales within 7% of actual bulb sales over the evaluation period.

Findings

Cadmus estimated combined CFL and LED freeridership of 58%. Table B8 shows the estimated freeridership ratio by bulb type. LEDs had slightly lower freeridership than CFLs.

Table B8. Modeling Results by Bulb Type

Bulb Type	Freeridership	NTG*
CFLs	57%	43%
LEDs	61%	39%
All Bulbs	**58%**	**42%**

[3] In 2016, four anomalous sales events produced sales much greater or fewer than expected; these did not correspond with typical seasonality or program activity. Therefore, dummy variables absorbed these effects rather than attributing them to the program.

[4] Where a qualitative variable had many states (such as bulb types), Cadmus did not omit variables if one state's proved insignificant; rather, the analysis considered the joint significance of all states.

[5] Cadmus used AIC to assess model fit, as nonlinear models did not define the R-square statistic. AIC also offered a desirable property, given it penalized overly complex models (similarly to the adjusted R-square).

Table B9 shows the incentive as a share of the original retail price and the estimated freeridership ratio, by bulb type. Typically, the proportional price reduction and net of freeridership trend correlate: the higher the incentive, the lower the freeridership. For CFLs, however, this was not the case. Markdowns increased from 2015 to 2016, but freeridership also increased, possibly due to an increased focus on LEDs and falling LED prices. Conversely, LED markdowns decreased from 42% to 30% and freeridership increased.

Table B9. Modeling Results by Bulb Type

Year	Technology	Final Price per Bulb	Original Price per Bulb	Markdown %	Freeridership
2015	CFL	$ 3.39	$ 4.29	21%	54%
	LED	$ 5.70	$ 9.81	42%	57%
2016	CFL	$ 1.52	$ 2.09	27%	75%
	LED	$ 3.77	$ 5.39	30%	65%

Elasticities

Freeridership ratios derive from an estimate of price elasticities of demand, which measures the percentage change in the quantity demanded, given a percentage change in price. Due to the model's logarithmic functional form, elasticities were simply the estimated coefficients for each price variable. In previous, similar analyses, elasticities typically ranged from -1 to -3 for CFLs and LEDs, meaning a 10% drop in price led to a 10% to 30% increase in the quantity sold.

As shown in Table B10, elasticity estimates for 2015 and 2016 fell a bit below the expected ranges, with most estimates less than one.

Table B10. Elasticity Estimates by Retail Channel and Bulb Type

Year	Channel	Technology	Average Elasticity
2015	Club	CFL	-0.87
		LED	-1.06
	DIY	CFL	-0.74
		LED	-0.74
	Mass Market	CFL	-1.04
		LED	-0.98
2016	Club	CFL	-1.43
		LED	-1.71
	DIY	CFL	-0.58
		LED	-0.87
	Mass Market	CFL	-0.67
		LED	-0.96

CADMUS

Appendix C. HES Billing Analysis

Cadmus conducted two billing analyses to estimate evaluated savings for the following measures:

- Insulation (attic, wall, or floor)
- Ductwork (duct sealing and/or duct insulation)

The following sections outline the methodology and results for each effort.

Insulation Billing Analysis

Cadmus conducted billing analysis to assess evaluated energy savings associated with insulation measure installations.[1] Cadmus determined the savings estimate using a pooled, conditional savings analysis (CSA) regression model, which included the following groups:

- 2015–2016 insulation participants (combined attic, wall, and floor insulation)
- Nonparticipant homes, serving as the comparison group

The billing analysis resulted in a 155% evaluated realization rate for insulation measures.

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 91,000 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 as many nonparticipants as participants.
- ***Billing data***, provided by Rocky Mountain Power, included all Idaho residential accounts. Cadmus matched the 2015–2016 participant program data to the census of Idaho's billing data for participants installing only insulation measures (i.e., not installing other measures through HES). Billing data included meter-read dates and kWh consumption from January 2014 through May 2017. The final sample used in the billing analysis consisted of 15 participants and 60 control customers.
- ***Idaho weather data***, including daily average temperatures from January 2014 to May 2017 for one weather station, corresponded with HES participant locations.

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

Cadmus matched participant program data with billing data, mapping daily heating degree days (HDD) and cooling degree days (CDD) to respective monthly read-date periods using zip codes. Cadmus defined the billing analysis pre-period as 2014, before measure installations occurred. This meant defining the post-period as June 2016 through May 2017.[2]

Data Screening

To ensure the final model used complete pre- and post-participation and nonparticipant billing data, Cadmus selected accounts meeting the following conditions:

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).
3. More than 5,939 kWh per year or less than 33,825 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).
6. Participants installing other measures through the HES program.

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.

[2] As participants installing measures in mid-late 2016 had less than 10 months of post-period data, the analysis excluded them. Similarly, the analysis excluded customers participating in 2015 with measure installation dates before November 2014 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			91,396	27
Match the 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).	64,222	-	27,174	27
Reject accounts with less than 300 days in the pre- or post-period	11,729	10	15,445	17
Reject accounts with less than 5,939 kWh or more than 33,825 kWh in the pre- or post-period	3,137	-	12,308	17
Reject accounts with consumption changing by more than 50%	516	-	11,792	17
Reject accounts with expected savings over 70% of pre-period consumption	-	-	11,792	17
Reject participant accounts that received other measures through the HES program	-	1	11,792	16
Reject accounts with billing data outliers, vacancies, and seasonal usage	254	1	11,538	15
Nonparticipant sample selection (random sample of nonparticipants to match participant pre-period usage by quartile; four times more than participants)	11,478	-	60	15
Final Sample			***60***	***15***

Regression Model

After screening and matching accounts, the final analysis group consisted of 15 participants and 60 nonparticipants.

For the final sample, 87% of participant homes installed attic insulation, 20% installed wall insulation, and 7% 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:

$$ADC_{it} = \alpha_i + \beta_1 HDD_{it} + \beta_2 CDD_{it} + \beta_3 PARTHDD_{it} + \beta_4 PARTCDD_{it} + \beta_5 POST_t + \beta_6 POSTHDD_{it} + \beta_7 POSTCDD_{it} + \beta_8 PARTPOST_{it} + \beta_9 PARTPOSTHDD_{it} + \beta_{10} PARTPOSTCDD_{it} + \varepsilon_{it}$$

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)
PARTHDD_{it}	=	Interaction of the participant indicator and average daily HDDs (base 65)
$PARTCDD_{it}$	=	Interaction of the participant indicator and average daily CDDs (base 65)
$POST_t$	=	Indicator variable of 1 in the post-period for participants and nonparticipants, 0 otherwise
$POSTHDD_{it}$	=	Indicator variable of 1 in the post-period for participants and nonparticipants interacted with average daily HDDs (base 65), 0 otherwise
$POSTCDD_{it}$	=	Indicator variable of 1 in the post-period for participants and nonparticipants interacted with average daily CDDs (base 65), 0 otherwise
$PARTPOST_{it}$	=	Indicator variable of 1 in the post-period for participants, 0 otherwise
$PARTPOSTHDD_{it}$	=	Indicator variable of 1 in the post-period for participants interacted with average daily HDDs (base 65), 0 otherwise
$PARTPOSTCDD_{it}$	=	Indicator variable of 1 in the post-period for participants interacted with average daily CDDs (base 65), 0 otherwise

$\beta_8, \beta_9, \beta_{10}$ are the key coefficients determining average insulation savings. The coefficients obtain insulation savings per program participant, normalizing the heating and cooling savings to TMY3 normal weather after accounting for nonparticipant trends. Thus, the final insulation savings estimate is:

$$\beta_8 * 365 + \beta_9 * 7701 + \beta_{10} * 314$$

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.[3]

Insulation Results

Cadmus estimated overall insulation savings of 2,589 kWh per participant. Average insulation exhibited expected savings of 1,672 kWh, translating to a 155% evaluated realization rate for insulation measures. With average participant pre-usage of 18,735 kWh, savings represented a 14% reduction in total energy

[3] 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.

usage from insulation measures installed. Table C2 presents the overall evaluated savings estimate for wall, floor, and attic insulation.

Table C2. Insulation Evaluated Realization Rates

Model	Billing Analysis Participant (n)	Reported kWh Savings per Premise	Evaluated kWh Savings per Premise	Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall*	**15**	**1,672**	**2,589**	**155%**	**±52%**	**75%–235%**
Electric Heat	14	1,790	2,730	152%	±50%	76%–229%

*Overall model includes electric and gas heat; gas heat could not be split out due to the small sample size.

Cadmus used the overall Idaho model results above, but provided results for electric heat participants.

Overall, electrically heated homes achieved insulation savings of 2,730 kWh per home. Expected average electrically heated insulation savings were 1,790 kWh, translating to a 152% evaluated realization rate. With average electrically heated participant pre-usage of 19,608 kWh, savings represented a 14% reduction in energy usage from insulation measures.

Because of small sample size (n=1), Cadmus could not obtain reliable savings estimates for gas-heated homes.

