



2015–2016 Report: Wyoming Home Energy Savings Program Evaluation

December 14, 2017

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Glossary of Terms

AHRI

Air Conditioning, Heating, and Refrigeration Institute

CDD

Cooling Degree Days

CV

Coefficient of Variation

CZ

Cooling Zone

DEER

The Database for Energy Efficient Resources is developed by the California Public Utilities Commission and contains information on selected energy-efficient technologies and measures offered through ratepayer-funded energy efficiency programs.

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:

$$\text{Evaluated Savings}_i = \text{Verified Installations}_i * \text{Unit Consumption}_i$$



HDD

Heating Degree Days

HES

Home Energy Savings

HOU

Hours of Use

HVAC

Heating, Ventilation, and Air Conditioning

IMEF

Integrated Modified Energy Factor

ISR

Also called the installation rate, the in-service rate is the proportion of incented measures actually installed. For light bulbs, if the bulb was later removed due to burning out, the bulb is still counted as in-service. The effective measure life incorporated in the cost-effectiveness analysis already accounts for the average life of a light bulb.

IWF

Integrated Water Factor

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

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.

RTF

The Regional Technical Forum 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.

WHF

Waste Heat Factor

Executive Summary

In 2009, Rocky Mountain Power first offered the Home Energy Savings (HES) Program in Wyoming. 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 site gross electricity savings of 7,290,211 kWh. HES was the largest of Rocky Mountain Power's Wyoming residential programs until 2016, when Home Energy Reports surpassed HES in annual reported savings. During 2015 and 2016, the HES program contributed 43% of the reported Wyoming residential portfolio savings and 10% of Wyoming's total energy efficiency portfolio savings.^{1,2}

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

- **Appliances:** efficient clothes washers, dishwashers (2015 only), refrigerators, freezers
- **Building Shell:** attic, wall, and floor insulation, high-efficiency windows
- **Electronics:** computer monitors and flat panel TVs (both were discontinued in 2015)
- **Heating, ventilation, and air conditioning (HVAC):** high-efficiency heating and cooling equipment and services, including central air conditioners, evaporative coolers, air source heat pumps, ductless heat pumps, energy-efficient gas furnace with electronically commutated motors, ceiling fans, room air conditioners, and duct leakage testing and sealing services
- **Lighting:** CFL and LED bulbs and lighting fixtures
- **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
- **Water Heating:** high-efficiency electric water heaters (2015 only) and heat pump water heaters

Rocky Mountain Power contracted with Cadmus to conduct impact and process evaluations of the Wyoming 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

¹ Residential portfolio and total portfolio savings (at the customer site) sourced from the 2015 and 2016 Rocky Mountain Power Wyoming annual reports.

² Due to rounding, the total reported site electricity savings resulting from adding up the values in the 2015 and 2016 Rocky Mountain Power Wyoming annual reports amounted to 7,290,212 kWh.



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

Key Findings

Cadmus' impact evaluation addressed 99% of the HES program savings. This included Cadmus collecting primary data on the top savings measures and completing engineering reviews using primary survey or 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 124% gross realization rate for reported savings in the appliance measure category. Gross savings realization rates ranged from 100% for energy-efficient dishwashers, freezers, and refrigerators to 133% for energy-efficient 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 65%, derived from self-response surveys.
- **Building Shell:** Overall, Cadmus assigned a 100% gross realization rate of reported savings for the building shell measure category (consisting of attic, wall, and floor insulation as well as windows). Building shell measures achieved a 64% savings-weighted NTG ratio, derived from self-response surveys.
- **Electronics:** Overall, Cadmus estimated a 29% gross realization rate of reported savings for the electronics measure category. Incented flat panel TVs, making up 99.9% of reported savings in this category, had a 29% realization rate because Cadmus used ENERGY STAR®'s improved market baseline, in effect as of 2013. Cadmus did not apply a freeridership ratio to the flat panel TV savings because evaluated gross savings used a market baseline. Electronics measures exhibited a 104% savings-weighted NTG, resulting from 4% nonparticipant spillover. Both TVs and computer monitors were discontinued in 2015.
- **HVAC:** Overall, the HVAC measure category realized 80% of reported gross savings. Evaluated gross savings realization rates ranged from 53% (ductless heat pumps) to 126% (evaporative coolers). HVAC measures achieved an 81% savings-weighted NTG, derived from self-response surveys.
- **wattsmart Starter Kits:** Though Cadmus evaluated **watt**smart kit products (such as lighting and water-saving devices) separately, when combined at the kit level, the kits realized 68% of reported savings. Installation rates varied from 52% for showerheads to 87% for LEDs, and 77% of survey respondents who received water-saving measures (i.e., faucet aerators and showerheads) reported having an electric water heater, meaning savings could not be claimed for 23% of water-saving measures. Derived from self-response surveys, kits had a weighted NTG of 87%.

- Lighting:** Overall, the HES lighting category, which includes light fixtures as well as bulbs, realized 83% of reported savings. Cadmus evaluated 87% and 79% realization rates for CFL and LED bulbs, respectively. The evaluation estimated lower hours-of-use (HOU) and in-service rates (ISR) for bulbs and fixtures than reported. The HES lighting category has a weighted NTG of 56% resulting from demand elasticity modeling (for bulbs) and self-response surveys (for fixtures). The low NTG results from low observed price elasticities and periods of greater sales, coinciding with increases in price—particularly for CFLs.
- Water Heating:** Cadmus assigned a 100% realization rate for the water heating category. Water heating measures achieved a 79% savings-weighted NTG ratio, derived from self-response surveys.

Table 1. 2015 and 2016 HES Program Savings¹

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	545	545	55,007	68,303	124%	±2%	48,996	65%
Building Shell	37,589	37,589	39,416	39,416	100%	N/A	31,153	64%
Electronics	413	413	73,762	21,305	29%	±0%	22,153	104%
HVAC	182	182	173,927	138,486	80%	±3%	113,357	81%
Energy Kits	2,621	2,621	960,281	651,372	68%	±9%	560,180	87%
Lighting	319,359	319,359	5,978,548	4,945,406	83%	±3%	2,789,196	56%
Water Heating	15	15	9,270	9,270	100%	N/A	7,466	79%
Total	360,724	360,724	7,290,211	5,873,558	81%	±3%	3,572,500	61%

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

²For the Building Shell category, Cadmus counted each square foot of incented insulation or windows as one unit.

Table 2 and Table 3 show impact evaluation findings by program year. Notably, Rocky Mountain Power updated reported program savings for several measures in 2016; therefore, the 2016 realization rates differed from the 2015 realization rates. Although the appliance category’s realization rate increased (resulting from an improved clothes washer realization rate) and the HVAC category realization rate decreased (resulting from a decreased realization rate for evaporative coolers) in 2016, the program-level realization rate stayed consistent between 2015 and 2016. This resulted from lighting constituting more than 80% of reported program savings, with a consistent realization rate for both years.

Cadmus applied NTG ratios to each measure 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. The increase in the water heating



category NTG resulted from the discontinuation of the electric water heaters in 2016.³ As the lighting NTG ratio dropped in 2016, a lower program NTG ratio resulted in 2016.

Table 2. 2015 HES Program Savings¹

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	398	398	38,947	47,135	121%	33,811	65%
Building Shell	18,412	18,412	17,480	17,480	100%	13,815	64%
Electronics	413	413	73,762	21,305	29%	22,153	104%
HVAC	92	92	64,843	60,509	93%	49,529	81%
Energy Kits	1,868	1,868	689,636	468,503	68%	402,912	87%
Lighting	233,697	233,697	4,296,482	3,542,630	82%	2,121,521	60%
Water Heating	11	11	2,094	2,094	100%	1,592	72%
Total	254,891	254,891	5,183,244	4,159,655	80%	2,645,334	64%

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

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

Table 3. 2016 HES Program Savings¹

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	147	147	16,060	21,169	132%	15,185	65%
Building Shell	19,177	19,177	21,936	21,936	100%	17,338	64%
HVAC	90	90	109,084	77,977	71%	63,828	81%
Energy Kits	753	753	270,645	182,869	68%	157,267	87%
Lighting	85,662	85,662	1,682,066	1,402,776	83%	667,675	48%
Water Heating	4	4	7,176	7,176	100%	5,874	81%
Total³	105,833	105,833	2,106,968	1,713,903	81%	927,166	54%

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

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

³Rocky Mountain Power did not offer electronics incentives in 2016.

³ Electric water heaters and heat pump water heater were assigned different NTG ratios. Due to low participation, Cadmus could not calculate self-reported NTG ratios for the water heating measure category. Consistent with previous evaluations of this program, Cadmus applied the evaluated appliances' NTG ratio to electric water heaters and the evaluated HVAC NTG ratio to the heat pump water heaters.

Key Process Evaluation Findings

Key process evaluation findings include the following:

- CLEAResult upgraded the customer experience throughout 2015–2016 by enabling online applications for most downstream, non-lighting measures, and by providing an online portal where customers could track their application’s progress.
- Customers continued to report that they primarily learned of upstream/midstream incentives through bill inserts and TV, mentioned by 41% and 16% of respondents, respectively. For downstream lighting fixture incentives, the primary awareness sources were retailer marketing (25%) and word-of-mouth (18%); for non-lighting incentives, customers reported learning about the program through retailers (52%) and bill inserts (12%).
- Customers continued to cite energy savings as the most common reason for purchasing LEDs, reported by 51% of respondents. The percentage of respondents, however, buying LEDs due to quality of light decreased significantly, from 37% to 20%.
- For non-lighting measures, customers continued to report most frequently that they selected the item purchased due to style or features (25%), because they wanted energy savings (24%), or they needed to replace broken equipment (21%). The incentive motivated purchases by 17% of respondents.
- The percentage of respondents indicating they were “very satisfied” with the *wattsmart* HES program in 2015–2016 (78%) increased significantly relative to 2013–2014 (65%).
- Trade ally participation declined in 2015–2016, primarily due to turnover among key personnel. The program administrator noted only a “handful” of trade allies were truly engaged in Wyoming.
- Although program staff reported online applications as a program success during the evaluation period, only three trade allies used them and, in general, they still struggled with the application process, finding the application online, and identifying and supplying the data required.
- Four of ten trade allies interviewed reported promoting the HES program to their customers frequently or all the time. When asked what would help them increase program awareness and activity, trade allies most often said increased program support in the form of more responsive communication and more information and materials.

Benchmarking

For CFL and LED lighting measures, Rocky Mountain Power exhibited a lower evaluated net savings-per-unit value than evaluated net savings reported by some utilities outside of the region. As Cadmus establishes in this evaluation, this resulted from lower ISRs and HOU.

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. Downstream incentives are paid post-purchase using mail-in or online incentive applications.

Cost-Effectiveness Results

As shown in Table 4, the HES program did not prove cost-effective across the 2015–2016 evaluation period in any test, except the Participant Cost Test (PCT) test. From the Total Resource Cost (TRC) perspective, the program achieved an average benefit-cost ratio of 0.73 across two years.

Table 4. 2015–2016 Evaluated Net HES Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PacifiCorp Total Resource Cost Test (PTRC) (TRC + 10% Conservation Adder)	\$0.080	\$1,949,012	\$1,570,770	(\$378,243)	0.81
Total Resource Cost (TRC) No Adder	\$0.080	\$1,949,012	\$1,427,972	(\$521,040)	0.73
Utility Cost Test (UCT)	\$0.072	\$1,747,281	\$1,427,972	(\$319,308)	0.82
Ratepayer Impact Measure (RIM) Test		\$4,381,980	\$1,427,972	(\$2,954,007)	0.33
Participant Cost Test (PCT)		\$1,614,891	\$5,029,177	\$3,414,287	3.11
Lifecycle Revenue Impacts (\$/kWh)					\$0.000056363
Discounted Participant Payback (years)					1.78

Table 5 and Table 6, respectively, show HES program cost-effectiveness for the 2015 and 2016 program years, based on evaluated net savings. The program did not prove cost-effective in any test, except the PCT test in either 2015 or 2016.

Table 5. 2015 Evaluated Net HES Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.078	\$1,282,233	\$1,031,396	(\$250,837)	0.80
TRC No Adder	\$0.078	\$1,282,233	\$937,633	(\$344,600)	0.73
UCT	\$0.068	\$1,123,582	\$937,633	(\$185,949)	0.83
RIM		\$2,876,656	\$937,633	(\$1,939,023)	0.33
PCT		\$1,106,486	\$3,263,978	\$2,157,492	2.95
Lifecycle Revenue Impacts (\$/kWh)					\$0.000036997
Discounted Participant Payback (years)					1.33

Table 6. 2016 Evaluated Net HES Program Cost-Effectiveness Summary

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.084	\$711,186	\$575,296	(\$135,891)	0.81
TRC No Adder	\$0.084	\$711,186	\$522,996	(\$188,190)	0.74
UCT	\$0.079	\$665,237	\$522,996	(\$142,241)	0.79
RIM		\$1,605,578	\$522,996	(\$1,082,582)	0.33
PCT		\$542,264	\$1,882,761	\$1,340,497	3.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000021610
Discounted Participant Payback (years)					1.66

Summary and Recommendations

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

- **wattsmart Kit Participant Phone Numbers:** As the *wattsmart* 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 *wattsmart* 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 merchandizing within retail locations. Though decreasing the price of efficient lighting products primarily drives sales, merchandizing 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 merchandizing 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.
- **Trade Ally Support:** A majority of trade allies (seven of ten) reported they were somewhat satisfied with the program overall, one reported very satisfied, one reported not very satisfied, and one did not report a satisfaction level. Four trade allies marketed the program frequently or all the time, while four trade allies said they marketed it seldom, and two said never. These six trade allies that were somewhat satisfied and did not aggressively market the program, reported multiple reasons for being less than very satisfied. Three did not fully understand the program, three cited incentives that were too low to justify the additional cost of the more



energy-efficient equipment, five did not receive the program support they feel they needed, and two found the application process difficult and time consuming. Only one trade ally reported receiving formal training in the last three years (i.e., program updates such as changes to program incentives, eligible equipment, or application processes). Additionally, trade allies' supplies of program materials were not replenished in a timely manner when exhausted, and some trade allies did not know program material were available. The program currently supports Wyoming trade allies with periodic visits from an account manager in Utah, who also supports trade allies in Idaho.