Table C3 and Table C4 summarize model outputs for the regression model Cadmus used to determine 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	10	321,713	32,171	94.8	<.0001
Error	1,802	611,543	339.3693		
Corrected Total	1,812	933,257			
Root MSE		18.4220	R-Square		0.3447
Dependent Mean		0.0000	Adj. R-Square		0.3447
Coefficient of Variation		-1.05E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
AvgHDD	1	1.0039	0.0664	15.12	<.0001
AvgCDD	1	3.0977	0.4843	6.40	<.0001
PartHDD	1	0.6923	0.1371	5.05	<.0001
PartCDD	1	0.1081	1.1146	0.10	0.9228
Post	1	-2.3839	2.4182	-0.99	0.3243
PostHDD	1	-0.0157	0.0890	-0.18	0.8603
PostCDD	1	0.5738	0.7259	0.79	0.4294
PartPost	**1**	**4.8932**	**5.2493**	**0.93**	**0.3514**
PartPostHDD	**1**	**-0.5317**	**0.1896**	**-2.80**	**0.0051**
PartPostCDD	**1**	**-0.8926**	**1.6285**	**-0.55**	**0.5837**
Annual Normalized Savings	**1**	**2588.97**	**813.82**	**-3.18**	**0.0015**

Table C4. Insulation Regression Model for Idaho (Electric Heat Model)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	330,667	33,067	97.6	<.0001
Error	1,778	602,392	338.8031		
Corrected Total	1,788	933,059			
Root MSE		18.4066	R-Square		0.3544
Dependent Mean		0.0000	Adj. R-Square		0.3544
Coefficient of Variation		-1.05E+18			
Source	**Parameter Estimates**				
	DF	**Parameter Estimates**	**Standard Error**	**t value**	**Prob. t**
AvgHDD	1	1.0039	0.0663	15.13	<.0001
AvgCDD	1	3.0977	0.4839	6.40	<.0001
PartHDD	1	0.7923	0.1400	5.66	<.0001
PartCDD	1	0.1410	1.1358	0.12	0.9012
Post	1	-2.3839	2.4162	-0.99	0.3239
PostHDD	1	-0.0157	0.0889	-0.18	0.8602
PostCDD	1	0.5738	0.7253	0.79	0.429
PartPost	**1**	**4.9682**	**5.3759**	**0.92**	**0.3555**
PartPostHDD	**1**	**-0.5552**	**0.1939**	**-2.86**	**0.0042**
PartPostCDD	**1**	**-0.8575**	**1.6626**	**-0.52**	**0.6061**
Annual Normalized Savings	**1**	**2730.21**	**836.53**	**-3.26**	**0.0011**

Ductwork Billing Analysis

Cadmus conducted a billing analysis to assess evaluated energy savings associated with duct sealing and insulation measure installations,[4] determining the savings estimate from a pooled, CSA regression model, which included the following groups:

- 2015–2016 ductwork participants (combined duct sealing and duct insulation)
- Nonparticipant homes, serving as the comparison group

The billing analysis resulted in a 45% evaluated realization rate for duct sealing and duct insulation measures. This produced an evaluated result as it compared participant usage trends to a nonparticipant group, accounting for market conditions outside of the program.

[4] Billing analysis performed for customers installing only duct sealing and/or duct insulation measures.

Ductwork 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 source, and expected savings for the entire participant population).
- ***Control group data,*** which Cadmus collected from a census of approximately 91,000 nonparticipating customers in Idaho. This included matching 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, included all Idaho residential accounts. Cadmus matched the 2015–2016 participant program data to the census of billing data for the state (only for participants installing duct sealing and/or duct insulation measures).The data included meter-read dates and kWh consumption from January 2014 through May 2017. The final sample used in the billing analysis consisted of 200 participants and 800 control customers.
- ***Idaho weather data***, including daily average temperatures from January 2014 to May 2017 for one weather station, corresponded with HES participants' locations.

Cadmus matched participant program data with billing data, and mapped HDDs and CDDs to respective monthly read-date periods using zip codes. Cadmus defined the pre-period for the billing analysis as 2014, before any measure installations occurred, and defined the post-period as June 2016 through May 2017.[5]

Data Screening

To ensure the final model used complete pre- and post-participation and nonparticipation billing data, Cadmus selected accounts with the following:

1. Participant addresses matching 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).
3. More than 2,847 kWh per year or less than 34,958 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.

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[5] As participants installing measures in mid-late 2016 had less than 10 months of post-period data, Cadmus removed them from the analysis. Similarly, customers who participated in 2015 with measure installation dates before November 2014 had less than 10 months of pre-period data and were removed from the analysis.

5. Expected savings under 70% of household consumption (accounting for either a mismatch between the participant database and billing data or the pre-period vacancies).
6. Participants installing other measures through the HES program.

Further, Cadmus examined individual monthly billing data to check for vacancies, outliers, and seasonal usage changes. If usage patterns proved inconsistent between the pre- and post-periods, the analysis dropped the accounts. Table C5 shows participant and nonparticipant screening criteria used in the billing analysis.

Table C5. Screen for Inclusion in Billing Analysis

Screen	Attrition		Remaining	
	Nonparticipant	Participant	Nonparticipant	Participant
Original measures database (duct work installations only) and nonparticipant population			90,979	444
Match billing data sample (reduced to nonparticipant, manufactured home residential accounts in participant zip codes; participant accounts that could be matched to the billing data addresses)	76,005	2	14,974	442
Reject accounts with less than 300 days in the pre- or post-period	12,441	216	2,533	226
Reject accounts with less than 2,847 kWh or more than 34,958 kWh in pre- or post-period	139	0	2,394	226
Reject accounts with consumption changing by more than 50%	60	0	2,334	226
Reject accounts with expected savings over 70% of pre-period consumption	0	0	2,334	226
Reject participant accounts that also received other measures through HES program	0	1	2,334	225
Reject accounts with billing data outliers, vacancies, and seasonal usage	204	25	2,130	200
Nonparticipant sample selection (random sample of nonparticipants to match participant pre-period usage by quartile: four times more than participants)	1,330	0	800	200
Final Sample			**800**	**200**

Regression Model

After screening and matching accounts, the final analysis group consisted of 200 participants and 800 nonparticipants.

Cadmus used the following CSA regression specification to estimate duct sealing and duct insulation savings from the HES Program:

$$ADC_{it} = \alpha_i + \beta_1 HDD_{it} + \beta_2 CDD_{it} + \beta_3 PARTHDD_{it} + \beta_4 PARTCDD_{it} + \beta_5 POST_t + \beta_6 POSTHDD_{it} + \beta_7 POSTCDD_{it} + \beta_8 PARTPOST_{it} + \beta_9 PARTPOSTHDD_{it} + \beta_{10} PARTPOSTCDD_{it} + \varepsilon_{it}$$

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)
PARTHDD_{it}	=	Interaction of the participant indicator and average daily HDDs (base 65)
$PARTCDD_{it}$	=	Interaction of the participant indicator and average daily CDDs (base 65)
$POST_t$	=	Indicator variable of 1 in the post-period for participants and nonparticipants, 0 otherwise
$POSTHDD_{it}$	=	Indicator variable of 1 in the post-period for participants and nonparticipants interacted with average daily HDDs (base 65), 0 otherwise
$POSTCDD_{it}$	=	Indicator variable of 1 in the post-period for participants and nonparticipants interacted with average daily CDDs (base 65), 0 otherwise
$PARTPOST_{it}$	=	Indicator variable of 1 in the post-period for participants, 0 otherwise
$PARTPOSTHDD_{it}$	=	Indicator variable of 1 in the post-period for participants interacted with average daily HDDs (base 65), 0 otherwise
$PARTPOSTCDD_{it}$	=	Indicator variable of 1 in the post-period for participants interacted with average daily CDDs (base 65), 0 otherwise

β_8, β_9, β_{10} are the key coefficients determining average duct sealing and insulation savings. The coefficients obtained duct sealing and insulation savings per program participant normalizing the heating and cooling savings to TMY3 normal weather, after accounting for nonparticipant trends. The final duct sealing and insulation savings estimate is thus $\beta_8 * 365 + \beta_9 * 7774 + \beta_{10} * 291$.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.[6]

[6] 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.

Ductwork Results

Cadmus estimated manufactured home duct sealing and duct insulation savings of 1,462 kWh per home. Expected average duct sealing and duct insulation savings were 3,268 kWh[7], translating to a 45% evaluated realization rate for duct sealing and insulation measures. With average participant pre-usage of 16,664 kWh, savings represented a 9% reduction in total energy usage from manufactured home duct sealing and duct insulation measures installed. Table C6 presents the overall savings estimate for manufactured home duct sealing and duct insulation.

Table C6. Manufactured Home Ductwork Evaluated Realization Rates

Model	Billing Analysis Participant (n)	Reported kWh Savings per Premise	Evaluated kWh Savings per Premise	Realization Rate	Relative Precision at 90% Confidence	90% Confidence Bounds
Overall	**200**	**3,268**	**1,462**	**45%**	**±19%**	**36%–53%**
Electric Heat	200	3,268	1,462	45%	±19%	36%–53%

Cadmus used the overall Idaho model results above, but provided results for electric heat participants.

Overall, electrically heated homes achieved duct sealing and duct insulation savings of 1,462 kWh per home. Expected average electrically heated duct sealing and duct insulation savings were 3,268 kWh, translating to a 45% evaluated realization rate. With average electrically heated participant pre-usage of 16,664 kWh, savings represented a 9% reduction in energy usage from manufactured home duct sealing and duct insulation measures.

Table C7 summarizes model outputs for the regression model Cadmus used to determine the Idaho manufactured home duct sealing and duct insulation realization rate.

[7] The 3,268 kWh was unusually high compared to the other states at 20% of the entire pre-period usage.

Table C7. Manufactured Home Ductwork Regression Model for Idaho (Overall + Electric Heat)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	10	6,694,218	669,422	3587.32	<.0001
Error	23,230	4,334,904	186.61		
Corrected Total	23,240	11,029,122			
Root MSE		13.6605	R-Square		0.6070
Dependent Mean		0.0000	Adj. R-Square		0.6070
Coefficient of Variation		-6.87E+18			

Source	Parameter Estimates				
	DF	Parameter Estimates	Standard Error	t value	Prob. t
AvgHDD	1	1.2291	0.0133	92.31	<.0001
AvgCDD	1	1.9246	0.1041	18.48	<.0001
PartHDD	1	0.3014	0.0283	10.64	<.0001
PartCDD	1	-0.1734	0.2293	-0.76	0.4495
Post	1	-1.9932	0.5068	-3.93	<.0001
PostHDD	1	0.0029	0.0182	0.16	0.8729
PostCDD	1	1.2697	0.1904	6.67	<.0001
PartPost	**1**	**-0.0336**	**1.0719**	**-0.03**	**0.975**
PartPostHDD	**1**	**-0.1570**	**0.0390**	**-4.03**	**<.0001**
PartPostCDD	**1**	**-0.7882**	**0.3686**	**-2.14**	**0.0325**
Annual Normalized Savings	**1**	**1461.82**	**165.62**	**-8.83**	**<.0001**

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Appendix D. Self-Reported Net-to-Gross Methodology

Net-to-gross (NTG) estimates provide a critical part of demand-side management (DSM) program impact evaluations as they allow utilities to determine portions of gross energy savings influenced by and attributable to their DSM programs. This evaluation calculated two NTG components: freeridership and participant spillover.

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 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 could gauge net effects for many measures at once, it enabled Cadmus to monitor freeridership and spillover over several evaluation efforts.

Survey Design

Direct questions (for example: "Would you have installed measure X without the program incentive?") tend to result in exaggerated "yes" responses. Participants tend to provide answers that 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 involves 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, Cadmus 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 a scoring approach when estimating freeridership for the kit measure category. After conducting participant surveys with energy-efficient kit recipients, Cadmus used responses from three questions to estimate a freeridership score for each participant. Freeridership questions focused on whether the participant already used the measure in their home and if they planned to purchase the measure before signing up to receive the kit.

For participants receiving energy efficiency kits, Cadmus 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 at the time they signed up for the kit?
3. If the participant planned to purchase the measure before signing up for the kit, in terms of timing, when would they have purchased the CFLs? (For example: at the same time, later but within the same year, or in one year or more?)

Cadmus sought to answer three primary questions using a participant spillover survey design:

1. Since participating in the evaluated program, did participants install additional energy-efficient equipment or services incented through a utility program?
2. How influential was the evaluated program on 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 that addressed 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 the following:

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 addressed each measure (per the survey format):

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 spillover question results to determine whether program participants installed additional energy-saving measures since participating in the program. Savings that participants received from additional measures were considered spillover if the program significantly influenced their decisions to purchase additional measures, provided they did not receive additional incentives for those measures.

Using the surveys, Cadmus 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, Cadmus asked additional questions about what year they purchased the measure, if they received an incentive for the measure, and how influential (e.g., 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 by telephone with randomly selected program participants. Prior to beginning the survey effort, Cadmus pre-tested the survey to ensure all appropriate prompts and skip patterns were correct. Cadmus also monitored the survey company's initial phone calls to verify the following:

- Survey respondents understood the questions
- 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. This included assigning a freeridership score to each question response pattern, and calculating 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 they could be discussed and changed. This involved using a rules-based approach to assign scoring weights to each response from each freeridership question. This allowed sensitivity analysis to be performed instantaneously, and tested the stability of the response patterns and scoring weights. Scoring weights could be changed for a given response option to a given question. In addition, this provided the following important features:

- Derivation of a partial freeridership score, based on the likelihood of a respondent taking similar actions in the incentive's absence
- 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. Cadmus' experience has shown that program participants do not fall neatly into freerider and non-freerider categories. The study assigned partial freeridership scores to participants with 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, Cadmus 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. Converting each participant's survey response into freeridership matrix terminology.
2. Assigning each participant's response combination a score from the matrix.
3. Aggregating 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. Estimating 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, estimating a *prior use* freeridership score from a question focused on *prior use* of the kit measure in question in the respondent's 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 D1 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 planned to purchase the measure before learning about the incentive, Cadmus considered them as an unlikely freerider.

Table D1. 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. In creating the matrix, this process considered all combinations of survey question responses, and assigned each combination a freeridership score of 0% to 100%. Using this matrix, Cadmus scored every participants' combination of responses.

Kit Measure

If a respondent did not plan to purchase a kit measure within one year at the time that they signed up to receive the kit, they were automatically estimated at 0% freeridership for that measure. If a respondent planned to purchase the measure at the time of signing up for the kit, their *future intent* freeridership score derived from the prescribed values in Table D2.

Table D2. 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 measures installed in their home at the time they signed up for the kit, they received a *prior-use* freeridership score of 0%, and this *prior-use* freeridership estimate was averaged with their *future intent* freeridership score only if they would have purchased the measure within one year of when they initially signed up for the kit.

For example, if a respondent said they would have purchased the measure at the same time they received the kit, but also said they did not use any of the measures in their home at the time they signed up for the kit, their *future intent* freeridership score of 100% was averaged with their *prior use* freeridership of 0%, using the arithmetic mean to arrive at a participant's final freeridership score of 50% for the measure. If the respondent said they would have purchased the measure at the same time they received the kit, and used the measure in their home at the time they signed up for the kit, their final freeridership score was 100%, coming 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. Using the following calculation, this individually weighted each respondent's freerider scores by the estimated savings from equipment they installed:

$$Savings\ Weighted\ Freeridership = \frac{\sum(Respondent\ FR\ Score) * (Rebated\ Measure\ kWh\ Savings)}{\sum(Rebated\ Measure\ kWh\ Savings\ of\ All\ Respondents)}$$

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. Using the following calculation, this individually weighted each respondent's final measure level freeridership scores by estimated savings from equipment they installed:

$$Measure\ Level\ Savings\ Weighted\ Freeridership = \frac{\sum(Kit\ Measure\ Respondent\ FR\ Score) * (Kit\ Measure\ kWh\ Savings)}{\sum(Kit\ Measure\ kWh\ Savings\ of\ All\ Respondents)}$$

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:

$$Kit\ Measure\ Category\ Weighted\ Freeridership = \frac{\sum(Measure\ Level\ FR\ Score) * (Measure\ Level\ kWh\ Population\ Savings)}{\sum(All\ Kit\ Measures\ Population\ kWh\ Savings)}$$

Cadmus' Rebate Measure Freeridership Scoring Model

Cadmus developed an Excel-based model for calculating freeridership and to improve the consistency and quality of the evaluation's results. The model translated raw survey responses into matrix terminology, and assigned a matrix score to each participant's response pattern. Cadmus 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 program categories for their incented measures, and—if applicable—their energy savings from those measures
- Values converting raw survey responses into matrix terminologies for each program category
- Custom freeridership scoring matrices for each unique survey type

The model displayed each participant's combination of responses and corresponding freeridership score, producing 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.

Cadmus' Kit Measure Freeridership Scoring Model

Cadmus developed a freeridership score for each survey respondent using a rules-based assignment of responses to survey items. This 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 scores focused on the participant's *future intent* to buy the kit measure within one year from the time they signed up to receive the kit. In some instances, a second freeridership score was estimated from a question focused on *prior use* of the program measure in question. Where the respondent had *future intent* to buy the kit measure within one year, and they reported not having *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 participants' evaluated savings, Cadmus calculated measure-level freerider scores, and averaged these scores to

calculate a kit measure's 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 due to their program participation). Cadmus also asked these respondents to rate the HES Program's (and incentive's) relative influence (e.g., highly, somewhat, 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. The analysis began 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, Cadmus removed participants who said the program had little influence on their decisions to purchase additional measures, solely retaining participants who rated the program as highly influential. Cadmus also removed participants who applied for an HES incentive for the additional measures they installed.

For the remaining participants with spillover savings, Cadmus estimated the energy savings from additional measures installed, and calculated savings values, matching these to 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. Generally, this is called nonparticipant spillover (NPSO), resulting 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 35 customers who self-reported that they participated in a Rocky Mountain Power residential program during 2015 or 2016. 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's programs (known as "like" spillover). Examples included installing a high-efficiency clothes washer and installing high-efficiency insulation that participants (for whatever reason) did not apply for and did not receive an incentive. Cadmus excluded 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
- Respondents' 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 reported energy-efficient actions or installations.

Cadmus leveraged measure-level estimated gross savings from the 2015–2016 residential ***watt***smart 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 2015–2016 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 Nonparticipant Population	Based on 2017 Billing Data and 2015-2016 Program Tracking Data
E	NPSO kWh Savings Applied to Population	[(A÷B)×C)] × D
F	Total Gross Evaluated Savings	2015-2016 Evaluation
G	NPSO as a Percentage of Total Residential Portfolio Evaluated Savings	E ÷ F

Results

Of 250 Rocky Mountain Power Idaho customers surveyed, three nonparticipant respondents reported installing four different measure types attributed to Rocky Mountain Power's influence. Table E2 presents measures and gross evaluated kWh savings that Cadmus attributed to Rocky Mountain Power Idaho, generating average savings of 298 kWh per NPSO measure.