- **Recommendation:** To encourage more engaged trade ally participation and outreach to customers, the program administrator should consider ways to increase the frequency of face-to-face contacts with trade allies, renew exhausted supplies of program materials, improve trade ally training, support trade allies in the field, and respond quickly to their questions.
- **HVAC Equipment Applications:** Trade allies have experienced difficulty understanding which equipment qualifies for the program incentives and with understanding, finding, and supplying information required by the program. Additionally, one trade ally pointed out a program requirement to provide a static pressure value for ductless heat pumps—a test that is designed for split systems and packaged HVAC equipment, not ductless heat pumps.

Program staff only recently (at the end of 2016) finished implementing online applications for most measures, therefore trade ally frustration may be decreasing since completing the evaluation interviews in mid-2017.

- **Recommendation:** Direct the account manager to reach out to trade allies in Wyoming, either in person or via phone, to introduce them to the online application forms, walking them through them and determining if challenges are ongoing. This will serve two purposes: increasing the attention and support that trade allies say they lack, and identifying if underlying issues with the application form remain. With this information, the program staff can determine how best to address such issues.
- **Recommendation:** On the heat pump application, clarify testing requirements for ductless heat pumps by indicating the *Outside Air Temperature (Option I) True Flow Test* applies to ducted heap pumps only.

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
- Building shell measures

The program also included a downstream incentive for LED and CFL lighting fixtures. The HES program included an upstream and/or midstream lighting component, providing high-efficiency lighting options by offering incentives for eligible CFLs and LED lamps at the retail level. The program also offered low- and no-cost **watt**smart Starter Kits.

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

- Appliances:
 - Clothes washer
 - Dishwasher
 - Freezer
 - Refrigerator
- Building Shell:
 - Insulation (e.g., attic, floor, wall)
 - Windows
- Home Electronics: (2015 only)
 - Computer monitor
 - Flat panel TV
- HVAC:
 - Ceiling fan
 - Central air conditioner equipment
 - Central air conditioner best practice installation and sizing
 - Central air conditioner proper sizing
 - Ductless heat pump
 - Duct sealing and insulation (2016 only)
 - Duct sealing and insulation—Multifamily homes (2016 only)
 - Efficient gas furnace with electronically commutated motor (ECM)
 - Evaporative cooler



- Ground source heat pump
- Heat pump conversion
- Heat pump to heat pump upgrade
- Room air conditioner
- Lighting:
 - CFLs
 - LEDs
 - Efficient light fixtures
- Water Heating:
 - Electric water heater (2015 only)
 - Heat pump water heater
- **wattsmart** Starter Kits (e.g., CFLs, LEDs, aerators, high-efficiency showerheads)

Program Participation

During the 2015–2016 HES program years, Rocky Mountain Power provided prescriptive incentives to more than 1,000 residential customers, **wattsmart** Starter Kits to more than 2,600 customers, and upstream discounts for more than 319,000 products. Table 7 shows participation and savings by measure category and measure for this period.⁴

Table 7. HES Reported Quantity and Savings by Measure, 2015–2016¹

Measure Category	Measure Name	Reported Quantity	Quantity Type	Reported kWh Savings
Appliances	Energy Efficient Clothes Washer	312	Measures	39,887
	Energy Efficient Dishwasher	87	Measures	3,978
	Energy Efficient Freezer	60	Measures	3,992
	Energy Efficient Refrigerator	86	Measures	7,150
Building Shell	Insulation-Attic	26,896	Square Feet	24,871
	Insulation-Floor	1,288	Square Feet	4,508
	Insulation-Wall	8,937	Square Feet	8,686
	Windows	468	Square Feet	1,351
Electronics	Energy Efficient Computer Monitor	1	Measures	14
	Energy Efficient Flat Panel Television	412	Measures	73,748
HVAC	Central Air Conditioner Best Practice Installation & Sizing	4	Measures	892
	Central Air Conditioner Equipment	3	Measures	744
	Central Air Conditioner Proper Sizing	3	Measures	180
	Duct Sealing & Insulation - Multifamily Homes	31	Measures	32,240
	Efficient Gas Furnace with ECM	7	Measures	3,514
	Electric System to Heat Pump Conversion	4	Measures	32,012

⁴ Table 9 provides detailed participant counts.

Measure Category	Measure Name	Reported Quantity	Quantity Type	Reported kWh Savings
	Energy Efficient Ceiling Fan	2	Measures	318
	Energy Efficient Room Air Conditioner	1	Measures	41
	Evaporative Cooler - Tier 1	40	Measures	10,840
	Evaporative Cooler - Tier 2	3	Measures	1,425
	Evaporative Cooler - Tier 2, Self-Installed	69	Measures	32,775
	Heat Pump to Heat Pump Upgrade	1	Measures	1,294
	Heat Pump, Ductless	14	Measures	57,652
Energy Kits	Basic Kit	1,040	Kits	672,286
	Best Kit	283	Kits	198,885
	Better Kit	4	Kits	2,289
	CFL Kit	1,083	Kits	67,839
	LED Kit	211	Kits	18,982
Lighting	Light Bulbs - CFL	222,127	Bulbs	3,703,992
	Light Bulbs - LED	90,932	Bulbs	1,963,805
	Light Fixtures - CFL	33	Fixtures	1,076
	Light Fixtures - LED	6,267	Fixtures	309,674
Water Heating	Electric Water Heater	10	Measures	1,207
	Heat Pump Water Heater, Self-installed	5	Measures	8,063
Total				7,290,211

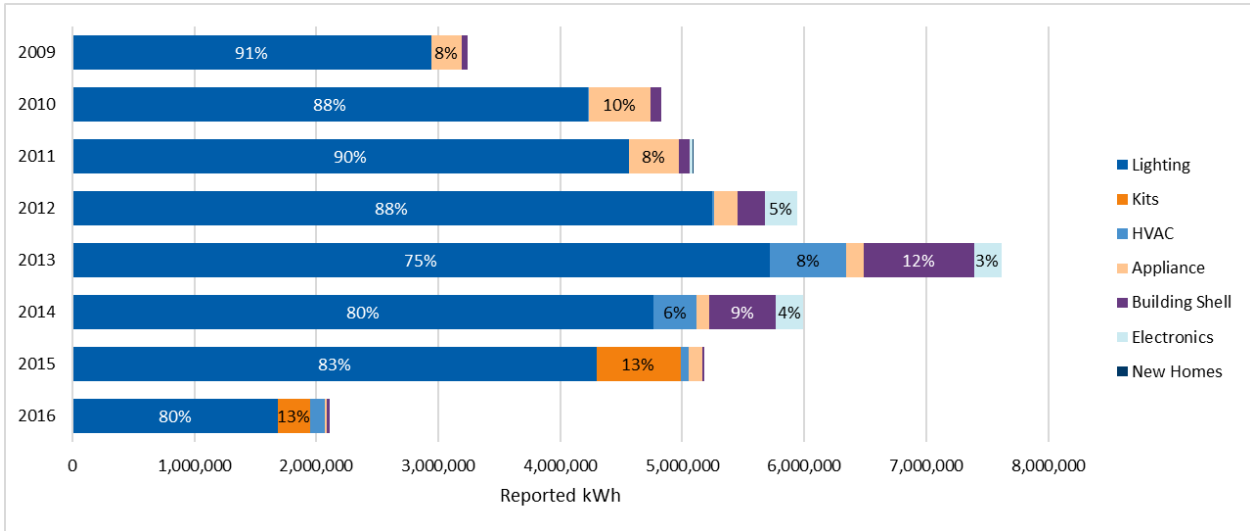
¹Source: Rocky Mountain Power 2015 and 2016 annual reports and 2015–2016 kits, lighting, and non-lighting databases, provided by the program administrator.

Historically, the great majority of HES program savings have derived from lighting, and the 2015 and 2016 program years have not been an exception: upstream lighting measures contributed 83% and 80% of annual reported gross program savings, respectively, as shown in Figure 1. However, lighting measure category savings dropped significantly in 2016. In its 2016 annual report, Rocky Mountain Power states that the decrease in 2016 HES reported savings from 2015 was primarily due to a reduction in incandescent CFLs. This was caused by the largest participating retail chain in the Company’s Wyoming service territory moving away from CFL products in early 2016, contributing to a decrease in their availability. Additionally, the primary manufacturer of LEDs for independent retailers in the service territory was slow to adapt to static incentive levels for LEDs during the program year.⁵ As of this report, the 2017 program is reporting increased participation and savings from 2016 levels, indicating Rocky Mountain Power has addressed the issues necessary for the savings to rebound to previous levels.

⁵ Rocky Mountain Power Wyoming 2016 Efficiency and Peak Reduction Annual Reports. Available online: [http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2016_WY_Annual_DSM_Report_\(7-13-17\).pdf](http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2016_WY_Annual_DSM_Report_(7-13-17).pdf)



Figure 1. Reported Gross kWh Savings by Measure Category from 2009–2016^{1,2,3}



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

²Rocky 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 the program vary from those in the figure above.

³Heat pump water heaters have been categorized under HVAC, and electric water heaters have been categorized under appliances, to allow comparisons between 2015–2016 and 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 similar utility programs. Table 8 summarizes evaluation activities supporting the impact and process evaluations, and Appendix A provides the survey and data collection instruments used.

Table 8. Summary of Evaluation Approach

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

*This activity provided an estimate of nonparticipant spillover (NPSO) savings.

Sample Design and Data Collection Methods

For each measure category, Cadmus developed a representative sample of each surveyed population, designed to achieve $\pm 10\%$ precision with 90% statistical confidence. Cadmus assumed a coefficient of variation (CV)⁶ equal to 0.5 for computing initial sample sizes. Given the small surveyed population, Cadmus applied a finite population adjustment factor, which effectively reduced the sample size necessary while maintaining the desired target precision.

Table 9 shows the final sample disposition for various data collection activities. For nearly all data collection (except administrator and management staff interviews), Cadmus drew samples using simple or stratified random sampling.⁷

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

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



Table 9. Sample Disposition for Various HES Program Data Collection Activities in Wyoming

Data Collection Activity	Population	Sampling Frame	Target Completes	Achieved Completes
Program Staff Interview	N/A	N/A	1	1
Program Administrator Interviews	N/A	N/A	1	2
Non-Lighting Participant Surveys ¹	1,053	971	240	132 ²
Lighting Participant Surveys (Fixtures)	259	164	30	30
Kit Participant Survey ¹	2,621	2,535	140	140
General Population Surveys ³	102,553	94,538	250	250
HVAC Trade Ally Interviews	13	12	10	10 ⁴

¹Non-lighting and kit participant populations represent all unique participants by account number, according to program tracking data from the program administrator.

²The program participant data that Cadmus received for the first round of non-lighting participant surveys in 2015, covering the first two quarters of 2015, contained phone numbers assigned to the wrong participants. As a result, a sizable portion of the available sample (over 200) was lost to refusals before Cadmus could apply corrected phone numbers to the data.

³The general population count includes residential program participants and nonparticipants based on customer data provided by Rocky Mountain Power for the general population survey.

⁴Cadmus spoke to 12 of the 13 trade allies in the population. One trade ally representative had recently moved, and the new contact could not answer the questions; a second trade ally completed the interview, but participated only in 2017 and therefore could not be included in the completed interview data.

Non-Lighting Participant Telephone Surveys

Cadmus surveyed 132 non-lighting participants, gathering measure-level 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.

Table 10 provides the population of non-lighting participants, targets, and achieved numbers of surveys.

Table 10. Non-Lighting Participant Survey Sample

Measure Category	Population	Sampling Frame	Targeted	Achieved
Appliances	874	792	80	78
HVAC	149	149	80	45
Building Shell	38	37	80	9 ²
Total	1,061¹	978	240	132

¹The total population differs from the total population in Table 9 as some participant respondents participated in multiple measure categories.

²Due to the small population of building shell participants, Cadmus could not complete the targeted number of surveys. All efforts were made to attain the target without placing undue burden on customers; up to five attempts were made to reach each participant.

Participant Kit Surveys

Cadmus surveyed 140 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.

The evaluation targeted samples to achieve statistically significant results for kits containing CFLs and kits containing LEDs (all kit types contained only one type of lighting), and stratified the sample into two groups: participants receiving LEDs; and participants receiving CFLs. Cadmus then randomly selected survey participants. Table 11 lists the population of kit participants, targets, and achieved surveys.

Table 11. Participant Kit Survey Sample

Lighting Type	Population	Sampling Frame	Targeted	Achieved
CFL	2,127	2,050	70	70
LED	494	485	70	70
Total	2,621	2,535	140	140

General Population Surveys

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

HVAC Trade Ally Interviews

Cadmus interviewed 10 HVAC trade allies participating in HES. 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 participation barriers for customers and trade allies
- Trade ally satisfaction with HES

Lighting Participant Surveys (Fixtures)

Rocky Mountain Power administered the CFL and LED light fixture incentives downstream. Cadmus conducted participant surveys with 30 downstream lighting participants, gathering measure-level information on installations, freeridership, spillover, program awareness and satisfaction, and demographics, as shown in Table 12.

Table 12. Lighting Participant Survey (Fixtures) Sample

Measure Category	Population	Sampling Frame	Targeted	Achieved
Light Fixture	259	164	30	30
Total	259	164	30	30

Impact Evaluation

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

- Participant surveys
- General population surveys
- Elasticity modeling
- 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.⁸ To determine evaluated gross savings, Cadmus applied Step 1 through Step 3; 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 the 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.
- **Step 4** (applying net adjustments): Cadmus calculated net saving adjustments using results from customer self-response and demand elasticity modeling. No freeridership savings adjustments were applied to measures that used a market baseline for gross savings evaluation in Step 3.⁹

Table 13 lists the methodology used for each gross and net savings step, by measure, for the 2015–2016 program.

⁸ Rocky Mountain Power Wyoming 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-DSM-WY-Annual-Report-081616.pdf

2016 report:

[http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2016_WY_Annual_DSM_Report_\(7-13-17\).pdf](http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2016_WY_Annual_DSM_Report_(7-13-17).pdf)

⁹ Freeridership is a measure of actions that customers would have undertaken in the program's absence. Freerider participants do not need the financial incentive to obtain an energy-efficient measure. Cadmus did not apply freeridership to savings calculations utilizing a market baseline as those savings accounted for customers that already would have bought equipment above the code minimum.