Table E2. NPSO Response Summary

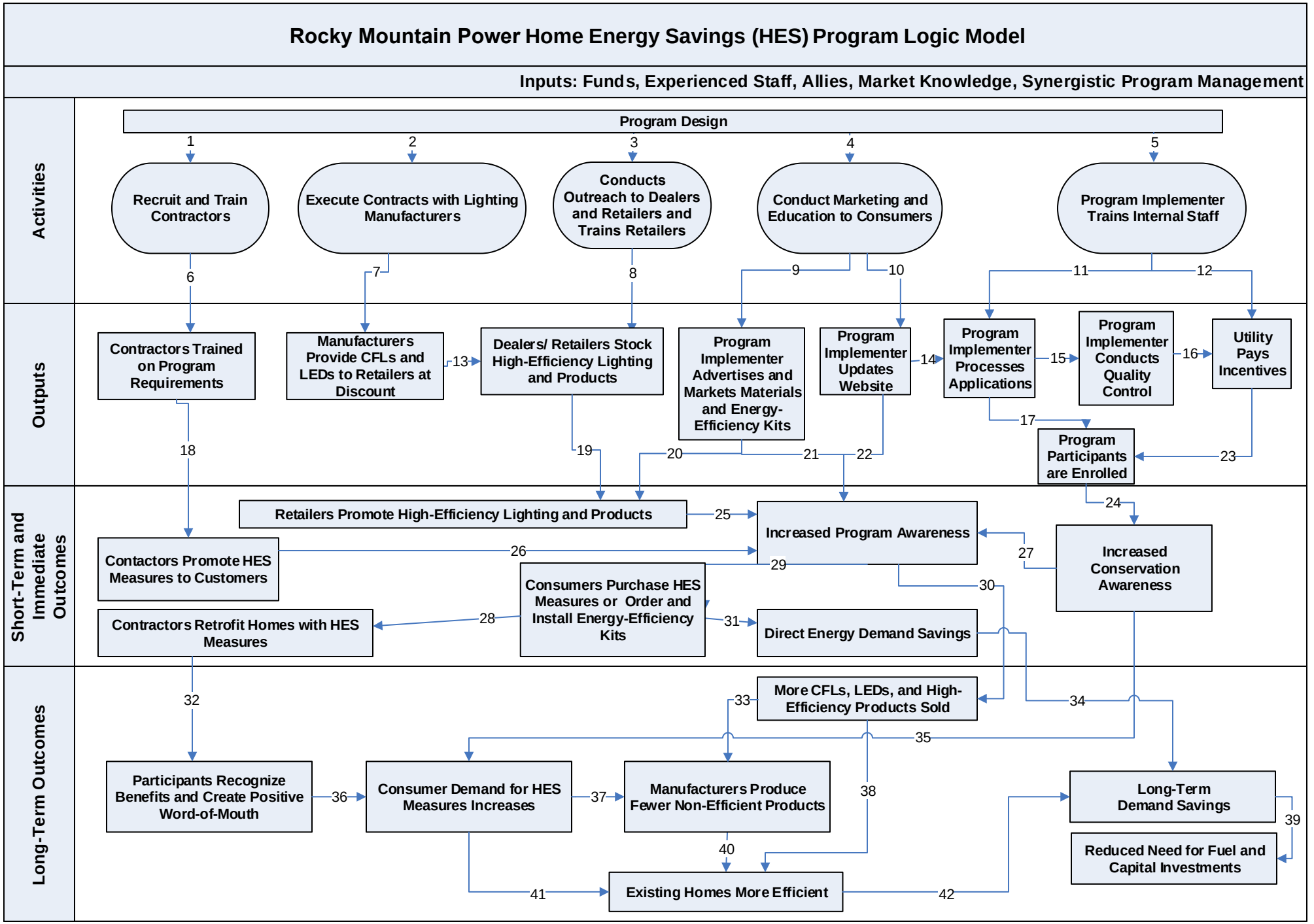
Reported Spillover Measures	Quantity	Unit Energy Savings (kWh)*	Total Savings (kWh)	Average Savings Per Spillover Measure (kWh)
ENERGY STAR Clothes Washer	1	199.2 per unit	199	
ENERGY STAR Refrigerator	1	85.8 per unit	86	
Low Flow Showerhead	1	165.7 per unit	166	
Smart Thermostat	1	741.2 per unit	741	
Total	**4**		**1,192**	**298 (Variable C)**

*Unit energy savings (kWh) estimated for each measure were generated from average 2015–2016 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 ***watt***smart program evaluated savings. Cadmus applied the 5% NPSO equally across the Rocky Mountain Power residential ***watt***smart program measures.

Table E3. NPSO Analysis Results

Variable	Metric	Value	Source
A	Number of Like Spillover Nonparticipant Measures	4	Survey data
B	Total Nonparticipant Customers Surveyed	215	Survey disposition
C	Weighted Average of Per Unit Measures Savings in kWh	298	Calculated in Table E2
D	Total Residential Customer Nonparticipant Population	35,115	Based on 2017 Billing Data and 2015-2016 Program Tracking Data
E	NPSO kWh Savings Applied to Population	194,701	((A÷B)×C)) × D
F	Total Gross Evaluated Savings	4,013,361	2015-2016 Residential ***watt***smart Evaluated Savings
G	NPSO as a Percentage of Total Residential Portfolio Reported Savings	5%	E ÷ F


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
Conducts Outreach to Dealers and Retailers and Trains 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
33
More CFLs, LEDs, and High-Efficiency Products Sold
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

Appendix G. Measure Category Cost-Effectiveness

Completed at the measure-category level, the evaluation reported cost-effectiveness for evaluated savings and net savings. Net results are the results of applying the evaluated NTG ratio (consisting of spillover and nonparticipant spillover) to evaluated gross savings. Table G1 shows cost-effectiveness inputs for the evaluated results.

Table G1. Idaho Measure Category Cost-Effectiveness Inputs

Input Description	2015	2016	Total
Average Measure Life*			
Appliances	14.2378866	13.9011202	14.0569582
Building Shell	30	30	30
Electronics	5	N/A	5
Kits	9.35629939	9.94214283	9.44764714
HVAC	18.3277267	18.0503683	18.1824711
Lighting	6.36578886	8.78537435	6.94533794
Water Heating	15	N/A	15
Whole Home	N/A	32.4010946	32.4010946
Evaluated Energy Savings (kWh/year)**			
Appliances	19693.4187	22864.1273	42557.5459
Building Shell	29406.2699	43259.0575	72665.3274
Electronics	7770	N/A	7770
Kits	976098.469	180313.806	1156412.28
HVAC	386709.725	425212.183	811921.908
Lighting	1450558.95	456876.883	1907435.83
Water Heating	3087	N/A	3087
Whole Home	N/A	11511	11511
Total Utility Cost (excluding incentives)***			
Appliances	3621	4479	8100
Building Shell	7031	10577	17608
Electronics	2285	N/A	2285
Kits	68431	32399	100830
HVAC	230667	292041	522708
Lighting	65417	61130	126547
Water Heating	908	N/A	908
Whole Home	N/A	3846	3846
Incentives			
Appliances	5590	5810	11400

Building Shell	10010	14827	24837
Electronics	3885	N/A	3885
Kits	32029	9798	41827
HVAC	110644	120202	230846
Lighting	153167	38768	191935
Water Heating	1000	N/A	1000
Whole Home	N/A	4500	4500
Retail Rate	**$0.105**	**$0.107**	

*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.

***Pacific Power provided program costs and incentives in annual report data, allocating program costs by weighted savings.

Appliances—Evaluated Savings

Table G2, 3, and 4 show cost-effectiveness results for evaluated savings, excluding non-energy impacts. The appliance measure category (again, excluding non-energy impacts) proved cost-effective from the UCT and PCT perspectives, as shown in Table G2. Table G5 provides annual program non-energy impacts. Table G6, Table G7, and Table G8 provide cost-effectiveness results, including non-energy impacts. The appliance measure category (including non-energy impacts) proved cost-effective from all perspectives except for the RIM, as shown in Table G6.

Table G2. Idaho Appliance 2015-2016 (Excluding Non-Energy Impacts)
(2015 IRP West Plug Loads 61% Preferred Decrement & 2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.109	$47,701	$30,209	($17,492)	0.63
TRC	$0.109	$47,701	$27,463	($20,238)	0.58
UCT	$0.043	$18,858	$27,463	$8,606	1.46
RIM		$65,022	$27,463	($37,558)	0.42
PCT		$39,881	$57,201	$17,321	1.43
Lifecycle Revenue Impacts ($/kWh)					$0.000000881
Discounted Participant Payback (years)					8.21

Table G3. Idaho Appliance 2015 (Excluding Non-Energy Impacts)
(2015 IRP West Plug Loads 61% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.135	$28,412	$14,301	($14,111)	0.50

TRC	$0.135	$28,412	$13,001	($15,411)	0.46
UCT	$0.044	$9,211	$13,001	$3,790	1.41
RIM		$31,283	$13,001	($18,283)	0.42
PCT		$24,791	$27,662	$2,872	1.12
Lifecycle Revenue Impacts ($/kWh)					$0.000000440
Discounted Participant Payback (years)					5.10

Table G4. Idaho Appliance 2016 (Excluding Non-Energy Impacts) (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.085	$20,574	$16,968	($3,606)	0.82
TRC	$0.085	$20,574	$15,426	($5,148)	0.75
UCT	$0.043	$10,289	$15,426	$5,137	1.50
RIM		$35,985	$15,426	($20,559)	0.43
PCT		$16,095	$31,506	$15,411	1.96
Lifecycle Revenue Impacts ($/kWh)					$0.000000492
Discounted Participant Payback (years)					2.17

Table G5. Idaho Appliance Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Clothes Washer 2015	$ 4,372	TRC, PTRC, PCT
Clothes Washer 2016	$ 2,561	TRC, PTRC, PCT

Table G6. Idaho Appliance 2015-2016 (Including Non-Energy Impacts) (2015 IRP West Plug Loads 61% Preferred Decrement & 2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.109	$47,701	$94,704	$47,003	1.99
TRC No Adder	$0.109	$47,701	$91,958	$44,257	1.93
UTC	$0.043	$18,858	$27,463	$8,606	1.46
RIM		$65,022	$27,463	($37,558)	0.42
PCT		$39,881	$121,696	$81,815	3.05
Lifecycle Revenue Impacts ($/kWh)					$0.000000881
Discounted Participant Payback (years)					3.15

Table G7. Idaho Appliance 2015 (Including Non-Energy Impacts)
(2015 IRP West Plug Loads 61% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.135	$28,412	$55,929	$27,517	1.97
TRC No Adder	$0.135	$28,412	$54,629	$26,217	1.92
UTC	$0.044	$9,211	$13,001	$3,790	1.41
RIM		$31,283	$13,001	($18,283)	0.42
PCT		$24,791	$69,291	$44,500	2.80
Lifecycle Revenue Impacts ($/kWh)					$0.000000440
Discounted Participant Payback (years)					2.35

Table G8. Idaho Appliance 2016 (Including Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.085	$20,574	$41,358	$20,784	2.01
TRC No Adder	$0.085	$20,574	$39,815	$19,241	1.94
UTC	$0.043	$10,289	$15,426	$5,137	1.50
RIM		$35,985	$15,426	($20,559)	0.43
PCT		$16,095	$55,896	$39,801	3.47
Lifecycle Revenue Impacts ($/kWh)					$0.000000492
Discounted Participant Payback (years)					2.12

Appliances—Net Savings

Table G9, Table G10, and Table G11 show cost-effectiveness results for net savings, excluding non-energy impacts. The appliance measure category (again, excluding non-energy impacts) did proved cost-effective from the UCT and PCT perspectives, as shown in Table G9.

Table G12 provides the annual program non-energy impacts. Table G13, Table G14, and Table G15 provide cost-effectiveness results, including non-energy impacts. The appliance measure category (including non-energy impacts) proved cost-effective from all perspectives except for the RIM, as shown in Table G13.

Table G9. Idaho Appliance 2015-2016 Net (Excluding Non-Energy Impacts) (2015 IRP West Plug Loads 61% Preferred Decrement & 2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.115	$36,327	$21,735	($14,592)	0.60
TRC	$0.115	$36,327	$19,759	($16,568)	0.54
UCT	$0.060	$18,858	$19,759	$901	1.05
RIM		$52,070	$19,759	($32,311)	0.38
PCT		$39,881	$57,201	$17,321	1.43
Lifecycle Revenue Impacts ($/kWh)					$0.000000758
Discounted Participant Payback (years)					8.21

Table G10. Idaho Appliance 2015 Net (Excluding Non-Energy Impacts) (2015 IRP West Plug Loads 61% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.142	$21,222	$10,154	($11,069)	0.48
TRC	$0.142	$21,222	$9,230	($11,992)	0.43
UCT	$0.062	$9,211	$9,230	$19	1.00
RIM		$24,882	$9,230	($15,652)	0.37
PCT		$24,791	$27,662	$2,872	1.12
Lifecycle Revenue Impacts ($/kWh)					$0.000000377
Discounted Participant Payback (years)					5.10

Table G11. Idaho Appliance 2016 Net (Excluding Non-Energy Impacts) (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.092	$16,111	$12,353	($3,758)	0.77
TRC	$0.092	$16,111	$11,230	($4,881)	0.70
UCT	$0.059	$10,289	$11,230	$941	1.09
RIM		$28,999	$11,230	($17,769)	0.39
PCT		$16,095	$31,506	$15,411	1.96
Lifecycle Revenue Impacts ($/kWh)					$0.000000425
Discounted Participant Payback (years)					2.17

Table G12. Idaho Appliance Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Clothes Washer 2015	$3,104.26	PTRC, TRC, PCT
Clothes Washer 2016	$1,818.75	PTRC, TRC, PCT

Table G13. Idaho Appliance 2015-2016 Net (Including Non-Energy Impacts) (2015 IRP West Plug Loads 61% Preferred Decrement & 2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.115	$36,327	$67,526	$31,199	1.86
TRC No Adder	$0.115	$36,327	$65,550	$29,223	1.80
UTC	$0.060	$18,858	$19,759	$901	1.05
RIM		$52,070	$19,759	($32,311)	0.38
PCT		$39,881	$121,696	$81,815	3.05
Lifecycle Revenue Impacts ($/kWh)					$0.000000758
Discounted Participant Payback (years)					3.15

Table G14. Idaho Appliance 2015 Net (Including Non-Energy Impacts) (2015 IRP West Plug Loads 61% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.142	$21,222	$39,710	$18,487	1.87
TRC No Adder	$0.142	$21,222	$38,787	$17,564	1.83
UTC	$0.062	$9,211	$9,230	$19	1.00
RIM		$24,882	$9,230	($15,652)	0.37
PCT		$24,791	$69,291	$44,500	2.80
Lifecycle Revenue Impacts ($/kWh)					$0.000000377
Discounted Participant Payback (years)					2.35

Table G15. Idaho Appliance 2016 Net (Including Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	$0.092	$16,111	$29,669	$13,558	1.84
TRC No Adder	$0.092	$16,111	$28,546	$12,435	1.77
UTC	$0.059	$10,289	$11,230	$941	1.09
RIM		$28,999	$11,230	($17,769)	0.39
PCT		$16,095	$55,896	$39,801	3.47
Lifecycle Revenue Impacts ($/kWh)					$0.000000425
Discounted Participant Payback (years)					2.12

HVAC—Evaluated Savings

Table G16, Table G17, and Table G18 show HVAC measure category cost-effectiveness results for evaluated savings, excluding non-energy impacts. The HVAC measure category proved not to be cost-effective from all perspectives except for PCT, as shown in Table G16.

Table G16. Idaho HVAC 2015-2016
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.085	$820,023	$635,448	($184,575)	0.77
TRC	$0.085	$820,023	$577,680	($242,343)	0.70
UCT	$0.075	$727,813	$577,680	($150,133)	0.79
RIM		$1,776,719	$577,680	($1,199,039)	0.33
PCT		$315,550	$1,272,246	$956,696	4.03
Lifecycle Revenue Impacts ($/kWh)					$0.000028130
Discounted Participant Payback (years)					1.85

Table G17. Idaho HVAC 2015
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.080	$381,228	$309,738	($71,491)	0.81
TRC	$0.080	$381,228	$281,580	($99,649)	0.74
UCT	$0.071	$341,311	$281,580	($59,731)	0.82
RIM		$855,722	$281,580	($574,142)	0.33
PCT		$150,561	$625,055	$474,493	4.15
Lifecycle Revenue Impacts ($/kWh)					$0.000013814
Discounted Participant Payback (years)					1.00

Table G18. Idaho HVAC 2016
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.090	$468,018	$347,403	($120,615)	0.74
TRC	$0.090	$468,018	$315,821	($152,197)	0.67
UCT	$0.079	$412,243	$315,821	($96,422)	0.77
RIM		$982,335	$315,821	($666,515)	0.32
PCT		$175,977	$690,294	$514,317	3.92
Lifecycle Revenue Impacts ($/kWh)					$0.000015940
Discounted Participant Payback (years)					1.24

HVAC—Net Savings

Table G19, Table G20, and Table G21 show HVAC measure category cost-effectiveness results for net savings. The HVAC measure category proved not to be cost-effective from all perspectives, except for the PCT perspective, as shown in Table G19.

Table G19. Idaho HVAC 2015-2016 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.088	$826,913	$615,725	($211,188)	0.74
TRC	$0.088	$826,913	$559,750	($267,163)	0.68
UCT	$0.078	$727,813	$559,750	($168,063)	0.77
RIM		$1,744,947	$559,750	($1,185,197)	0.32
PCT		$315,550	$1,244,043	$928,493	3.94
Lifecycle Revenue Impacts ($/kWh)					$0.000027805
Discounted Participant Payback (years)					1.85

Table G20. Idaho HVAC 2015 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.084	$387,770	$297,817	($89,953)	0.77
TRC	$0.084	$387,770	$270,743	($117,027)	0.70
UCT	$0.074	$341,311	$270,743	($70,568)	0.79
RIM		$836,481	$270,743	($565,738)	0.32
PCT		$150,561	$607,871	$457,310	4.04
Lifecycle Revenue Impacts ($/kWh)					$0.000013612
Discounted Participant Payback (years)					1.00

Table G21. Idaho HVAC 2016 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.092	$468,390	$339,080	($129,310)	0.72
TRC	$0.092	$468,390	$308,255	($160,135)	0.66
UCT	$0.081	$412,243	$308,255	($103,988)	0.75
RIM		$968,970	$308,255	($660,715)	0.32
PCT		$175,977	$678,541	$502,564	3.86
Lifecycle Revenue Impacts ($/kWh)					$0.000015801
Discounted Participant Payback (years)					1.24

Lighting – Evaluated Savings

Table G22, Table G23, and Table G24 show cost-effectiveness results for evaluated savings, excluding non-energy impacts. The lighting measure category proved cost-effective the UCT and PCT perspectives, as show in Table G22.

Table G25 provides the annual program non-energy impacts. Table G26, Table G27, and Table G28 provide cost-effectiveness results, including non-energy impacts. The Lighting measure category (including non-energy impacts) proved cost-effective from all perspectives except for the RIM, as shown in Table G26.

Table G22. Idaho Lighting 2015-2016 (Excluding Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.076	$884,977	$729,457	($155,519)	0.82
TRC	$0.076	$884,977	$663,143	($221,834)	0.75
UCT	$0.027	$312,244	$663,143	$350,899	2.12
RIM		$1,481,882	$663,143	($818,739)	0.45
PCT		$762,247	$1,359,152	$596,906	1.78
Lifecycle Revenue Impacts ($/kWh)					$0.000022359
Discounted Participant Payback (years)					3.27

Table G23. Idaho Lighting 2015 (Excluding Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.067	$569,204	$518,065	($51,139)	0.91
TRC	$0.067	$569,204	$470,968	($98,236)	0.83
UCT	$0.026	$218,584	$470,968	$252,384	2.15
RIM		$1,058,413	$470,968	($587,445)	0.44
PCT		$503,787	$992,996	$489,209	1.97
Lifecycle Revenue Impacts ($/kWh)					$0.000016693
Discounted Participant Payback (years)					2.38

Table G24. Idaho Lighting 2016 (Excluding Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.099	$336,803	$225,471	($111,332)	0.67

TRC	$0.099	$336,803	$204,974	($131,829)	0.61
UCT	$0.029	$99,898	$204,974	$105,076	2.05
RIM		$451,672	$204,974	($246,698)	0.45
PCT		$275,673	$390,542	$114,869	1.42
Lifecycle Revenue Impacts ($/kWh)					$0.000006967
Discounted Participant Payback (years)					5.66

Table G25. Idaho Lighting Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Light Bulbs – CFL – 2015	$72,338.16	PTRC, TRC, PCT
Light Bulbs – LED – 2015	$20,611.02	PTRC, TRC, PCT
Light Bulbs – CFL -2016	$13,593.52	PTRC, TRC, PCT
Light Bulbs – LED – 2016	$20,611.02	PTRC, TRC, PCT