Table 13. 2015–2016 HES Impact Methodology by Measure

Measure Category	Measure Name	Percentage of Savings	Method			
			Step 1: Database Review	Step 2: Verification	Step 3: UES	Step 4: Net Adjustment
Appliances	Energy Efficient Clothes Washer	0.5%	Non-Lighting Tracking Database Review	In-Service Rate: Non-Lighting Survey	Engineering Review	Self-Response net-to-gross (NTG)
	Energy Efficient Dishwasher	0.1%			Reported	
	Energy Efficient Freezer	0.1%				
	Energy Efficient Refrigerator	0.1%				
Building Shell	Insulation-Attic	0.3%		Reported		
	Insulation-Floor	0.1%				
	Insulation-Wall	0.1%				
	Windows	Less than 0.1%				
Electronics	Energy Efficient Computer Monitor	Less than 0.1%		Engineering Review	Current practice baseline used*	
	Energy Efficient Flat Panel Television	1.0%				
HVAC	Central Air Conditioner Best Practice Installation & Sizing	Less than 0.1%		In-Service Rate (ISR): Non-Lighting Participant Survey	Reported	Self-Response NTG
	Central Air Conditioner Equipment	Less than 0.1%				
	Central Air Conditioner Proper Sizing	Less than 0.1%				
	Duct Sealing & Insulation - Multifamily Homes	0.4%			Engineering Review	
	Efficient Gas Furnace with ECM	Less than 0.1%			Reported	
	Electric System to Heat Pump Conversion	0.4%			Engineering Review	
	Energy Efficient Ceiling Fan	Less than 0.1%	Reported			
	Energy Efficient Room Air Conditioner	Less than 0.1%				
	Evaporative Cooler - Tier 1	0.1%	Engineering Review			
	Evaporative Cooler - Tier 2	Less than 0.1%				
	Evaporative Cooler - Tier 2, Self-Installed	0.4%				
	Heat Pump to Heat Pump Upgrade	Less than 0.1%	Reported			

Measure Category	Measure Name	Percentage of Savings	Method			
			Step 1: Database Review	Step 2: Verification	Step 3: UES	Step 4: Net Adjustment
	Heat Pump, Ductless	0.8%			Engineering Review	
Energy Kits	Basic Kit	9.2%	Kit Tracking Database Review	ISR: Kit Participant Survey	Engineering Review	
	Best Kit	2.7%				
	Better Kit	Less than 0.1%				
	CFL Kit	0.9%				
	LED Kit	0.3%				
Lighting	Light Bulbs - CFL	50.8%	Lighting Tracking Database Review	ISR: General Population Survey	Engineering Review	Demand Elasticity Modeling
	Light Bulbs - LED	26.9%		ISR: Lighting Participant Survey		Self-Response NTG
	Light Fixtures - CFL	Less than 0.1%				
	Light Fixtures - LED	4.2%				
Water Heating	Electric Water Heater	Less than 0.1%	Non-Lighting Tracking Database Review	ISR: Non-Lighting Survey	Reported	
	Heat Pump Water Heater, Self-installed	0.1%				

*Freeridership adjustments were not applied to measures as the engineering review used a current practice baseline to estimate savings, producing a net-of-freeridership result, however spillover was applied as applicable.



Evaluated Gross Savings

To calculate gross savings for HES program measures, Cadmus conducted tracking database reviews, measure verification, and engineering reviews for at least 99% of program savings. Table 14 presents the savings share and gross savings evaluation method for measures during the 2015–2016 period.

Table 14. Measure Selection for Step 3: Engineering Reviews

Measure Category	Measure	Percentage of Reported kWh Savings	Step 3: Evaluation Method
Appliance	Clothes Washers	Less than 1%	Engineering Review
Electronics	Flat Panel Televisions	1%	Engineering Review
HVAC	Duct Sealing & Insulation—Multifamily Homes	Less than 1%	Engineering Review
	Electric System to Heat Pump Conversion	Less than 1%	Engineering Review
	Evaporative Coolers	Less than 1%	Engineering Review
	Ductless Heat Pumps	1%	Engineering Review
Energy Kits	watt smart Starter Kits	13%	Engineering Review
Lighting	Light Bulbs--CFL	51%	Engineering Review
	Light Bubs--LED	27%	Engineering Review
	Fixtures	4%	Engineering Review
Sum % of Reported Savings Evaluated		99%	

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

Table 15. Reported and Evaluated Gross HES Program Savings for 2015–2016

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated	
Appliance	Energy Efficient Clothes Washer	312	39,887	53,183	133%
	Energy Efficient Dishwasher	87	3,978	3,978	100%
	Energy Efficient Freezer	60	3,992	3,992	100%
	Energy Efficient Refrigerator	86	7,150	7,150	100%
Building Shell ¹	Insulation-Attic	26,896	24,871	24,871	100%
	Insulation-Floor	1,288	4,508	4,508	100%
	Insulation-Wall	8,937	8,686	8,686	100%
	Windows	468	1,351	1,351	100%
Electronics	Energy Efficient Computer Monitor	1	14	14	100%
	Energy Efficient Flat Panel Television	412	73,748	21,291	29%
HVAC	Central Air Conditioner Best Practice Installation & Sizing	4	892	892	100%
	Central Air Conditioner Equipment	3	744	744	100%
	Central Air Conditioner Proper Sizing	3	180	180	100%

Measure Category	Measure Name	Quantity	Program Savings (kWh)		Realization Rate
			Reported	Evaluated	
	Duct Sealing & Insulation—Multifamily Homes	31	32,240	21,198	66%
	Efficient Gas Furnace with ECM	7	3,514	3,514	100%
	Electric System to Heat Pump Conversion	4	32,012	22,920	72%
	Energy Efficient Ceiling Fan	2	318	318	100%
	Energy Efficient Room Air Conditioner	1	41	41	100%
	Evaporative Cooler—Tier 1	40	10,840	18,869	174%
	Evaporative Cooler—Tier 2	3	1,425	2,641	185%
	Evaporative Cooler—Tier 2, Self-Installed	69	32,775	35,055	107%
	Heat Pump to Heat Pump Upgrade	1	1,294	1,294	100%
	Heat Pump, Ductless	14	57,652	30,819	53%
Energy Kits	Basic Kit	1,040	672,286	444,573	66%
	Best Kit	283	198,885	130,004	65%
	Better Kit	4	2,289	1,576	69%
	CFL Kit	1,083	67,839	59,637	88%
	LED Kit	211	18,982	15,581	82%
Lighting	Light Bulbs—CFL	222,127	3,703,992	3,204,783	87%
	Light Bulbs—LED	90,932	1,963,805	1,552,294	79%
	Light Fixtures—CFL	33	1,076	949	88%
	Light Fixtures—LED	6,267	309,674	187,380	61%
Water Heating	Electric Water Heater	10	1,207	1,207	100%
	Heat Pump Water Heater, Self-installed	5	8,063	8,063	100%
Total²		360,724	7,290,211	5,873,558	81%

¹Quantities for building shell measures are in square feet.

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

Step 1: Tracking Database Reviews

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

The **wattsmart** 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 numbers¹⁰ from 2015 to 2016 (which were necessary for conducting surveys). Rocky Mountain Power provided participant phone numbers by mapping participant account numbers to its customer database.

¹⁰ At the time of this evaluation, the program administrator has started collecting phone numbers.



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 incented bulbs and fixtures, in addition to retailers, electric savings, purchase dates, models, and stock keeping units [SKUs].¹¹ 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 estimate sales lift due to price effects and to 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 estimating freeridership. Any merchandising coinciding with price changes and leading to increased sales, if 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, if 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, the lighting participant (fixture) surveys for light fixtures, and the general population survey for upstream CFL and LED bulbs.

Non-Lighting In-Service Rate

For each measure category, Cadmus asked survey respondents a series of questions designed to determine if they installed products for which they received incentives. All survey respondents reported installing all measures, resulting in a 100% ISR for all non-lighting measure categories. Table 16 shows the quantities of measures and their ISRs as well as the breadth and quantity of measures addressed by the survey.

Note that one electronics category participant purchasing a flat panel TV reported installing the unit in his camping trailer. Given a trailer’s portable nature and not being consistently occupied, Cadmus assumed this unit was not in-service. All other survey respondents reported installing all measures listed in the survey, resulting in a 95% ISR for the electronics measure category.

¹¹ SKU numbers represent the unique make and model indicators for a specific retailer.

Table 16. ISR by Measure Category, 2015–2016

Measure Category	Measure	2015 and 2016			Average Weighted ISR
		Total Surveyed Measures	Installed Measures	Percentage Installed	
Appliances	Clothes Washer	33	33	100%	100%
	Dishwasher	3	3	100%	
	Freezer	11	11	100%	
	Energy Efficient Refrigerator	8	8	100%	
Building Shell	Attic Insulation	5,779	5,779	100%	100%
	Wall Insulation	1,275	1,275	100%	
	Windows	143	143	100%	
Electronics	Flat Panel TV	20	19	95%	95%
HVAC	Central AC Best Practice Installation and Sizing	2	2	100%	100%
	Ductless Heat Pump	8	8	100%	
	Evaporative Cooler (Tier 1)	3	3	100%	
	Evaporative Cooler (Tier 2)	37	37	100%	
	Efficient Furnace with ECM	1	1	100%	
	Heat Pump Conversion or Upgrade	1	1	100%	
Water Heating	Heat Pump Water Heater	2	2	100%	100%

wattsmart Starter Kits In-Service Rate

Cadmus calculated ISRs for each kit product using data collected through a survey that Cadmus administered with 140 Wyoming 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 measures they had installed (at the time of the survey). If respondents reported that they had not installed the measure, the survey asked additional questions about why the measure had not been installed and what ultimately happened to the measure (e.g., stored, discarded).

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



Table 17. ISR by Kit Measure, 2015-2016

Measure	Total Surveyed Measures	Measures Reported as Installed	ISR
Bathroom Aerator	107	61	57%
CFLs*	264	187	71%
Kitchen Aerator	61	31	51%
LEDs*	271	236	87%
Showerheads	126	65	52%

*Consistent with the upstream CFL and LED ISR analysis, bulbs removed due to burnout were considered to have been installed.

LEDs attained the highest ISR of the five measures reported installed at the time of the survey (87%); kitchen aerators had the lowest ISR (51%).

Cadmus compared **wattsmart** Starter Kit ISRs with those from Rocky Mountain Power’s Idaho HES program evaluation and with two other utilities’ residential energy efficiency kit programs in which free energy- and water-saving products were delivered to customers at their request. As shown in Table 18, Wyoming **wattsmart** Starter Kit ISRs were close to **wattsmart** Starter Kit ISRs evaluated in Idaho, but generally lower than those of the other utilities.

Table 18. Mail-by-Request Kit Program ISRs Comparison

Product	PPL Electric Utilities PA 2015 ¹	Iowa Energy Wise IA 2016 ²	Idaho HES 2015–2016 ³	Wyoming HES 2015–2016
Kitchen Faucet Aerator	65%	74%	60%	51%
Bathroom Faucet Aerators	N/A	70%	63%	57%
Showerheads	60%	74%	67%	52%
CFLs	N/A	79%	81%	71%
LEDs	97%	75%	92%	87%

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.

³ Cadmus. *Rocky Mountain Power 2015–2016 Wyoming Home Energy Savings Program Evaluation*. Draft submitted on October 16, 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 Wyoming 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 those 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 burnout 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 approach arose from Cadmus’ concerns about a customer’s ability to recall purchases occurring more than two years before the survey. The calculated ISRs did not account for installations occurring after the first year of purchase.

The following formula calculated the lighting ISR:

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

To reflect the program’s move away from CFL incentives in Wyoming, the 2015–2016 survey did not include questions related to CFL purchases. Therefore, Cadmus based the CFL first-year ISR values reported for the current evaluation on the program’s previous evaluation (i.e., 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 (i.e., 2013–2014).¹² Of 250 customers surveyed, 64 did not purchase CFLs, and nine could not confirm or estimate how many they purchased; consequently, the analysis excluded these data. The analysis also removed an additional 21 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 156 respondents.

Table 19 provides ISR results for 2013–2014 CFLs.

Table 19. 2015 and 2016 First-Year CFL ISR (Based on 2013–2014 Upstream Lighting Survey)*

Bulb Status	Bulbs Reported	ISR
Purchased	1,314	71%
Installed	1,010	
Stored	304	
Removed	143	
Removed After Burning Out	63	
In-Service Bulbs (Including Burned Out)	930	

*n = 156 respondents

Table 20 compares first-year ISRs evaluated for similar programs across the country (and for past HES program evaluations in Wyoming), with Wyoming’s CFL ISRs in the same range as those from other programs.

¹² Cadmus. *2013–2014 Wyoming Home Energy Savings Program Evaluation*. Prepared for Rocky Mountain Power. October 20, 2016. Available at: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2016/2013-2014_Wyoming_HES_Evaluation_Report.pdf



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

Source	Data Collection Method	Reported Year	ISR
Midwest Utility 1	Self-reporting: determined by interview during home inventory site visits	2016	86%
Midwest Utility 2	Self-reporting: 301 customer surveys	2012	68%
Northeast Utility	Self-Reporting: 200 telephone surveys	2012	73%
Rocky Mountain Power Wyoming 2011–2012 HES Evaluation	Self-reporting: 245 in-territory lighting surveys	2014	72%
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation (Same as 2013–2014 Evaluation)	Self-reporting: 156 in-territory upstream lighting surveys for 2013–2014 Evaluation	2017	71%

LED In-Service Rates

Cadmus calculated the first-year LED ISR for 2015–2016 using data collected through the general population survey of 250 Wyoming 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 purchasing LEDs and providing reliable responses, 51 customers remained eligible for inclusion in the LED ISR analysis. Table 21 lists the LED ISR results.

Table 21. 2015–2016 First-Year LED ISR*

Bulb Status	Bulbs Reported	ISR
Purchased	530	73%
Installed	394	
Stored	136	
Removed	12	
Removed After Burning Out	5	
In-Service Bulbs (Including Burned Out)	387	

*n = 51 respondents

Table 22 compares LED ISR values to ISRs calculated for LEDs in other jurisdictions. As noted, the Rocky Mountain Power’s 2015–2016 LED ISR value is the lowest amongst other studies referenced. All but one of the studies referenced use multi-year ISR, assume that bulbs currently in storage will be installed in the future. The only other first-year ISR in Maryland was verified using site visits. which may indicate that ISRs evaluated through site visits may be higher than those evaluated through self-report surveys.