Table G26. Idaho Lighting 2015-2016 (Including Non-Energy Impacts) (2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.076	$884,977	$1,448,543	$563,567	1.64
TRC	$0.076	$884,977	$1,382,229	$497,253	1.56
UCT	$0.027	$312,244	$663,143	$350,899	2.12
RIM		$1,481,882	$663,143	($818,739)	0.45
PCT		$762,247	$2,078,238	$1,315,992	2.73
Lifecycle Revenue Impacts ($/kWh)					$0.000022359
Discounted Participant Payback (years)					2.06

Table G27. Idaho Lighting 2015 (Including Non-Energy Impacts) (2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.067	$569,204	$1,014,302	$445,098	1.78
TRC	$0.067	$569,204	$967,205	$398,001	1.70
UCT	$0.026	$218,584	$470,968	$252,384	2.15
RIM		$1,058,413	$470,968	($587,445)	0.44
PCT		$503,787	$1,489,234	$985,447	2.96
Lifecycle Revenue Impacts ($/kWh)					$0.000016693
Discounted Participant Payback (years)					1.45

Table G28. Idaho Lighting 2016 (Including Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.099	$336,803	$463,162	$126,359	1.38
TRC	$0.099	$336,803	$442,664	$105,861	1.31
UCT	$0.029	$99,898	$204,974	$105,076	2.05
RIM		$451,672	$204,974	($246,698)	0.45
PCT		$275,673	$628,232	$352,559	2.28
Lifecycle Revenue Impacts ($/kWh)					$0.000006967
Discounted Participant Payback (years)					3.01

Lighting—Net Savings

Table G29, Table G30, and Table G31 show cost-effectiveness results for net savings. The lighting measure category proved cost-effective from the PCT perspective, as shown in Table G29.

Table G32 provides the annual program non-energy impacts. Table G33, Table G34, and Table G35 provide cost-effectiveness results, including non-energy impacts. The Lighting measure category (including non-energy impacts) proved cost-effective from all perspectives except for the UCT and RIM perspectives, as shown in Table G33.

Table G29. Idaho Lighting 2015-2016 Net (Excluding Non-Energy Impacts)
(2015 IRP West Residential Lighting 45% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.087	$475,331	$341,345	($133,986)	0.72
TRC	$0.087	$475,331	$310,313	($165,017)	0.65
UCT	$0.057	$312,244	$310,313	($1,931)	0.99
RIM		$860,403	$310,313	($550,089)	0.36
PCT		$762,247	$1,359,152	$596,906	1.78
Lifecycle Revenue Impacts ($/kWh)					$0.000015022
Discounted Participant Payback (years)					3.27

Table G30. Idaho Lighting 2015 Net (Excluding Non-Energy Impacts)
(2015 IRP West Residential Lighting 45% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio

PTRC (TRC + 10% Conservation Adder)	$0.074	$317,947	$261,722	($56,225)	0.82
TRC	$0.074	$317,947	$237,929	($80,017)	0.75
UCT	$0.051	$218,584	$237,929	$19,345	1.09
RIM		$642,899	$237,929	($404,970)	0.37
PCT		$503,787	$992,996	$489,209	1.97
Lifecycle Revenue Impacts ($/kWh)					$0.000011507
Discounted Participant Payback (years)					2.38

Table G31. Idaho Lighting 2016 Net (Excluding Non-Energy Impacts) (2015 IRP West Residential Lighting 45% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.132	$167,866	$84,926	($82,940)	0.51
TRC	$0.132	$167,866	$77,205	($90,661)	0.46
UCT	$0.078	$99,898	$77,205	($22,693)	0.77
RIM		$231,989	$77,205	($154,784)	0.33
PCT		$275,673	$390,542	$114,869	1.42
Lifecycle Revenue Impacts ($/kWh)					$0.000004371
Discounted Participant Payback (years)					5.66

Table G32. Idaho Lighting Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Light Bulbs – CFL - 2015	$36,892.46	PTRC, TRC, PCT
Light Bulbs – LED - 2015	$9,893.29	PTRC, TRC, PCT
Light Bulbs – CFL -2016	$4,078.06	PTRC, TRC, PCT
Light Bulbs – LED - 2016	$8,244.41	PTRC, TRC, PCT

Table G33. Idaho Lighting 2015-2016 Net (Including Non-Energy Impacts) (2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.087	$475,331	$672,631	$197,300	1.42
TRC	$0.087	$475,331	$641,600	$166,269	1.35
UCT	$0.057	$312,244	$310,313	($1,931)	0.99
RIM		$860,403	$310,313	($550,089)	0.36
PCT		$762,247	$2,078,238	$1,315,992	2.73
Lifecycle Revenue Impacts ($/kWh)					$0.000015022
Discounted Participant Payback (years)					2.06

Table G34. Idaho Lighting 2015 Net (Including Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.074	$317,947	$509,494	$191,547	1.60
TRC	$0.074	$317,947	$485,701	$167,754	1.53
UCT	$0.051	$218,584	$237,929	$19,345	1.09
RIM		$642,899	$237,929	($404,970)	0.37
PCT		$503,787	$1,489,234	$985,447	2.96
Lifecycle Revenue Impacts ($/kWh)					$0.000011507
Discounted Participant Payback (years)					1.45

Table G35. Idaho Lighting 2016 Net (Including Non-Energy Impacts)
(2013 IRP West Residential Lighting 48% Medium LF Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.132	$167,866	$174,002	$6,136	1.04
TRC	$0.132	$167,866	$166,282	($1,584)	0.99
UCT	$0.078	$99,898	$77,205	($22,693)	0.77
RIM		$231,989	$77,205	($154,784)	0.33
PCT		$275,673	$628,232	$352,559	2.28
Lifecycle Revenue Impacts ($/kWh)					$0.000004371
Discounted Participant Payback (years)					3.01

Building Shell—Evaluated Savings

Table G36, Table G37, and Table G38 show building shell measure category cost-effectiveness results for evaluated savings. The building shell measure category proved cost-effective from all perspectives, except for RIM, as shown in Table G36.

Table G36. Idaho Building Shell 2015-2016
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.045	$48,501	$77,616	$29,114	1.60
TRC	$0.045	$48,501	$70,560	$22,058	1.45
UCT	$0.038	$40,859	$70,560	$29,701	1.73
RIM		$164,741	$70,560	($94,181)	0.43
PCT		$31,554	$147,794	$116,240	4.68
Lifecycle Revenue Impacts ($/kWh)					$0.000001869
Discounted Participant Payback (years)					1.87

Table G37. Idaho Building Shell 2015
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.042	$18,835	$32,016	$13,182	1.70
TRC	$0.042	$18,835	$29,106	$10,271	1.55
UCT	$0.038	$17,041	$29,106	$12,065	1.71
RIM		$68,542	$29,106	($39,437)	0.42
PCT		$11,804	$61,511	$49,708	5.21
Lifecycle Revenue Impacts ($/kWh)					$0.000000792
Discounted Participant Payback (years)					0.90

Table G38. Idaho Building Shell 2016
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.048	$31,643	$48,637	$16,994	1.54
TRC	$0.048	$31,643	$44,215	$12,572	1.40
UCT	$0.038	$25,404	$44,215	$18,811	1.74
RIM		$102,606	$44,215	($58,391)	0.43
PCT		$21,066	$92,029	$70,963	4.37
Lifecycle Revenue Impacts ($/kWh)					$0.000001166
Discounted Participant Payback (years)					1.37

Building Shell—Net Savings

Table G39, Table G40, and Table G41 show building shell measure category cost-effectiveness results for net evaluated savings. The building shell measure category proved cost-effective from all perspectives, except for RIM, as shown in Table G39.

Table G39. Idaho Building Shell 2015-2016 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.045	$47,861	$76,996	$29,136	1.61
TRC	$0.045	$47,861	$69,997	$22,136	1.46
UCT	$0.039	$40,859	$69,997	$29,138	1.71
RIM		$163,752	$69,997	($93,755)	0.43
PCT		$31,554	$147,794	$116,240	4.68
Lifecycle Revenue Impacts ($/kWh)					$0.000001861
Discounted Participant Payback (years)					1.87

Table G40. Idaho Building Shell 2015 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.042	$18,516	$31,717	$13,200	1.71
TRC	$0.042	$18,516	$28,833	$10,317	1.56
UCT	$0.038	$17,041	$28,833	$11,792	1.69
RIM		$68,060	$28,833	($39,227)	0.42
PCT		$11,804	$61,511	$49,708	5.21
Lifecycle Revenue Impacts ($/kWh)					$0.000000788
Discounted Participant Payback (years)					0.90

Table G41. Idaho Building Shell 2016 Net
(2015 IRP West Residential Heating 17% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.048	$31,298	$48,296	$16,997	1.54
TRC	$0.048	$31,298	$43,905	$12,607	1.40
UCT	$0.039	$25,404	$43,905	$18,501	1.73
RIM		$102,065	$43,905	($58,159)	0.43
PCT		$21,066	$92,029	$70,963	4.37
Lifecycle Revenue Impacts ($/kWh)					$0.000001161

Discounted Participant Payback (years)	1.37

Kits—Evaluated Savings

Table G42, Table G43, and Table G44 show the kit measure category (excluding non-energy impacts) cost-effectiveness results for evaluated savings. The kit measure category proved cost-effective from all perspectives, except for RIM, as shown in Table G42.

Table G45 provides the annual program non-energy impacts. Table G46, Table G47, and Table G48 provide cost-effectiveness results, including non-energy impacts. The kit measure category (including non-energy impacts) proved cost-effective from all perspectives, except for RIM, as shown in Table G46.

Table G42. Idaho Kits 2015-2016 (Excluding Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.016	$148,851	$526,963	$378,112	3.54
TRC	$0.016	$148,851	$479,058	$330,206	3.22
UCT	$0.015	$140,022	$479,058	$339,036	3.42
RIM		$1,081,931	$479,058	($602,874)	0.44
PCT		$50,044	$983,124	$933,080	19.65
Lifecycle Revenue Impacts ($/kWh)					$0.000018795
Discounted Participant Payback (years)					0.28

Table G43. Idaho Kits 2015 (Excluding Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.013	$105,860	$432,704	$326,843	4.09
TRC	$0.013	$105,860	$393,367	$287,507	3.72
UCT	$0.013	$100,460	$393,367	$292,907	3.92
RIM		$895,061	$393,367	($501,694)	0.44
PCT		$37,429	$826,630	$789,201	22.09
Lifecycle Revenue Impacts ($/kWh)					$0.000016515
Discounted Participant Payback (years)					0.28

Table G44. Idaho Kits 2016 (Excluding Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.030	$45,854	$100,537	$54,683	2.19
TRC	$0.030	$45,854	$91,398	$45,544	1.99
UCT	$0.028	$42,197	$91,398	$49,201	2.17
RIM		$199,316	$91,398	($107,918)	0.46
PCT		$13,455	$166,917	$153,462	12.41
Lifecycle Revenue Impacts ($/kWh)					$0.000003531
Discounted Participant Payback (years)					0.46

Table G45. Idaho Kits Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Kits – 2015	$59,243.91	PTRC, TRC, PCT
Kits – 2016	$10,729.50	PTRC, TRC, PCT

Table G46. Idaho Kits 2015-2016 (Including Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.016	$148,851	$1,031,851	$883,000	6.93
TRC	$0.016	$148,851	$983,945	$835,094	6.61
UCT	$0.015	$140,022	$479,058	$339,036	3.42
RIM		$1,081,931	$479,058	($602,874)	0.44
PCT		$50,044	$1,488,012	$1,437,968	29.73
Lifecycle Revenue Impacts ($/kWh)					$0.000018795
Discounted Participant Payback (years)					0.19

Table G47. Idaho Kits 2015 (Including Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.013	$105,860	$861,625	$755,765	8.14
TRC	$0.013	$105,860	$822,288	$716,428	7.77
UCT	$0.013	$100,460	$393,367	$292,907	3.92
RIM		$895,061	$393,367	($501,694)	0.44
PCT		$37,429	$1,255,551	$1,218,122	33.54
Lifecycle Revenue Impacts ($/kWh)					$0.000016515

Discounted Participant Payback (years)	0.19

Table G48. Idaho Kits 2016 (Including Non-Energy Impacts)
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.030	$45,854	$181,563	$135,709	3.96
TRC	$0.030	$45,854	$172,423	$126,569	3.76
UCT	$0.028	$42,197	$91,398	$49,201	2.17
RIM		$199,316	$91,398	($107,918)	0.46
PCT		$13,455	$247,942	$234,487	18.43
Lifecycle Revenue Impacts ($/kWh)					$0.000003531
Discounted Participant Payback (years)					0.34

Kits—Net Savings

Table G49, Table G50, and Table G51 show the kit measure category (excluding non-energy impacts) cost-effectiveness results for net savings. The kit measure category proved cost-effective from all perspectives, except for RIM, as shown in Table G49, which Table G50 provides the annual program non-energy impacts.

Table G52 provides the annual program non-energy impacts. Table G53, Table G54, and Table G55 provide net cost-effectiveness results, including non-energy impacts. The kit measure category (including non-energy impacts) proved cost-effective from all perspectives, except for RIM, as shown in Table G53.

Table G49. Idaho Kits 2015-2016 (Excluding Non-Energy Impacts) Net
(2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.017	$146,349	$500,615	$354,266	3.42
TRC	$0.017	$146,349	$455,105	$308,756	3.11
UCT	$0.016	$140,022	$455,105	$315,083	3.25
RIM		$1,034,836	$455,105	($579,731)	0.44
PCT		$50,044	$983,124	$933,080	19.65
Lifecycle Revenue Impacts ($/kWh)					$0.000018074
Discounted Participant Payback (years)					0.28

Table G50. Idaho Kits 2015 (Excluding Non-Energy Impacts) Net (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.014	$103,989	$411,069	$307,080	3.95
TRC	$0.014	$103,989	$373,699	$269,710	3.59
UCT	$0.013	$100,460	$373,699	$273,239	3.72
RIM		$855,331	$373,699	($481,632)	0.44
PCT		$37,429	$826,630	$789,201	22.09
Lifecycle Revenue Impacts ($/kWh)					$0.000015855
Discounted Participant Payback (years)					0.28

Table G51. Idaho Kits 2016 (Excluding Non-Energy Impacts) Net (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.031	$45,181	$95,511	$50,329	2.11
TRC	$0.031	$45,181	$86,828	$41,646	1.92
UCT	$0.029	$42,197	$86,828	$44,631	2.06
RIM		$191,460	$86,828	($104,632)	0.45
PCT		$13,455	$166,917	$153,462	12.41
Lifecycle Revenue Impacts ($/kWh)					$0.000003424
Discounted Participant Payback (years)					0.46

Table G52. Idaho Kits Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Kits – 2015	$56,281.71	PTRC, TRC, PCT
Kits – 2016	$10,193.03	PTRC, TRC, PCT

Table G53. Idaho Kits 2015-2016 (Including Non-Energy Impacts) Net (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.017	$146,349	$980,258	$833,909	6.70
TRC	$0.017	$146,349	$934,748	$788,399	6.39
UCT	$0.016	$140,022	$455,105	$315,083	3.25
RIM		$1,034,836	$455,105	($579,731)	0.44
PCT		$50,044	$1,488,012	$1,437,968	29.73
Lifecycle Revenue Impacts ($/kWh)					$0.000018074

Discounted Participant Payback (years)	0.19

Table G54. Idaho Kits 2015 (Including Non-Energy Impacts) Net (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.014	$103,989	$818,544	$714,555	7.87
TRC	$0.014	$103,989	$781,174	$677,185	7.51
UCT	$0.013	$100,460	$373,699	$273,239	3.72
RIM		$855,331	$373,699	($481,632)	0.44
PCT		$37,429	$1,255,551	$1,218,122	33.54
Lifecycle Revenue Impacts ($/kWh)					
Discounted Participant Payback (years)					

Table G55. Idaho Kits 2016 (Including Non-Energy Impacts) Net (2015 IRP West Residential Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.031	$45,181	$172,485	$127,304	3.82
TRC	$0.031	$45,181	$163,802	$118,621	3.63
UCT	$0.029	$42,197	$86,828	$44,631	2.06
RIM		$191,460	$86,828	($104,632)	0.45
PCT		$13,455	$247,942	$234,487	18.43
Lifecycle Revenue Impacts ($/kWh)					$0.000003424
Discounted Participant Payback (years)					0.34

New Homes—Evaluated Savings

Table G56 shows the new homes measure category's cost-effectiveness results for evaluated savings. The new homes measure category proved cost-effective from all test perspectives except for the RIM.

Table G56. Idaho New Homes 2016 (2015 IRP West Residential Whole House 65% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.051	$8,893	$13,554	$4,662	1.52
TRC	$0.051	$8,893	$12,322	$3,429	1.39
UCT	$0.048	$8,346	$12,322	$3,976	1.48
RIM		$28,520	$12,322	($16,198)	0.43

PCT		$5,047	$24,674	$19,628	4.89
Lifecycle Revenue Impacts ($/kWh)					$0.000000310
Discounted Participant Payback (years)					0.88

New Homes—Net Savings

Table G57 shows the new homes measure category's cost-effectiveness results for net savings. The new homes measure category proved cost-effective from all test perspectives except for the RIM.

Table G57. Idaho New Homes 2016 Net
(2015 IRP West Residential Whole House 65% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.051	$8,893	$13,554	$4,662	1.52
TRC	$0.051	$8,893	$12,322	$3,429	1.39
UCT	$0.048	$8,346	$12,322	$3,976	1.48
RIM		$28,520	$12,322	($16,198)	0.43
PCT		$5,047	$24,674	$19,628	4.89
Lifecycle Revenue Impacts ($/kWh)					$0.000000310
Discounted Participant Payback (years)					0.88

Electronics—Evaluated Savings

Table G58 shows the electronics measure category's cost-effectiveness results for evaluated savings. The electronics measure category proved not to be cost-effective from any of the test perspectives.

Table G58. Idaho Electronics 2015
(2015 IRP West Residential Whole House 65% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.277	$10,573	$2,155	($8,418)	0.20
TRC	$0.277	$10,573	$1,959	($8,614)	0.19
UCT	$0.161	$6,170	$1,959	($4,211)	0.32
RIM		$9,894	$1,959	($7,935)	0.20
PCT		$8,288	$7,609	($679)	0.92
Lifecycle Revenue Impacts ($/kWh)					$0.000000520
Discounted Participant Payback (years)					0.00

Electronics—Net Savings

Table G59 shows electronics measure category cost-effectiveness results for net savings. The electronics measure category proved not to be cost-effective from any of the test perspectives.

Table G59. Idaho Electronics 2015 Net
(2015 IRP West Residential Whole House 65% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.287	$9,330	$1,832	($7,498)	0.20
TRC	$0.287	$9,330	$1,665	($7,664)	0.18
UCT	$0.190	$6,170	$1,665	($4,505)	0.27
RIM		$9,336	$1,665	($7,670)	0.18
PCT		$8,288	$7,609	($679)	0.92
Lifecycle Revenue Impacts ($/kWh)					$0.000000502
Discounted Participant Payback (years)					0.00

Water Heating —Evaluated Savings

Table G58 shows the water heating measure category's cost-effectiveness results for evaluated savings. The water heating measure category proved cost-effective only from the PCT perspective.