Table 22. Comparison of Evaluated LED ISR Estimates

Utility or Program Administrator	Source	First-year or Multi-year	Reported Year	ISR
Ameren, MO	Site Visits	Multi-year	2016	88%
Salt River Project, AZ	The Uniform Methods Project*	Multi-year	2016	99%
EmPOWER, MD	Site Visits	First-year	2016	90%
PPL Electric, PA	Pennsylvania 2015 Technical Reference Manual	Multi-year	2016	97%
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation	Phone surveys	First-year	2016	73%

*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/UMPCChapter21-residential-lighting-evaluation-protocol.pdf>

Step 3: Unit Energy Savings Reviews

Cadmus conducted engineering reviews to estimate UES values for measures representing 99% of program-reported gross savings. Engineering reviews addressed the following program measures:

- CFL and LED bulbs
- Clothes washers
- Ductless heat pumps
- Duct Sealing and Insulation—Multifamily
- Evaporative Coolers
- Flat panel TVs
- Heat pump conversions
- Light fixtures
- **watt**smart starter kits (including CFLs, LEDs, faucet aerators and high-efficiency showerheads)

Cadmus assigned 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 23, UES realization rates for the evaluated measures ranged between 30% for flat panel TV and 185% for evaporative coolers (Tier 2).

Table 23. 2015–2016 Measurement Analysis and Gross¹ Unit Realization Rate Summary Table

Measure Category	Measure	Average UES (kWh/Unit)		UES Realization Rate*	UES Method
		Reported	Evaluated		
Appliance	Clothes Washer	128	170	133%	Engineering Review
Electronics	Flat Panel Television	179	54	30%	Engineering Review
HVAC	Duct Sealing & Insulation—Multifamily Homes	1,040	684	66%	Engineering Review
	Electric System to Heat Pump Conversion	8,003	5,730	72%	Engineering Review



Measure Category	Measure	Average UES (kWh/Unit)		UES Realization Rate*	UES Method
		Reported	Evaluated		
	Evaporative Cooler—Tier 1	271	472	174%	Engineering Review
	Evaporative Cooler—Tier 2	475	880	185%	Engineering Review
	Evaporative Cooler—Tier 2, Self-Installed	475	508	107%	Engineering Review
	Heat Pump, Ductless	4,118	2,201	53%	Engineering Review
Energy Kits	wattsmart Starter Kits	366	249	68%	Engineering Review
Lighting	CFL Lamps	17	20	122%	Engineering Review
	LED Lamps	22	23	108%	Engineering Review
	Fixtures	49	30	61%	Engineering Review

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

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

CFL and LED Bulbs

During the 2015–2016 program years, Rocky Mountain Power provided incentives for 222,127 CFLs and 90,932 LEDs through 13 different Wyoming retailers, representing 45 stores. Table 24 shows quantities and savings for the 14 different bulb types. Overall, CFL and LED bulbs represented 78% of the total HES reported savings.

Table 24. 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	3,455	1.1%	38,856
	Spiral	178,445	57.0%	2,965,848
	Candelabra	321	0.1%	5,384
	Globe	934	0.3%	13,799
	Reflector	4,216	1.3%	111,267
	Daylight	33,692	10.8%	538,208
	Outdoor	1,042	0.3%	29,944
	Dimmable	18	0.0%	529
	3-Way	4	0.0%	157
CFL Total		222,127	71.0%	3,703,992

Lighting Type	Bulb Type	Reported Quantity (Bulbs)	Reported Quantity % (Bulbs)	Reported Savings (kWh)
LED	A-Lamp	69,019	22.0%	1,288,113
	Candelabra	4,442	1.4%	83,579
	Globe	1,247	0.4%	17,220
	Downlight	16,184	5.2%	573,398
	3-Way	40	0.0%	1,495
LED Total		90,932	29.0%	1,963,805
Overall Total		313,059	100.0%	5,667,797

For the 2015–2016 evaluation period, LEDs made up 29% of the upstream programs, with this fraction increasing from 2015 to 2016, as shown in Table 25. In 2016, CFL participation dropped precipitously while LED participation approximately doubled. This drop reflects the market’s shift to LEDs since according to the 2016 annual report, the largest participating retail chain in the Rocky Mountain Power’s Wyoming service territory moved away from CFL products in early 2016, contributing to a decrease in the availability of CFLs.

Table 25. CFL and LED Upstream Lighting Participation, 2015–2016

Year	CFL Quantity	LED Quantity	Total	CFL %	LED %
2015	197,704	31,039	228,743	86%	14%
2016	24,423	59,893	84,316	29%	71%
Total	222,127	90,932	313,059	71%	29%

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 units 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



Cadmus determined baseline lamp wattages using the Energy Independence and Security Act of 2007 (EISA) with the exception of reflector lamps, which used a 2009 lamps ruling.¹³ To calculate the various CFL and LED lighting component inputs, Cadmus conducted the primary and secondary data collection and analysis activities shown in Table 26.

Table 26. 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	31.5 ¹
	LED		35.8 ¹
ISR	CFL	2013–2014 General Population Survey (n=133)	70.8%
	LED	2015–2016 General Population Survey (n=51)	73.0%
HOU	CFL	Multistate HOU Regression Model, 2013–2014 General Population Survey (n=86)	1.835
	LED	Multistate HOU Regression Model, 2015–2016 General Population Survey (n=203)	1.847
WHF	CFL + LED	2015–2016 General Population Survey (n=222)	0.967

¹Weighted average value for all bulbs of each technology.

²National 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 that the UMP prescribed for calculating residential lighting energy use and savings. The following sections discuss each equation component (except for ISR, discussed 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 313,059 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.

¹³ Energy Conservation Program. *Energy Conservation Standards and Test Procedures for General Service Fluorescent Lamps and Incandescent Reflector Lamps*. 74 FR 34080. Available online:

<https://www.gpo.gov/fdsys/pkg/FR-2009-07-14/pdf/E9-15710.pdf>

Whenever possible, Cadmus estimated each lamp’s lumen output and efficient wattage by mapping it to ENERGY STAR’s database. When this proved impossible, Cadmus interpolated lumen outputs from efficient wattage, based on a best-fit line derived from the ENERGY STAR database.

Table 27 shows reported quantities for the five reported general lamp categories.

Table 27. 2015 and 2016 CFL Database Quantities by Bulb Types

Bulb Type	2015 Quantity	2015 Percentage	2016 Quantity	2016 Percentage	Overall Quantity	Percentage Overall
Standard	215,170	94.1%	70,501	83.6%	285,671	91.3%
Decorative	2,024	0.9%	2,739	3.2%	4,763	1.5%
Globe	1,595	0.7%	586	0.7%	2,181	0.7%
EISA-Exempt	37	0.0%	7	0.0%	44	0.0%
Reflectors	9,917	4.3%	10,483	12.4%	20,400	6.5%
Total	228,743		84,316		313,059	

The majority of bulbs fell into the standard bulb category. Table 28 shows 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, with reflector lamps divided into six separate categories, following the practice of the Mid-Atlantic Technical Reference Manual (TRM).¹⁴

Table 28. 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	392	308	700
450-799	29	8,884	9,527	18,411
800-1,099	43	170,374	55,207	225,581
1,100-1,599	53	14,952	1,752	16,704
1,600-1,999	72	20,568	3,707	24,275
2,000-2,600	72	0	0	0

¹⁴ 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>



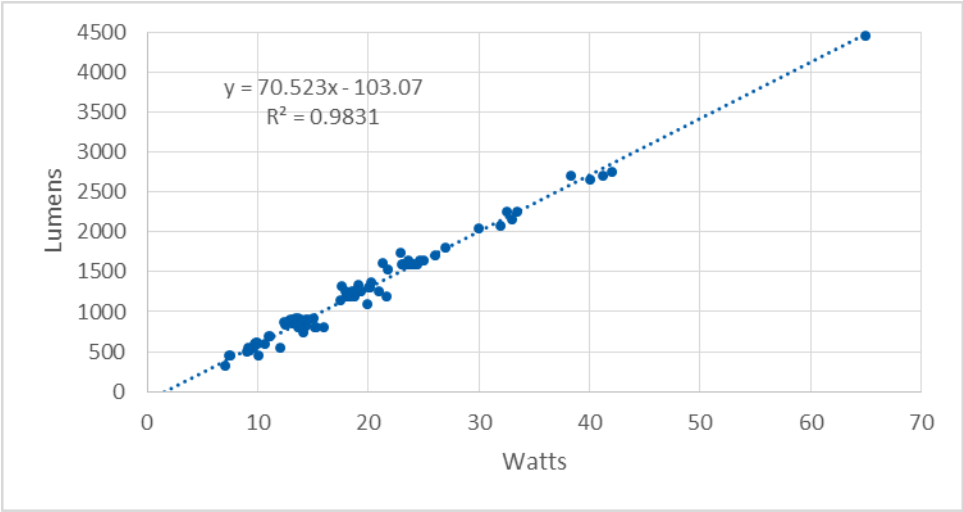
ENERGY STAR Qualified Product List Analysis

While all program bulbs had to be ENERGY STAR certified, 4% of bulbs (representing 47 models) could not be matched to the compiled ENERGY STAR qualified product list used by Cadmus. This does not mean these models were not ENERGY STAR certified; rather, it means these 47 models (out of 478) did not automatically match to the ENERGY STAR database and consisted of too few bulbs 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’s qualified product list.

To determine a relationship between CFL and LED wattages and lumen outputs, Cadmus used ENERGY STAR’s qualified bulb product lists, captured in October 2015 and October 2016.¹⁵ The database consisted of approximately 8,300 CFL products and 36,900 LED products, along with their associated wattages and lumens. Lumen outputs for given lamp wattages 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 ENERGY STAR’s qualified lamp product list.

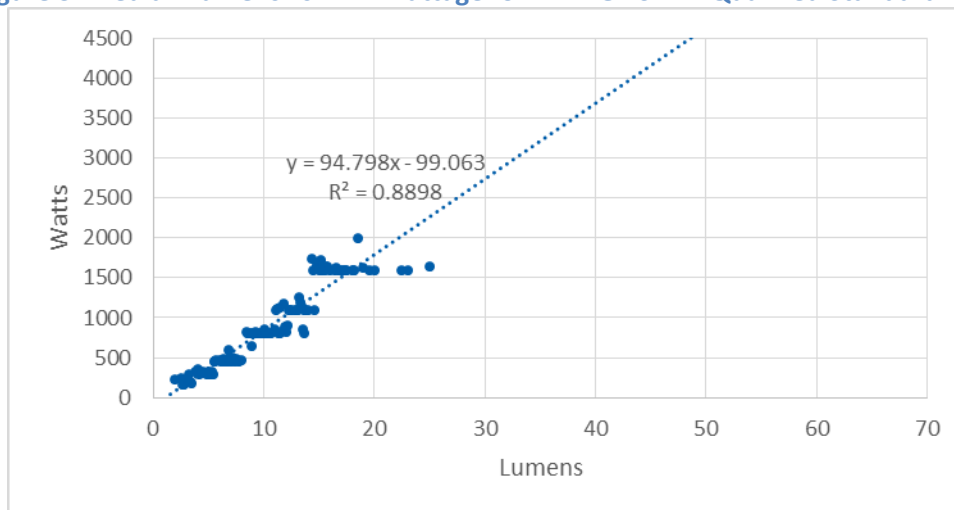
Figure 2. Median Lumens vs. CFL Wattage for ENERGY STAR-Qualified Standard CFLs



¹⁵ 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 3 shows the same chart for LED standard lamps, indicating an even wider spread of efficacies, though the average LED efficacy was clearly higher than the average CFL efficacy (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 hours of use (HOU) using bulb installation locations, drawn from surveys of Rocky Mountain Power customers in Wyoming combined with analysis of covariance model coefficients (from combined, multistate, multiyear data, produced by two recent CFL HOU metering studies conducted by Cadmus in Maryland and Missouri during 2014). This model expressed average HOU as a function of room type and is consistent with the method used in the 2013–2014 program year evaluation.

Cadmus used the LED bulb installation location data from the 2015–2016 general population survey. As that 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. This resulted in an average of 1.83 HOU for CFLs and 1.85 HOU for LEDs. Table 29 compares the evaluations’ HOU results.



Table 29. HOU by Evaluation Period

Evaluation Period	Evaluated HOU
2009–2010	2.25 hours
2011–2012	2.18 hours
2013–2014 CFLs*	1.83 hours
2015–2016 CFLs*	1.83 hours
2013–2014 LEDs	1.91 hours
2015–2016 LEDs	1.85 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 (i.e., rooms with lower usage, supplemental lighting such as desk lamps).

Cadmus estimated the lighting distribution per room using response data from the general population surveys, as shown in Table 30. The reported proportion of bulbs installed in some room types changed markedly between evaluation cycles. For example, the proportion of efficient bulbs installed in living space fixtures dropped in recent years, from 29% in 2011–2012 (combined CFL/LED evaluation) to 17% for CFLs and 14% for LEDs.

The “Other” category (e.g., closets, hallways, garages, dining, home office, utility or storage rooms) exhibited a large increase, to 28% for CFLs and 22% for LEDs in 2015–2016 compared to 8% in previous evaluations. As many room types in the “Other” category had a lower average HOU, increases in the proportion of bulbs installed in these room types lowered the overall average HOU.

Table 30. Survey-Reported CFL and LED Installation Locations

Bulb Location	Percentage of Total CFLs ¹			Percentage of Total LEDs 2015–2016
	2009–2010	2011–2012	2013–2014 (Also Used in 2015–2016 Evaluation)	
Living Space	30%	29%	17%	14%
Bedroom	26%	28%	21%	19%
Kitchen	13%	10%	16%	16%
Bathroom	14%	17%	10%	17%
Outdoor	3%	3%	3%	8%
Basement	5%	6%	4%	3%
Other	8%	8%	29%	23%
Total²	100%	100%	100%	100%

¹For 2009 and 2010 program years, n=250; for 2011 and 2012 program years, n=245; for 2013-2014 program years n=250.

²Percentages may not add to 100% due to rounding.

Current estimated HOU are similar to HOU calculated by the Regional Technical Forum (RTF) and by a recent metering study for the Northwest Energy Efficiency Alliance (NEEA), both of which were regionally representative. The RTF Residential Lighting Workbook v4.2, approved in January 2016,¹⁶ provided an average HOU of 2.0, while the NEEA study found an average of 1.8.¹⁷

Waste Heat Factor

A waste heat factor (WHF) adjustment made to energy savings accounts for 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. For this evaluation, Cadmus used Simplified Energy Enthalpy Model (SEEM) results from the RTF Residential Lighting Workbook v4.2 to serve as a foundation for analysis.^{18,19}

Table 31 and Table 32 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 surveys of Rocky Mountain Power residential customers in Wyoming, cooling zone weightings from Typical Meteorological Year 3 weather data, and census population data for Wyoming counties.

Table 31. WHF Heating Inputs Summary

WHF Component	Heating System Type	SEEM Results (kWh/kWh Saved) ²	Cadmus Saturation Weighting ¹
Heating Impact	Electric Zonal	-0.440	14.4%
	Electric Forced Air	-0.479	0.0%
	Heat Pump	-0.258	1.0%
	Non-Electric	0.000	84.6%

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

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

¹⁶ RTF's savings workbook for residential, screw-in, CFL and LED lamps: ResLighting_Bulbs_v4_2.xlsm: <https://nwcouncil.box.com/s/vu2d2uw5si5uyop848gyk2er0sg0xlv6>

¹⁷ Northwest Energy Efficiency Alliance. "Residential Building Stock Assessment: Metering Study." April 28, 2014. Accessed January 2016: <https://neea.org/docs/default-source/reports/residential-building-stock-assessment--metering-study.pdf?sfvrsn=6>

¹⁸ SEEM is a building simulation model that the RTF calibrated for residential homes, 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/>

¹⁹ RTF's savings workbook for residential, screw-in, CFL and LED lamps: ResLighting_Bulbs_v4_2.xlsm.



Table 32. 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	37.0%	33%
	Cooling Zone 2	0.053	53.4%	
	Cooling Zone 3	0.074	9.6%	

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

Calculating the weighted averages of values in Table 31 and Table 32 provided the impacts from heating and cooling of a bulb installed in a conditioned space, as shown in Table 33. Summing the heating and cooling impacts produced an estimated combined impact of -0.05 kWh per kWh of lighting savings.

Table 33. WHF Weighted Average Impact, Conditioned Space

Component	kWh/kWh Savings*
Heating	-0.066
Cooling	0.016
Combined	-0.05

*Table may not sum to total due to rounding

Cadmus also considered the location of bulbs to determine the appropriate WHF and to account for bulbs not installed in conditioned spaces. As shown in Table 34, 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 34. Thermal Coupling by Space Type

Space Type	RTF Thermal Coupling Correction Factor	Bulb Allocation*
Basement	50%	1.9%
Main House	75%	87.2%
Outdoor	0%	11.0%
Weighted Average		66.3%

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

Multiplying the combined impact from Table 33 by the weighted thermal coupling from Table 34 and adding 1 provided the final WHF, shown in Table 35.

Table 35. Wyoming CFL and LED Bulb WHF, Average Installation Location

Fuel	Value	Units
Electric	0.967*	kWh/kWh Saved

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

CFL and LED Bulbs Total Savings

Table 36 shows reported and evaluated savings inputs and input sources for CFL lamps, in addition to reported and evaluated energy savings per unit (i.e., UES). Cadmus determined evaluated savings and inputs using assumptions provided by Rocky Mountain Power combined with 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 $\Delta Watts$ in Table 36 represent weighted averages. The far-right column shows the fraction produced by dividing evaluated savings or inputs by reported savings or inputs. The UES value equals the CFL bulb realization rate, and serves as an approximate “partial realization rate” for each of the other inputs—delta watts, WHF, HOU, and ISR.

Table 36. 2015–2016 Reported and Evaluated CFL Bulb Savings and Inputs

Input ¹	Reported		Evaluated		Evaluated/ Reported
	Value	Source	Value	Source	
UES (kWh/bulb)	16.68 ¹	Tracking database	14.43 ¹	Calculated from factors below	87%
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	100%
W_{BASE}	46.7 ¹	Lumen equivalence via EISA bins and baselines, special reflector bins	46.3 ¹	Lumen equivalence via UMP (non-reflectors), Mid-Atlantic TRM (reflectors)	99%
$\Delta Watts$ (W)	31.9 ¹	$W_{BASE} - W_{EFF}$	31.5 ¹	$W_{BASE} - W_{EFF}$	98%
WHF	0.906	PacifiCorp HES 2011–2012 Evaluation ²	0.967	2015–2016 General Population Survey (n=222)	107%
HOU (hr/day)	2.18		1.83	Multistate HOU Regression Model, 2013–2014 General Population Survey	84%
ISR	72.0%		70.8%	2013–2014 General Population Survey (n=133)	98%

¹Weighted average values.

²Cadmus. *Final Report: 2011–2012 Wyoming Residential Home Energy Savings Evaluation*. January 21, 2014. Available online:

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2014/Wyoming_Final_2011-2012_HES_Evaluation_Report.pdf

These weighted average input values could be used to discern general drivers of differences between CFL evaluated and reported savings. As seen in the Evaluated/Reported column for UES, CFL bulbs achieved an 87% overall realization rate. A difference in reported and evaluated HOU primarily drove the difference in evaluated and reported values. The 2.18 reported HOU came from Cadmus’ 2011–2012 evaluation, though the 1.83 HOU value from the 2013–2014 evaluation was used again this year. Reported $\Delta Watts$ and ISR values were extremely close, with evaluated values representing 98% of reported values. Evaluated WHF actually was slightly higher than reported WHF. These factors all combine to produce the 87% overall CFL realization rate.



Table 37 shows reported and evaluated savings inputs and input sources for LED bulbs, with wattage values again representing weighted averages. Several factors contributed to the 79% overall realization rate for LED bulbs. Evaluated Δ Watts were 20% higher than reported, driven by a similar difference in W_{BASE} . Evaluated WHF was also higher than reported WHF (by 7%), though, as with CFLs, the evaluated HOU were lower than reported HOU. In addition, the reported LED ISR followed an RTF version that assumed a 100% LED installation rate. The 2015–2016 participant survey, however, revealed a 73% LED bulb installation rate. These factors combined to produce the 79% overall LED realization rate.

Table 37. 2015–2016 Reported and Evaluated LED Bulb Savings and Inputs

Input ¹	Reported		Evaluated		Evaluated/ Reported
	Value	Source	Value	Source	
UES (kWh/bulb)	21.60 ¹	Tracking database	17.07 ¹	Calculated from factors below	79%
W_{EFF}	9.4 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}	39.3 ¹	Lumen equivalence via EISA bins and baselines, special reflector bins	45.1 ¹	Lumen equivalence via UMP, Mid-Atlantic TRM	115%
Δ Watts (W)	30.0 ¹	$W_{BASE} - W_{EFF}$	35.8 ¹	$W_{BASE} - W_{EFF}$	120%
WHF	0.906	PacifiCorp HES 2011–2012 Evaluation ²	0.967	2015–2016 General Population Survey (n=222)	107%
HOU (hr/day)	2.18		1.85	Multistate HOU Regression Model, 2015–2016 General Population Survey	85%
ISR	100.0%	RTF v3.0 storage and removal rate	73.0%	2015–2016 General Population Survey (n=51)	73%

¹Weighted average values.

²Cadmus. *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 38 provides evaluated CFL and LED savings and realization rates by bulb types.

Table 38. 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	3,573,386	1,288,113	3,118,460	1,052,503	87%	82%	86%
Decorative	5,384	83,579	4,731	64,338	88%	77%	78%
Globe	13,799	17,220	19,691	17,664	143%	103%	120%
EISA-Exempt	157	1,495	216	1,556	138%	n/a	107%
Reflector	111,267	573,398	61,686	416,234	55%	73%	70%
Overall	3,703,992	1,963,805	3,204,783	1,552,294	86%	79%	84%

Light Fixtures

During the 2015–2016 program period, Rocky Mountain Power provided incentives for 6,300 ENERGY STAR light fixtures, representing 4% of reported program savings. Cadmus grouped and analyzed savings for fixtures within two categories:

- Downlight fixtures
- Miscellaneous fixtures

Respectively, these categories contributed 97.1% and 1.7% of program fixtures by quantity, with 1.2% 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 energy savings calculations. Again, the lighting saving evaluation used the following general equation:

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

To calculate various light fixture component inputs, Cadmus conducted the primary and secondary data collection activities shown in Table 39.

Table 39. Light Fixture Evaluated Savings Activities and Results

Savings Variables	Lighting Technology	Activity	Value
ΔWatts	CFL	Downlights: UMP, ² recessed can average baseline	39.3 ¹
	LED	Miscellaneous: UMP, ² standard lamp baseline Unknown: Reported savings passed through as evaluated savings	
ISR	CFL	2015–2016 Lighting Participant Survey	100.0%
	LED		
HOU	CFL	Multistate HOU Regression Model, 2013–2014 General Population Survey (n=86)	1.835
	LED	Multistate HOU Regression Model, 2015–2016 General Population Survey (n=203)	1.847
WHF	CFL + LED	2015–2016 General Population Survey (n=222)	0.967

¹Weighted average value for all bulbs.

Cadmus applied the same HOU and WHF used in the CFL and LED bulb analyses, along with a 100% ISR, based on 2015-2016 lighting participant surveys. For delta watts, Cadmus employed a modified lumen binning approach that depended on the fixture category, as discussed below.

Downlight Fixtures

Figure 4 provides an example of a downlight fixture. These fixtures are designed to be installed into recessed ceiling or “can” light receptacles (intended to accept reflector lamps). Therefore, this fixture type differs from other fixtures in that each purchase replaces a particular lamp, meriting application of the lumens equivalence method to calculate delta watts.



Figure 4. Example of a Downlight Fixture



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

To do so, Cadmus calculated an average set of reflector lumen bins and baseline wattages to account for the six different types of reflector lamps. 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.

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

As shown in Table 40, 85.6% of lamps installed in ceiling receptacles were reflector lamps and 13.5% were standard lamps, with the other categories comprising the rest. Cadmus used these saturation values to create an average set of lumen bins and baseline wattages for recessed ceiling receptacles, for both 2015 and 2016. Appendix B provides plots for 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 40. Lamp Type Saturation in Recessed Ceiling Receptacles

Lamp Type	Southwestern Utility	Central Utility	Midwest Utility	Mid-Atlantic Utility	Combined
Standard	11.7%	17.6%	13.2%	12.7%	13.5%
Globe	0.6%	0.5%	0.0%	0.9%	0.6%
Reflector	87.7%	81.9%	86.0%	86.0%	85.6%
Decorative	0.0%	0.0%	0.3%	0.4%	0.2%
EISA-Exempt	0.0%	0.0%	0.5%	0.0%	0.1%
Total Bulbs	473	431	393	928	2,225
Total Households	38	46	68	65	217

Miscellaneous Fixtures

Just 1.7% 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). A majority were 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 1.2% of fixtures falling within unknown categories, listing models that could not be matched to the ENERGY STAR database or be found online. In addition, none of these fixtures had efficient wattages listed in the data. For these fixtures, therefore, Cadmus passed the reported savings through as evaluated savings.

Lighting Fixture Findings

In 2015–2016, the HES program provided incentives for 6,300 light fixtures. Table 41 provides lamp quantities, savings, and realization rates by fixture type for 2015–2016.

Table 41. 2015–2016 Light Fixture Quantity and Gross Savings

Fixture Category	CFL/LED	Quantity	Reported Savings (kWh)	Evaluated Savings (kWh)	Evaluated UES (kWh/unit)	Realization Rate
Downlight	CFL	24	633	699	29.1	111%
	LED	6,092	301,980	181,918	29.9	60%
Miscellaneous	CFL	8	366	172	21.5	47%
	LED	102	4,738	2,506	24.6	53%
Unknown	N/A	74	3,034	3,034	41.0	100%
Total		6,300	310,751	188,329	29.9	61%

This resulted in average evaluated UES of 29.9 kWh, with a 61% average realization rate across all fixtures. Approximately 58% of fixtures had a reported UES value of 30.0 kWh, coming from an unknown derivation that cites “Cadmus/UMP/PECI” and very closely matching the evaluated average UES. Almost all remaining fixtures, however, had a reported UES value of 78 kWh. The derivation of this value



remains unknown, and this value is 2.6 times higher than the average evaluated UES value. Therefore, these fixtures bring the overall fixture realization rate down to 61%.

wattsmart Starter Kits

Rocky Mountain Power’s HES program includes eight varieties of **wattsmart** Starter Kits, containing unique combinations of 13-watt CFLs, 10-watt LEDs, kitchen aerators, bathroom aerators, and showerheads. Table 42 shows components in each of the eight kits available in 2015 and 2016.

Table 42. Components in Each *wattsmart* 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 provided in the basic kits.

Kit CFLs and LEDs

Cadmus estimated energy savings for CFLs and LEDs distributed through **wattsmart** Starter Kits using the following equation (outlined in the UMP’s Residential Lighting Evaluation Protocol):²⁰

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

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

²⁰ National Renewable Energy Laboratory. *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*, Chapter 21: Residential Lighting Evaluation Protocol. December 2014. Available online: <http://www.nrel.gov/extranet/ump/pdfs/ump-res-lighting-clean.pdf>

Table 43. *wattsmart* 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 as outlined in the Uniform Methods Project (UMP), using EISA baselines
W_{EE}	Measure wattage	13.0	10.5	W	Program materials
ISR	In-service rate	70.8	87.1	%	2015–2016 kit participant surveys (n=66 - CFL, 69 - LED)
HOU	Hours of use	1.835	1.847	$\frac{hours}{year}$	2015–2016 HES light bulb room and HOU analysis (see Table 26)
WHF	Waste heat factor	0.967	0.967		2015–2016 HES light bulb WHF analysis
ΔkWh	Energy Savings	13.8	18.5	$\frac{kWh}{year}$	Calculated

Using Cadmus’ 2011–2012 annual report evaluating the HES Program in Wyoming, Rocky Mountain Power derived its assumptions for CFL and LED reported savings inputs for HOU (796), ISR (72.4%), and WHF (0.906). Cadmus updated these values for its evaluated savings calculations, and used ENERGY STAR’s lumens equivalence method to derive the LED baseline wattage assumption.

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

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

Kit Product	Reported Savings Per Unit (kWh)	Evaluated Savings Per Unit (kWh)	Realization Rate
CFL	15.7	13.8	88%
LED	22.5	18.5	82%

CFLs and LEDs did not realize 100% of reported savings almost exclusively due to varying reported and evaluated HOU assumptions (a difference of almost 120 hours annually).