Table G60. Idaho Water Heating 2015
(2015 IRP East Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.077	$2,629	$2,081	($548)	0.79
TRC	$0.077	$2,629	$1,892	($737)	0.72
UCT	$0.056	$1,908	$1,892	($16)	0.99
RIM		$5,502	$1,892	($3,611)	0.34
PCT		$1,721	$4,594	$2,874	2.67
Lifecycle Revenue Impacts ($/kWh)					$0.000000103
Discounted Participant Payback (years)					2.30

Water Heating —Net Savings

Table G59 shows water heating measure category cost-effectiveness results for net savings. The water heating measure category proved cost-effective only from the PCT perspective.

Table G61. Idaho Water Heating 2015 Net
(2015 IRP East Water Heating 53% Preferred Decrement)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	$0.082	$2,353	$1,748	($606)	0.74
TRC	$0.082	$2,353	$1,589	($764)	0.68
UCT	$0.066	$1,908	$1,589	($319)	0.83
RIM		$4,927	$1,589	($3,338)	0.32
PCT		$1,721	$4,594	$2,874	2.67
Lifecycle Revenue Impacts ($/kWh)					$0.000000095
Discounted Participant Payback (years)					2.30

CADMUS

Appendix H. Benchmark Detail

The tables in this appendix provide additional detail on programs included in Cadmus' benchmark review of residential lighting and non-lighting.

Table H1. Residential Upstream Lighting Programs

Utility, State	Program Name	Implementer	Measure Detail	Program Year	Units	Net MWh	kWh/ Unit	NTG	WHF	HOU	ISR
Pacific Power, ID	HES	CLEAResult	CFLs (Gen Purpose) CFLs (Specialty) LEDs (Gen Purpose) LEDs (Specialty) CFL, LED Fixtures	2015-2016	137,152	898	6.5	47%	0.938	1.8 (LED) and 1.7 (CFL)	75.6% (LED) and 69.7% (CFL)
Ameren, MO	Residential Lighting	ICF	LEDs: 10W General Purpose 15W General Purpose 20W General Purpose 4W Candelabra 8W Globe 12W Dimmable 10.5W Downlight 15W Flood (PAR 30) 18W Flood (PAR 38)	2016	917,013	24,418	27	64%	0.99	3.15	87.9%
EmPOWER, MD	Residential Lighting	ICF, Honeywell	CFL Lamps, LED Lamps and Efficient Fixtures Standard/Specialty CFLs, Standard/ Specialty LEDs, and ENERGY STAR Fixtures	1/1/2016-5/31/2016	2,442,683	47,519	20	61%	0.915 to 0.963	2.46	90%
Salt River Project, AZ	Retail Lighting	SRP	CFLs	FY17	693,595	30,488	44	100%	1.075	2.5	99%
PPL, PA	Residential Retail	Ecova	LEDs	6/1/2015-5/31/2016	1,419,223	39,278	28	61%	0.94	2.8	97%

Table H2. Residential Non-Lighting Programs Measure and Participation Detail

Utility/PA, State	Program Name	Implementer	Measure Detail	Program Year	Participation	Gross MWh*	NTG
Ameren, MO	Efficient Products Program	ICF International	ES Room ACs ES HP Water Heaters ES Room Air Purifiers ES Pool Pumps Multispeed ES Pool Pumps Var Speed Smart Thermostats	2016	HPWHs: 322 RACs: 324 Room Air Purifiers: 1,300 Multispeed Pool Pumps: 147 Var Speed Pool Pumps: 550 Smart Thermostats: 8,200	6,671	HPWHs: 84.8% RACs: 59.8% Room Air Purifiers: 50.2% Pool pumps: 67.8%
EmPOWER, MD	Appliance Rebate Program	ICF Int'l for BGE, Pepco, Delmarva Power, and SMECO. Honeywell for PE	ES Cl Washer Tier 2: $75 ES Cl Washer Tier 3: $100 ES Refrig Tier 2: $100 ES Refrig Tier 3: $150 ES Room AC Tier 2: $30 ES Elec Cl Dryer: $50 HP Water Heater: $500 Pool Pump Multispeed: $150 Pool Pump Var Speed: $400	1/1/2016-5/31/2016	CL Dryer: 1,730 CL Washer Tier 2: 1,789 CL Washer Tier 3: 120 Pool Pump: 344 Refrig Tier 2: 215 Refrig Tier 3: 1 HP Water Heater: 424	1,548	68%
EmPOWER, MD	Residential HVAC Program	ICF Int'l for BGE, Pepco, Delmarva Power, and SMECO. Honeywell for PE	ASHP SEER 16-18 ASHP SEER 18+ CAC SEER 16-18 CAC SEER 18 Furnace GSHP Mini Split HP	1/1/2016-5/31/2016	ASHP SEER 16-18: 1,631 ASHP SEER 18+: 1,029 CAC SEER 16-18: 2,094 CAC SEER 18+: 540 Furnace: 848 GSHP: 336 Mini Split HP 374	5,380	60%
PPL, PA	Residential Retail	Ecova	Energy-efficient refrigerators and heat pump water heaters; includes efficient fossil-fuel water heaters eligible for rebates under the fuel-switching pilot.	PY7	Refrigerators HPWHs Efficient fossil-fuel WHs: 4417	3,053	64%

Utility/PA, State	Program Name	Implementer	Measure Detail	Program Year	Participation	Gross MWh*	NTG
PSE, WA	Residential Single-Family Existing Dealer Channel & Low Income Weatherization Programs	N/A	Shell improvements/wzn (Insulation, Air Sealing, Windows) HVAC (Furnace, Boiler, HPs), Water heat (Equip. Repl, SHs) Lighting (CFLs, LEDs), Appliances (Refrigs.) Other Direct Install (Power Strips)	2013-2015	Ceiling Insulation: 1,502 Floor Insulation: 1,615 Wall Insulation: 483 Air Sealing: 190 Windows: 3,078 Duct Sealing, Insulation: 1,922 Heat System Repl: 7,404 Fireplace: 1,163 Integ Space Water Heat: 95 Showerheads: 188	N/A	N/A
Energy Trust, OR	Exiting Homes	CLEAResult	1) Incentives for OR homes that install energy-efficient electric or gas measures 2) Incentives for NW Natural customers in SW WA who install gas measures 3) Energy Saver Kits: LED lightbulbs, showerheads, and faucet aerators	2013-2015	Downstream/Midstream mix Recent effort to increase midstream engagement (Distrib. SPIFs, info sessions) Instant incentives through trade allies Specialized offers for Moderate income, rental properties	11,440	N/A
Ameren, MO	Efficient Products Program	ICF International	ES room ACs ES HP Water Heaters ES Room Air Purifiers ES Pool Pumps Multispeed ES Pool Pumps Var Speed Smart Thermostats	2016	HPWHs: 322 RACs: 324 Room Air Purifiers: 1,300 Multispeed Pool Pumps: 147 Var Speed Pool Pumps: 550 Smart Thermostats: 8,200	6,671	HPWHs: 84.8% RACs: 59.8% Room Air Purifiers: 50.2% Pool pumps: 67.8%

Utility/PA, State	Program Name	Implementer	Measure Detail	Program Year	Participation	Gross MWh*	NTG
EmPOWER, MD	Appliance Rebate Program	ICF Int'l for BGE, Pepco, Delmarva Power, and SMECO. Honeywell for PE	ES Cl Washer Tier 2: $75 ES Cl Washer Tier 3: $100 ES Refrig Tier 2: $100 ES Refrig Tier 3: $150 ES Room AC Tier: 2 $30 ES Elec Cl Dryer: $50 HP Water Heater: $500 Pool Pump Multispeed: $150 Pool Pump Var Speed: $400	1/1/2016-5/31/2016	CL Dryer: 1,730 CL Washer Tier 2: 1,789 CL Washer Tier 3: 120 Pool Pump: 344 Refrig Tier 2: 215 Refrig Tier 3: 1 HP Water Heater: 424	1,548	68%
EmPOWER, MD	Residential HVAC Program	ICF Int'l for BGE, Pepco, Delmarva Power, and SMECO. Honeywell for PE	ASHP SEER 16-18 ASHP SEER 18+ CAC SEER 16-18 CAC SEER 18 Furnace GSHP Mini Split HP	1/1/2016-5/31/2016	ASHP SEER 16-18: 1,631 ASHP SEER 18+: 1,029 CAC SEER 16-18: 2,094 CAC SEER 18+: 540 Furnace: 848 GSHP: 336 Mini Split HP: 374	5,380	60%
PPL, PA	Residential Retail	Ecova	Energy-efficient refrigerators and heat pump water heaters; includes efficient fossil-fuel water heaters eligible for rebates under the fuel-switching pilot.	PY7	Refrigerators HPWHs Efficient Fossil-Fuel WHs: 4,417	3,053	64%

Utility/PA, State	Program Name	Implementer	Measure Detail	Program Year	Participation	Gross MWh*	NTG
PSE, WA	Residential Single-Family Existing Dealer Channel & Low Income Weatherization Programs	N/A	Shell improvements/wzn (Insulation, Air Sealing, Windows) HVAC (Furnace, Boiler, HPs), Water heat (Equip. Repl, SHs) Lighting (CFLs, LEDs), Appliances (Refrigs.) Other Direct Install (Power Strips)	2013-2015	Ceiling Insulation: 1,502 Floor Insulation: 1,615 Wall Insulation: 483 Air Sealing: 190 Windows: 3,078 Duct Sealing, Insulation: 1,922 Heat System Repl: 7,404 Fireplace: 1,163 Integ Space Water Heat: 95 Showerheads: 188	N/A	N/A
Energy Trust, OR	Exiting Homes	CLEAResult	1) Incentives for OR homes that install energy-efficient electric or gas measures 2) Incentives for NW Natural customers in SW WA who install gas measures 3) Energy Saver Kits: LED lightbulbs, showerheads, and faucet aerators	2013-2015	Downstream/Midstream mix Recent effort to increase midstream engagement (Distrib. SPIFs, info sessions) Instant incentives through trade allies Specialized offers for moderate income, rental properties	11,440	N/A

* Gross MWh are values determined by evaluators and were taken from final evaluation reports.