Kit Aerators

To estimate energy savings for bathroom and kitchen faucet aerators distributed through *wattsmart* Starter Kits, Cadmus used the following equation:

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

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



Table 45. wattsmart Starter Kit Aerator Key Evaluation Variables and Assumptions

Parameter	Definition	Kitchen Aerator	Bathroom Aerator	Unit	Source(s) ¹
<i>ISR</i>	In-service rate	53.4	57.0	%	2015–2016 kit participant surveys (n=58 - kitchen, 60 - bathroom)
<i>GPM_{Base}</i>	Baseline flow rate	2.2	2.2	$\frac{gal}{min}$	Federal rated maximum flow rate (10CFR430.32) (DOE 1998)
<i>GPM_{EE}</i>	Measure flow rate	1.5	0.5	$\frac{gal}{min}$	Program materials
<i>MPD</i>	Minutes of use per person per day	4.5	1.6	Min/person/day	2013 Cadmus Study ²
<i>PH</i>	People per household	2.5	2.5	People	2015–2016 kit participant survey (n=133)
<i>FH</i>	Faucets per household	1	2.22	Faucets	Bathroom: 2015–2016 kit participant survey (n=134). Kitchen: One per household.
<i>T_{Mix}</i>	Usage water temperature	93	86	°F	2013 Cadmus Study ²
<i>T_{In}</i>	Inlet water temperature	52.4	52.4	°F	DOE Hot Water Scheduler, 2016 U.S. Census Bureau
<i>RE</i>	Recovery efficiency of electric water heater	98	98	%	NREL, “Building America Research Benchmark Definition” ³
<i>%DHW</i>	Households with electric hot water	77.1	77.1	%	2015–2016 kit participant survey (n=70)
<i>ΔkWh</i>	Energy Savings	120.0	41.1	$\frac{kWh}{year}$	Calculated

¹Survey results reflect averages only for those receiving water-saving measures.

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

³National 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 its reported savings values from version 2.1 of the Residential DHW Showerhead RTF workbook.²¹ These included people per household (2.51), showers per person per year (193), percentage of homes with electric water heat (64%), and difference between usage and inlet water temperatures (75°F).

Cadmus assumed a 2.2 GPM baseline flow rate, as specified by the U.S. Department of Energy (DOE), using the 2015–2016 kit participant surveys to derive values for people per household, fixtures per

²¹ Regional Technical Forum. “Residential: DHW—Showerheads.” ResShowerheads_v2_1.xlsm. July 12, 2011. Available online: <http://rtf.nwcouncil.org/measures/measure.asp?id=126>

household (for bathroom aerators), and the percentage of households with electrically heated hot water. Cadmus only assigned energy savings to the 77% of households with electric water heaters. Cadmus determined the change in water temperature using calculations from a 2013 Cadmus metering study²² and data from the Census Bureau and DOE’s hot water scheduler.

Table 46 shows reported and evaluated savings as well as realization rates for each faucet aerator type.

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

Kit Product	Ex Ante Savings Per Unit (kWh)	Ex Post Savings Per Unit (kWh)	Realization Rate
Kitchen Aerator	25.8	120.0	466%
Bathroom Aerator	62.6	41.1	66%

Each kit aerator product most likely produced discrepant realization rates due to very different assumptions belying the reported and evaluated savings calculations (e.g., water temperature differences [75°F versus 52.4°F], percentage of homes with electric water heat [64% versus 77%]).

Kit Showerheads

Using the following equation, Cadmus estimated energy savings for high-efficiency showerheads distributed through **wattsmart** 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 47 defines and provides values and sources for the key variables in the equation.

Table 47. wattsmart Starter Kit Showerhead Key Evaluation Variables and Assumptions

Parameter	Definition	Value	Unit	Source
<i>MPS</i>	Shower duration	7.8	$\frac{min}{shower}$	2013 Cadmus Study ¹
<i>GPM_{Base}</i>	Baseline flow rate	2.5	$\frac{gal}{min}$	Federal-rated maximum flow rate for showerheads (10CFR430.32) ²
<i>GPM_{EE}</i>	Efficient flow rate	1.5	$\frac{gal}{min}$	Program materials
<i>EV</i>	Showers per person per year	219	Showers	2013 Cadmus Study ¹
<i>PH</i>	People per household	2.5	People	2015–2016 kit participant survey (n=133)
<i>SH</i>	Showerheads per household	1.96	Showerheads	2015–2016 kit participant survey (n=134)
<i>T_{Mix}</i>	Usage water temperature	101	°F	2013 Cadmus Study ¹
<i>T_{In}</i>	Inlet water temperature	52.4	°F	Weather data
<i>RE</i>	Recovery efficiency	98	%	Constant
<i>ISR</i>	In-service rate	51.6	%	2015–2016 kit participant survey (n=74)

²² Cadmus and Opinion Dynamics. *Showerhead and Faucet Aerator Meter Study*. Prepared for Michigan Evaluation Working Group. 2013.



Parameter	Definition	Value	Unit	Source
%DHW	Households with electric hot water	77.1	%	2015–2016 kit participant survey (n=75)
ΔkWh	Energy Savings	104.8	$\frac{kWh}{year}$	Calculated

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

²Energy and water conservation standards, 40 C.F.R. § 430.32 (2017).

Rocky Mountain Power derived its reported savings values, including people per household (2.51), showers per person per year (193), the 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 its evaluated values from its 2015–2016 kit participant survey, including showerheads per household, people per household, and the percentage of homes with electric hot water. Cadmus used DOE for the baseline flow rate, and a 2013 Cadmus metering study for shower events per person per year and water temperature change. Cadmus only assigned showerhead savings to the 77% of homes with electric hot water.

Table 48 shows reported and evaluated savings as well as realization rates for kit showerheads.

Table 48. 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	104.8	40%

Showerheads did not realize 100% of reported savings due to very different assumptions belying the reported and evaluated savings calculations (e.g., water temperature difference [75°F versus 52.4°F], percentage of homes with electric water heat [64% versus 77%]).

wattsmart Starter Kits Summary

Using the evaluated savings shown above for CFLs, LEDs, aerators, and showerheads, Cadmus calculated savings for each variety of kit. Table 49 shows the percentage of evaluated savings attributable to each kit product.

Table 49. 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	17%	0%	37%	13%	33%
Basic 2	12%	0%	26%	18%	45%
Better 1	17%	0%	37%	13%	33%
Better 2	12%	0%	26%	18%	45%
Best 1	0%	22%	35%	12%	31%
Best 2	0%	15%	25%	17%	43%
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, and lighting and bathroom aerators accounted for roughly the same amount of energy savings. LEDs accounted for slightly more savings in kits that included and excluded water-saving products.

For each of the eight **wattsmart** Starter Kits, Table 50 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 50. Products in Each **wattsmart** 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	Showerhead				
Basic 1	4	0	1	1	1	281	411	321	78%
Basic 2	4	0	1	2	2	759	734	467	64%
Better 1	4	0	1	1	1	2	411	321	78%
Better 2 ¹	4	0	1	2	2	2	734	467	64%
Best 1	0	4	1	1	1	51	438	340	78%
Best 2	0	4	1	2	2	232	761	486	64%
CFL Only	4	0	0	0	0	1,083	63	55	88%
LED Only	0	4	0	0	0	211	90	74	82%
Total	N/A	N/A	N/A	N/A	N/A	2,621	960,281²	651,372²	68%

¹Better 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.

²Total savings from all installed kits, which equals the sum-product of quantities 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 the Integrated Water Factor (IWF) replaced the program-tracked parameters of the Modified Energy Factor (MEF) and Water Factor (WF) as best practices for estimating clothes washers' energy consumption.

Cadmus used the ENERGY STAR Clothes Washer database to find the 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 361²³ average loads expected per year—a result 32% greater than that predicted by the RTF (i.e., 273 average loads). Cadmus estimated an average evaluated savings value of 171 kWh per unit, yielding a 133% 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 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 51 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 during 2015 and 2016.

As shown, 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 indicated that measures combining natural gas dryers and water heaters accounted for 5% of all incented measures.

²³ The 2013–2014 Wyoming HES Program Evaluation used 269 loads per year, and the 2011–2012 Wyoming HES Program Evaluation used 289 loads per year.

Table 51. 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
ENERGY STAR	2	2.37	Electric	Electric	23	0	101.5	n/a	208	n/a	205%	n/a	16%	0%
			Electric	Natural Gas	0	0	n/a	n/a	n/a	n/a	n/a	n/a	0%	0%
			Natural Gas	Electric	32	0	57	n/a	163	n/a	286%	n/a	13%	0%
			Natural Gas	Natural Gas	2	0	2	n/a	24	n/a	1217%	n/a	0%	0%
CEE Tier 1	2.38	2.73	Electric	Electric	14	6	192	149	508	508	265%	341%	10%	8%
			Electric	Natural Gas	0	1	n/a	22	n/a	214	n/a	995%	0%	0%
			Natural Gas	Electric	23	14	114	114	251	251	220%	220%	9%	14%
			Natural Gas	Natural Gas	1	1	4	4	-4	-4	-87%	-87%	0%	0%
CEE Tier 2	2.74	2.91	Electric	Electric	27	19	87	75	149	149	172%	199%	16%	25%
			Electric	Natural Gas	2	0	22	n/a	87	n/a	403%	n/a	0%	0%
			Natural Gas	Electric	70	46	57	114	59	260	103%	228%	28%	46%
			Natural Gas	Natural Gas	8	4	4	4	-3	-3	-92%	-80%	0%	0%
CEE Tier 3	2.92	N/A	Electric	Electric	6	1	93	75	165	165	178%	221%	4%	1%
			Electric	Natural Gas	0	0	n/a	n/a	n/a	n/a	n/a	n/a	0%	0%
			Natural Gas	Electric	4	2	57	57	65	65	114%	114%	2%	2%
			Natural Gas	Natural Gas	0	0	n/a	n/a	n/a	n/a	n/a	n/a	0%	0%
All Levels	2	N/A	Electric	Electric	70	26	189	149	266	313	141%	210%	47%	36%
			Electric	Natural Gas	2	1	43	43	n/a	214	n/a	497%	0%	0%
			Natural Gas	Electric	129	62	114	114	133	125	116%	109%	53%	64%
			Natural Gas	Natural Gas	11	5	7	8	-1	-7	-17%	-82%	0%	0%
Weighted Average³					212	94	132	117	170	171	129%	146%	100%	100%

¹Realization rates may not calculate exactly due to rounding of evaluated UES values, and the percentage of reported savings may not add to 100% due to rounding.

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

³“Quantity” and “Percent of Report Savings” values are summations, not average values.



Table 52 shows the percentage of measures installed in homes with electrically heated DHW and dryers. The saturation of fuel types for DHW and dryers remained consistent between the 2013–2014 and 2015–2016 performance periods.

Table 52. Clothes Washer Percentage of Electric DHW and Dryer Fuel

Input Categories		2015–2016 Saturation of Fuel Types	2013–2014 Saturation of Fuel Types	Source
DHW Fuel	Electric	32.4%	30.8%	WY 2013–2014 and 2015–2016 Non-Lighting Tracking Databases
	Other	67.6%	69.2%	
Dryer Fuel	Electric	93.8%	95.5%	
	Other	6.2%	4.6%	

Flat Panel TVs

Cadmus estimated flat panel TV energy savings using the approach outlined in the 2013 ENERGY STAR Consumer Electronics Calculator. Cadmus divided a TV’s operation into two modes—on and standby—and assumed that the average TV remained in the on-mode for five hours per day and the standby-mode for 19 hours per day—an assumption consistent with the ENERGY STAR calculator and the 2013–2014 Rocky Mountain Power Evaluation.

According to the ENERGY STAR calculator, baseline units consume the same amount of power as efficient units while in standby-mode, resulting in zero standby-mode energy savings. Cadmus used the ENERGY STAR TV product list from October 2015 to look up the on-mode operating power and screen areas for 95% of the incented measures. To estimate baseline energy consumption, Cadmus used the following equation from the ENERGY STAR calculator, which relies on the TV’s screen area:

$$kWh_{sav} = \left[(P_{on} \times h_{on} + P_{stdby} \times h_{stdby})_{base} - (P_{on} \times h_{on} + P_{stdby} \times h_{stdby})_{ES} \right] \times ISR \times 365.25$$

$$(P_{on})_{base} = 0.552 \times A^{0.737}$$

Table 53 defines the variables in the above equations and, when applicable, provides values and sources.

Table 53. Flat Panel TV Key Parameters and Assumptions

Parameter	Definition	Values	Unit	Source
kWh_{sav}	Total energy savings	Varied	$\frac{kWh}{year}$	Calculated
$(P_{on})_{base}$	Baseline on-mode operating power	Varied	kW	Calculated*
$(P_{on})_{ES}$	Efficient on-mode operating power	Varied	kW	ENERGY STAR TV Product List (October 2015)
$(P_{stdby})_{base} = (P_{stdby})_{ES}$	Standby mode operating power	Varied	kW	ENERGY STAR TV Product List (October 2015)
$(h_{on})_{base} = (h_{on})_{ES}$	Hours per day of on-mode operation per day	5	$\frac{hours}{day}$	ENERGY STAR Consumer Electronics Calculator (Sept. 2013)
$(h_{stdby})_{base} = (h_{stdby})_{ES}$	Hours per day of standby operation per day	19	$hours$	ENERGY STAR Consumer Electronics Calculator (Sept. 2013)
ISR	In service rate	95%	%	Wyoming 2015–2016 non-lighting participant survey
365.25	Days per year	365.25	$\frac{days}{year}$	Constant
A	Screen area	Varied	in^2	ENERGY STAR TV Product List (October 2015)

*Equation from ENERGY STAR consumer electronics calculator (Sept. 2013)

Table 54 shows the quantity of TVs incented in 2015 and 2016, the reported and evaluated savings, and the realization rates.

Table 54. Flat Panel TV Reported and Evaluated Savings

Year	Quantity	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
2015	412	179	52	29%
2016	0	n/a	n/a	n/a
Average*	412	179	52	29%

*"Quantity" is a summation, not an average.

Evaluated savings were much lower than reported savings as baseline units' efficiency has improved significantly over time. Rocky Mountain Power discontinued this measure due to low anticipated savings, such that the last flat panel TV measure was reportedly incented in February 2015. In the program's 2013–2014 evaluation, Cadmus found evaluated savings of 37 kWh (with a realization rate equal of 21%).

Evaporative Coolers

Cadmus evaluated savings for three evaporative cooler measures— Tier 1, Tier 2, and Tier 2, Self-Installed—for which Rocky Mountain Power offered incentives. Since evaporative coolers do not have an RTF workbook, Cadmus estimated savings for measures applying California’s Database for Energy Efficiency Resources (DEER) database savings to evaporative cooler measures in Wyoming, using a codes and standards baseline.

Table 55. 2015–2016 Evaporative Cooler Measures and Evaluation Source

Measure	Source
Evaporative Cooler*	[1]

*This includes Evaporative Cooler Tier 1, Tier 2, and Tier 2, Self-Installed.

[1] DEER Database.

Cadmus evaluated savings for Wyoming HES participants by mapping DEER climate zones to Wyoming’s climate zones, based on cooling degree days (CDD). Of 112 evaporative cooler measures in Wyoming, 54% occurred in Cooling Zone (CZ) 1, 41% in CZ2, and 4% in CZ3.

Cadmus refined the DEER evaporative cooler savings by incorporating Wyoming-specific data, using Wyoming participant surveys to estimate an average square footage of 1,605 per house.

Table 56 shows the quantity of each evaporative cooler measure incented in 2015 and 2016, the reported and evaluated savings, and the realization rates. Rocky Mountain Power used savings-modeling software from EnergyGauge USA that produced lower per-unit savings, accounting for the higher realization rates.

Table 56. 2015–2016 Reported and Evaluated Evaporative Cooler Savings

Measure	2015				2016			
	Quantity	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate	Quantity	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Evaporative Cooler—Tier 1	29	271	434	160%	11	271	571	211%
Evaporative Cooler—Tier 2	1	475	880	185%	2	475	880	185%
Evaporative Cooler—Tier 2, Self-Installed	40	475	545	115%	29	475	458	96%
Weighted Average*	70			129%	42			120%

*Quantity values are summations, not average values.

Heat Pumps

Cadmus evaluated savings for two heat pump measures—ductless heat pumps, and electric system to heat pump conversions—for which Rocky Mountain Power offered incentives. Cadmus estimated savings for the heat pump measures using versions 4.1 of the RTF residential, single-family, heat pump savings workbook.²⁴ The RTF workbooks use a pre-condition baseline.

Table 57. 2015–2016 Heat Pump Measures and Evaluation Sources

Measure	Source
Heat Pump System Conversion	[1]
Heat Pump, Ductless	[2]

[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>

Whenever possible, Cadmus refined the heat pump RTF models by incorporating program or Wyoming-specific data. That is, the evaluation used Wyoming participant surveys to more completely define the baseline condition, estimating that, prior to the installation of heat pumps, 9% of homes used central air conditioning. In addition, previous to heat pump conversions, Cadmus assumed 100% of customers had electric forced air furnaces. Prior to ductless heat pump installations, surveys showed that 100% of customers used zonal heating.

The RTF provides unique savings values for distinct heating and cooling zones, defined by average annual heating degree days (HDDs) and CDDs. All measures incented in 2015 and 2016 were located within Natrona County and Converse County, and both fell into cooling and heating zone two, as defined by the RTF.

Table 58 shows the quantity of each heat pump measure incented in 2015 and 2016, the reported and evaluated savings, and the realization rates. Rocky Mountain Power used savings modeling software from EnergyGauge USA that produced higher per-unit savings, accounting for the lower realization rates.

²⁴ Regional Technical Forum. Residential: Heating/Cooling—Air Source Heat Pump Conversions SF, ResSFExisitngHVAC_v3_2.xlsx. May 12, 2015. Available online: <http://rtf.nwcouncil.org/measures/measure.asp?id=131>



Table 58. 2015–2016 Reported and Evaluated Heat Pump Savings

Measure	2015				2016			
	Quantity	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate	Quantity	Reported Per Unit Savings	Evaluated Per Unit Savings	Realization Rate
Electric System to Heat Pump Conversion	2	8,003	5,730	72%	2	8,003	5,730	72%
Heat Pump, Ductless	4	4,118	2,191	53%	10	4,118	2,206	54%
Total Savings	6	32,478	20,224	62%	12	57,186	33,520	59%

Multifamily Duct Sealing and Insulation

During the 2015–2016 program years, Rocky Mountain Power provided incentives for 31 duct sealing and insulation projects and reporting 32,240 kWh of savings. Overall, duct sealing and insulation measures represented 0.4% of the total HES reported savings. Cadmus could not conduct a separate Wyoming billing analysis for duct sealing and insulation as participants mainly lived in a single multifamily building using electric heat. Instead, Cadmus applied the overall 66% realization rate for Pacific Power’s Washington home duct sealing and insulation (which included more participant data) to the reported savings, yielding 21,198 kWh. Initially it appeared that Idaho duct sealing and insulation measure realization rates, evaluated using a billing analysis for the Rocky Mountain Power Idaho HES program evaluation, were suitable for Wyoming due to proximity and similarity of weather conditions. However, Idaho reported duct sealing and insulation measure savings were unusually high (20% of pre-retrofit usage) leading to a low realization rate for that measure (45%). Pacific Power had reported an average saving of 10% of pre-retrofit usage for Washington duct-sealing measures, which was close to Wyoming duct-sealing measure average reported savings (9.5% of pre-retrofit usage) and offered the most appropriate realization rates.

Evaluated Net Savings

Cadmus tailored the net savings adjustment analysis to each measure and measure category, and developed net-to-gross (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. 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, in estimating NPSO, Cadmus included a series of questions from the 2015–2016 general population survey of Wyoming RMP customers. This addressed savings generated by customers who, motivated by the program’s reputation and marketing, conducted energy efficiency installations without receiving incentives. Cadmus estimated NPSO as 4% of the HES program’s total evaluated savings,

applying the 4% NPSO equally across HES program measures. Appendix D provides a detailed explanation of the estimated NPSO.

Table 59 provides net savings evaluation results, including evaluated gross savings, evaluated net savings, and NTG by measure type, in addition to the NTG methodology utilized.

Table 59. 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	53,183	38,149	72%	Self-Response NTG
	Dishwasher	3,978	2,854	72%	
	Freezer	3,992	2,864	72%	
	Refrigerator	7,150	5,129	72%	
Home Electronics	Computer Monitor	14	10	72%	Self-Response NTG
	Flat Panel TV	21,291	22,143	104%	Current Practice Baseline Used*
HVAC	Ceiling Fan	318	260	82%	Self-Response NTG
	Central Air Conditioner Equipment	744	609	82%	
	Central AC Proper Sizing	1,072	877	82%	
	Duct Sealing and Insulation	21,198	17,352	82%	
	Efficient Gas Furnace with ECM	3,514	2,876	82%	
	Evaporative Cooler	56,566	46,302	82%	
	Heat Pump System Conversion	22,920	18,761	82%	
	Heat Pump	1,294	1,059	82%	
	Ductless Heat Pump	30,819	25,227	82%	
Room Air Conditioner	41	34	82%		
Energy Kits	watt smart Starter Kit	651,372	560,180	86%	Self-Response NTG
Lighting	CFL Bulb	3,204,783	1,879,528	59%	Demand Elasticity Modeling
	LED Bulb	1,552,294	759,005	49%	
	CFL Fixture	949	759	80%	Self-Response NTG
	LED Fixture	187,380	149,904	80%	
Water Heating	Heat Pump Water Heater	8,063	6,600	82%	Self-Response NTG
	Water Heater	1,207	866	72%	Self-Response NTG
Building shell	Attic Insulation	24,871	19,657	79%	Self-Response NTG
	Floor Insulation	4,508	3,563	79%	
	Wall Insulation	8,686	6,865	79%	
	Windows	1,351	1,068	79%	
Total		5,873,558	3,572,500	61%	

*No freeridership adjustments were applied to measures as the engineering review used a current practice baseline to estimate savings, producing a net of freeridership result.



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

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. Using information from the tracking database (provided by the program administrator) to predict bulb sales, the analysis expressed sales as a function of price (including incentives), seasonality, retail channels, and bulb characteristics. Appendix B provides further details about the equation used by the elasticity model.

To complete the analysis, Cadmus used model coefficients to predict sales, both with program incentives in place (as observed in the tracking data) and with prices remaining at their original levels and promotional events not taking place. This, in effect, predicted sales in the absence of program intervention. Cadmus then multiplied predicted sales—at the incented program price and at the price absent program incentives—by evaluated gross kWh savings per bulb.²⁵ The savings difference between the hypothetical original price scenario and what actually occurred produced bulb savings attributable to the program.

As Rocky Mountain Power’s program experienced insufficient price variations to conduct an evaluation specific to just Wyoming’s territory, Cadmus produced elasticity elements by combining Wyoming sales with Rocky Mountain Power’s Idaho sales data and with Pacific Power’s Washington and California sales data. While consumer behaviors could have differed between the regions, the combined sales data provided the most representative information available with which to estimate price elasticities.

Cadmus applied these elasticity estimates to Wyoming sales data to reflect 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 Wyoming.

Table 60 shows the freeridership and NTG results.

Table 60. Lighting Freeridership and NTG Results

Bulb Type	Freeridership	Net of Freeridership	NTG*
CFLs	45%	55%	59%
LED	55%	45%	49%

*Includes 4% NPSO.

²⁵ Though statistical models over- or under-predict to some degree, predicted program sales should be close to actual sales when using a representative model. Using predicted program sales rather than actual sales mitigates bias by comparing predicted program sales to predicted non-program sales.

Both years exhibited a 53% average markdown per CFL bulb, with greater discounts offered in 2015. LEDs exhibited a 46% average markdown across both years, with slightly higher discounts in 2016. This decreasing incentive of CFLs and increasing of LEDs is consistent with RMP’s plan for lighting incentives. Table 61 shows average per-bulb prices and markdowns by year and bulb technology.

Table 61. Per-Bulb Price and Freeridership by Retail Channel and Bulb Type

Year	Technology	Final Price per Bulb	Original Price per Bulb	Markdown %
2015	CFL	\$0.80	\$2.07	61%
	LED	\$4.40	\$8.14	46%
2016	CFL	\$1.34	\$2.01	33%
	LED	\$2.80	\$5.76	51%

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

Freeridership Comparisons

Table 62 compares LED freeridership estimates from several recent evaluations using the elasticity model approach. The table also shows the average markdown (if available), which serves as a significant driver of freeridership estimates.

Table 62. Comparisons of LED Freeridership and Incentive Levels

Utility (Program Year)	Freeridership	Markdown
Rocky Mountain Power Wyoming (2015–2016)	52%	46%
Focus on Energy Wisconsin (2016)	38%	57%
Focus on Energy Wisconsin (2015)	29%	Not available
Midwest Utility 1 (2016)	40%	42%
Ameren Missouri (2015)	35%	Not available
Northeast Utility (2016)	39%	47%
Mid-Atlantic (2015–2016)	39%	48%

Rocky Mountain Power Wyoming’s freeridership estimates were slightly higher than those observed in other programs, with LED sales at club stores the most responsive to price changes (although club stores accounted for the smallest share of LED sales, accounting for only 8% of LED savings in 2016). In many programs, club stores account for a larger share of sales, comparable to DIY stores.

LED sales at DIY proved considerably less price sensitive than club stores, with DIY stores accounting for a majority of LED sales. A lack of merchandising and off-shelf placement information, however, could have affected the elasticity estimates.

Non-Lighting Evaluated Net Savings

Cadmus relied on the non-lighting participant survey to determine non-lighting NTG for appliance and home electronics, HVAC, and building shell measure categories for 2015 and 2016 participants.



Freeridership and participant spillover constitute the NTG (non-participant spillover is determined at the program level in another section). Cadmus used the following formula to determine the NTG ratio for each non-lighting program measure:

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

Methodology

In determining freeridership amounts for the appliance, HVAC, and building shell measure categories, Cadmus based its method on an approach previously developed for Rocky Mountain Power; this 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.²⁶

Cadmus used a separate set of questions and scoring approach when estimating freeridership for the kit product category. After conducting participant surveys with **wattsmart** Starter Kit recipients, Cadmus studied responses from three questions to estimate each participant’s freeridership score, using the scoring approach described in Appendix C. 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.

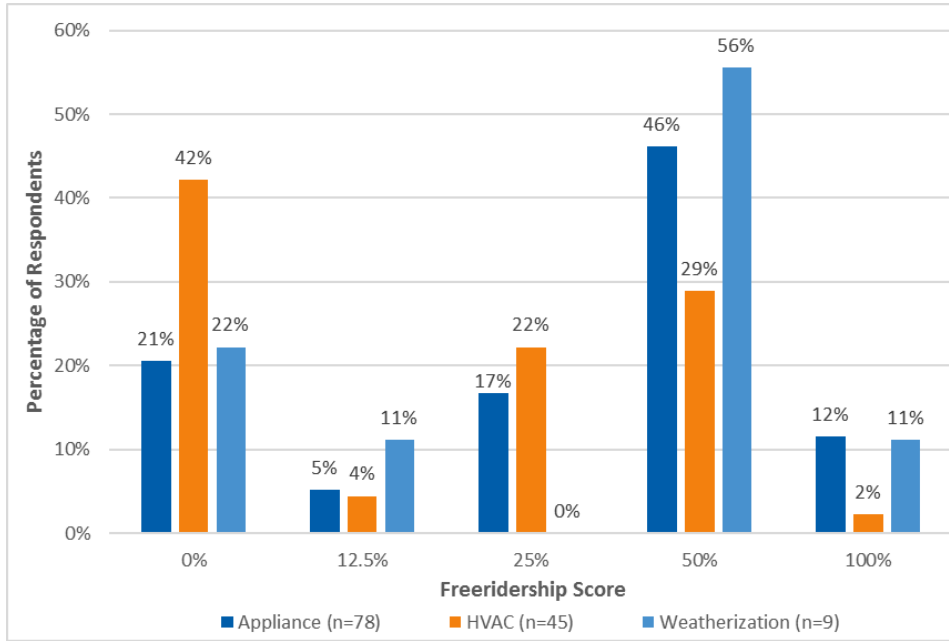
Cadmus determined participant spillover by estimating savings derived from additional installed measures and whether respondents credited Rocky Mountain Power with influencing their decisions to install these measures. Provided respondents did not request or receive incentives, Cadmus included measures eligible for program incentives, and then used the measure category’s freeridership and spillover results to calculate the program’s NTG ratio. Appendix C provides a detailed explanation of Cadmus’ self-reported NTG methodology.

Freeridership

After conducting surveys with appliance, HVAC, and building shell participants, Cadmus converted six freeridership questions’ responses into a score for each participant using the Excel-based matrix approach described in Appendix C. 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 appliance, HVAC, and building shell survey respondents.

²⁶ This approach was outlined in Schiller, Steven, et al. “National Action Plan for Energy Efficiency.” *Model Energy Efficiency Program Impact Evaluation Guide*. 2007. Available online: https://www.epa.gov/sites/production/files/2015-08/documents/evaluation_guide.pdf.

Figure 5. Distribution of Freeridership Scores by Measure Category^{1,2}



¹Total may not sum to 100% due to rounding.

²This figure is not weighted by measure savings and does not reflect final freeridership rates.

Approximately 21% of appliance measure category respondents and 42% of HVAC measure category respondents did not indicate freeridership, and just over 22% of building shell measure category respondents were estimated as non-freeriders. (That is, they would not have purchased the efficient measure in the absence of Rocky Mountain Power’s program.) More building shell respondents indicated high freeridership levels (scores of 50% to 100%) than those in other measure categories.

Kit Freeridership

Table 63 summarizes freeridership findings by measure for the kit product category. Cadmus weighted measure-level freeridership estimates by the evaluated gross program population’s kWh savings to determine an 18% freeridership estimate for the kit product category.

Table 63. HES Kit Measure Category Freeridership by Measure

Measure	Responses (n)	Freeridership Ratio	Evaluated Program Population kWh Savings
CFL	59	30%	117,127
LED	69	18%	36,478
Kitchen Faucet Aerator	34	15%	159,257
Bathroom Faucet Aerator	43	9%	95,436
Showerhead	46	18%	243,074
Overall		18%*	651,372

*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, but not claimed through the program.²⁷ 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 64 shows the results.

Table 64. Non-Lighting Spillover Responses

Program Category	Spillover Measure Installed	Quantity	Electric Savings (kWh)	Surveyed Measure Category Savings (kWh)	Spillover Ratio
Kit	Refrigerator	1	143	13,932	0%

Non-Lighting NTG Findings

Cadmus conducted 78 surveys with appliance measure category participants, 45 with HVAC measure category participants,²⁸ and nine with building shell measure category participants.²⁹ Additionally, 131 surveys addressed customers who received **wattsmart** Starter Kits. Cadmus used these participant responses to generate 72% NTG ratios for appliance measures, 82% for HVAC, 79% for building shell, and 86% for kits. Table 65 presents these findings.

Table 65. 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	78	32%	0%	4%	72%	±10%
HVAC	45	22%	0%	4%	82%	±6%
Building Shell	9	25%	0%	4%	79%	±23%
Kit	131	18%	0%	4%	86%	±17%

*Weighted by evaluated program savings.

²⁷ “Highly Influential” responses for question “How influential would you say the **wattsmart** Home Energy Savings program was in your decision to add the [MEASURE] to your home? Was it...?” qualified the measure for being significantly influenced by HES.

²⁸ Out of a population of 239.

²⁹ Out of a population of 110.

Table 66 shows freeridership, spillover, and NTG estimates for appliance, HVAC, building shell, 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 66. Non-Lighting NTG Comparisons¹

Utility/Region	Evaluation Report Publish Year	Responses (n)	Percentage FR ²	Participant Spillover	NPSO	NTG
Appliances						
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation: Appliances	2017	78	32%	0%	4%	72%
Rocky Mountain Power Wyoming 2013–2014 HES Evaluation: Appliances	2016	68	46%	0%	0% ³	54%
Northeast Utility—Appliance	2015	65	65%	3%	NA	38%
Northwest Utility—Appliance	2014	73	79%	2%	NA	23%
HVAC						
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation: HVAC	2017	45	22%	0%	4%	82%
Rocky Mountain Power Wyoming 2013–2014 HES Evaluation: HVAC	2016	18	41%	0%	0% ³	59%
Midwest Utility—HVAC	2015	73	51%	1%	NA	50%
Northwest Utility—HVAC	2014	48	72%	1%	NA	29%
Building Shell						
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation: Building Shell	2017	9	25%	0%	4%	79%
Rocky Mountain Power Wyoming 2013–2014 HES Evaluation: Building shell	2016	19	20%	0%	0% ³	80%
Midwest Utility—Building shell	2015	208	30%	2%	NA	72%
Midwest Utility—Building shell	2015	79	36%	2%	NA	66%
Energy Kits						
Rocky Mountain Power Wyoming 2015–2016 HES Evaluation: Kit	2017	131	18%	0%	4%	86%
Mideast Utility—Kit	2015	150	8%	1%	NA	93%

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

²FR = Freeridership

³NPSO was not calculated for the program’s 2013–2014 evaluation.



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’s design, marketing, and process
- Customer satisfaction and participation barriers
- HVAC trade allies’ experiences with HES
- HES upstream/midstream/downstream delivery channels versus those used by similar utility programs

Cadmus focused the research activities on key research topics, identified during the evaluation kick-off, as well as on topics of interest identified by program stakeholders. Table 67 lists the study’s primary research questions.

Table 67. Research Areas

Research Areas	Researchable Questions and Topics
Program Implementation and Delivery	
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 programs? If so, how did they learn about the programs?
Satisfaction	How satisfied are customers with their LEDs, lighting fixtures, wattsmart Starter Kits, incented non-lighting measures, or contractors? Why?
Motivations	What actions have customers taken to save energy, and what has motivated them to purchase a rebated LED, wattsmart 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 reviews
- Utility and administrator staff interviews
- General population survey
- Downstream lighting fixture participant survey
- Non-lighting participant survey
- HVAC trade ally interviews
- Benchmarking of selected program components

Program Materials Review

Cadmus reviewed program documentation to understand the program model and compared field activities to the expected implementation plan. The program materials review focused on critical program documents, including past evaluation reports, the program logic model, the program implementation manual, and Rocky Mountain Power annual reports for 2015 and 2016. As illustrated in Appendix F, Cadmus also reviewed the HES program logic model and noted only minor changes.

To document and evaluate marketing activity in 2015–2016, Cadmus reviewed the **wattsmart** Homes 2015–2016 Marketing Activities workbook provided by CLEAResult, in addition to the Rocky Mountain Power annual reports for 2015 and 2016.

Utility and Administrator Staff Interviews

Cadmus developed stakeholder interview guides and collected information about key topics from program management staff. The evaluation involved three interviews—one with program staff at Rocky Mountain Power and two with program staff at CLEAResult, 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 improvement
- Data tracking

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

Participant Survey

Cadmus conducted a telephone survey with non-lighting, downstream lighting, and **wattsmart** Starter Kits participating customers, designing the survey instrument to collect data regarding the following process topics:

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



General Population Survey

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

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

Downstream Lighting

Cadmus conducted a telephone survey of customers that explored CFL and LED lighting fixture purchases, designing the survey instrument to collect data regarding process topics:

- **Program process.** Details to inform the following performance indicators:
 - HES Program incentive awareness
 - Lighting fixture purchase decisions and barriers to purchasing energy-efficient lighting
 - Customer satisfaction with products purchased, installation contractors, and the incentive application process
- **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. The interviews sought 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 similar utility programs across the country. In conducting this benchmarking, Cadmus utilized its ESource data resource as well as a library of Cadmus’ current and past utility program evaluations.³⁰

Program Implementation and Delivery

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

³⁰ Data from DSM Insights, used with permission from E Source.

Program Overview

During the evaluation period, Rocky Mountain Power offered energy efficiency measures in three primary categories (e.g., lighting, non-lighting, and **wattsmart** Starter Kits). The lighting component (except lighting fixtures), and room air conditioners used an upstream and/or midstream incentive mechanism with a discount applied at the point of sale, whereas the non-lighting component and lighting fixtures, used a downstream post-purchase mechanism, using mail-in or online incentive applications.

Participants in the third delivery channel could order **wattsmart** 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 (e.g., 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

Each year, Rocky Mountain Power files program modifications (i.e., tariff changes) with the Wyoming Public Utilities Commission. HES program incentives and eligibility requirements for existing measures changed during the 2015–2016 period, with Rocky Mountain Power adding the following new measures:

- **wattsmart** Starter Kits (described above)
- LED bulbs and fixtures
- Central air conditioner best practice installations and sizing
- Efficient gas furnaces with ECM
- Electric system to heat pump conversions
- Duct sealing and insulation for multifamily homes (added in 2016)

For program year 2016, the program no longer incentivized the following:

- Computer monitors
- Flat panel televisions
- Electric water heaters

Delivery Structure and Processes

Program staff coordinated with participating distributors, retailers, and trade allies to deliver the program's different components. For most program-qualifying, non-lighting measures, customers received post-purchase, cash-back incentives directly from the program, allowing Rocky Mountain Power to verify recipients were their customers. Rocky Mountain Power offered its midstream and upstream lighting incentives through retailers, identifying these 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.

The program administrator maintains an account manager in Utah, who reaches out directly to property managers or property owners of multifamily properties in Wyoming—particularly electrically heated properties—to help them engage with the program incentives, pairing them with a choice of contractors providing non-lighting equipment.

Data Tracking

The program administrator, CLEAResult, provides the program tracking data to Rocky Mountain Power through a DSM Central (DSMC) data entry spreadsheet. This report, known as the project upload, also serves as CLEAResult’s invoice to Rocky Mountain Power. For downstream rebates, CLEAResult hand-keys the application information into its program tracking database, using a software control mechanism to ensure all application data are present and customers are eligible. The program administrator submits project uploads to the DSMC on a weekly basis. DSMC serves as Rocky Mountain Power’s project management and reporting database.

The program administrator also provides monthly reporting to Rocky Mountain Power that highlights the program’s actual performance compared to forecasts, and updates the forecast for the remainder of the year. In late 2016, the administrator began providing this report via an online dashboard.

Application Processing

By the end of 2016, CLEAResult provided almost all applications online. CLEAResult hoped online applications would 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, during 2015–2016, 18% of non-lighting customers reported receiving their incentives in less than four weeks, a rate significantly down from 36% in 2013–2014,³¹ but similar to that from the 2011–2012 cycle. Though the number of customers reporting that they received incentives in four to six weeks (47%) or seven to eight weeks (14%) were similar to those that reported receiving the prior survey in 2013–2014, those reporting they received their rebate more than eight weeks after submitting their application increased from 6% in 2013–2014 to 21% in 2015–2016.³²

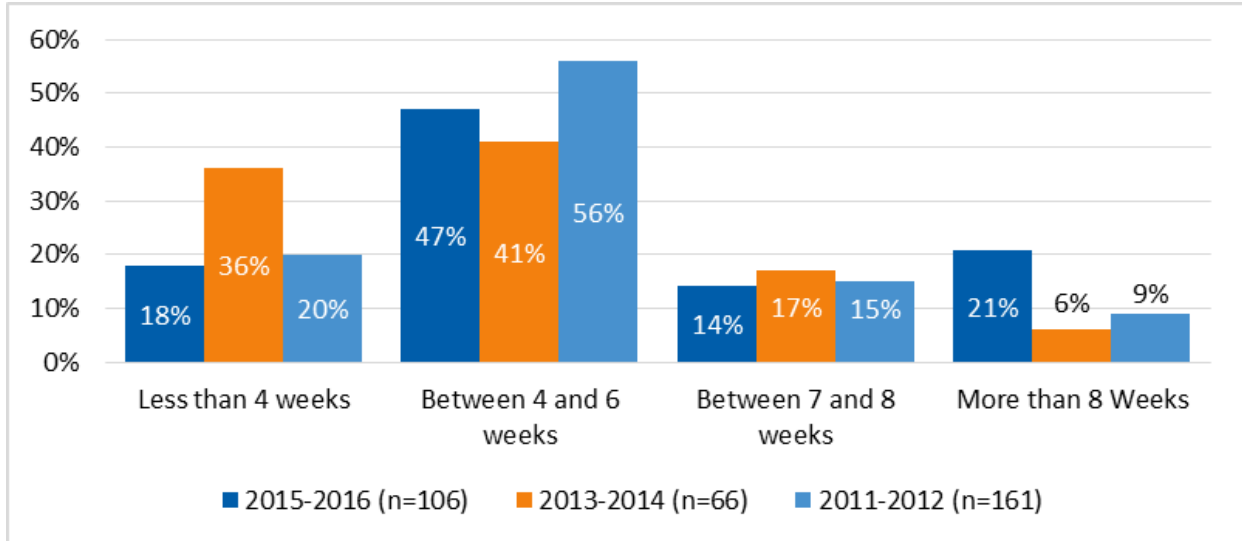
Notably, this question gauged participants’ perceptions of the time required to receive the rebate, and their responses probably included the time required to resubmit their applications to address missing or

³¹ Statistically significant change (p-value <0.10).

³² Statistically significant change (p-value <0.10).

incorrect information. The majority of respondents—76% (n=106)—expressed satisfaction with the time required to receive their incentives.

Figure 6. Time Between Application Submission and Incentive Receipt (2011–2016)



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

Trade Allies

The program administrator continued its use of a tiered system for trade allies, reflecting savings that a trade ally delivered to the HES Program and the attention level provided by the administrator. Tier 1 trade allies—those delivering 80% of program savings—received individual support from the administrator, including training on the program, measures, and incentives. Tier 2 trade allies received a program newsletter, along with site visits and phone calls from the account manager (although these proved less frequent than those provided to Tier 1 trade allies). Tier 3 trade allies remain new to the program.

The program administrator employed a full-time account manager for all trade allies in the Utah-based Rocky Mountain Power network in Utah. The account manager made periodic site visits to Wyoming trade allies, maintained the program relationships, and identified new trade allies using online resources such as DexKnows, Angie’s List, or Google.

Marketing

Approach

In 2015–2016, the **watt**smart program shifted resources to emphasize 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, Opower ads, content in Rocky Mountain Power’s customer newsletters, and social media channels. Rocky Mountain Power also distributed printed materials, and, at home shows, offered free Starter Kits to qualified customers.

In executing these tactics, the program sought to teach 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 **wattsmart** Starter Kits throughout the year, using targeted customer communication through direct mail, e-mail, and social media

The administrator also provided trade allies with some marketing collateral, such as general program fact sheets.

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.

Table 68 provides examples of direct-to-customer marketing tactics deployed in 2015–2016 and subsequent increases in website visits. The administrator noted that the significant increase for LED/Kit bill inserts reflected 288 views to the light bulbs page in April 2015 vs. six page-views in the previous month; the increase shown for the ductless heat pump bill insert reflected 116 pages views vs. 34 in previous month.

Table 68. Examples of Direct-to-Customer Tactics 2015–2016

Tactic	Date	Increase in Website Visits
LED/wattsmart Starter Kits Bill Insert	April 2015	4,700%
DHP Bill Insert	June 2015	241%
Opower LED Advertisement	July 2015	14%
DHP Bill Insert	July 2016	0.86%

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

The administrator pointed out that bill inserts featuring specific equipment measures—such as those shown in Table 68—continue to serve as effective vehicles for increasing customer awareness about program incentives and measure benefits.

The administrator added that, while articles in Rocky Mountain Power’s newsletters and social media did not notably increase website traffic, they maintained baseline awareness of the energy efficiency offerings from Rocky Mountain Power at a very low cost to the program.

In addition, as customers purchased qualified products through retailers or trade allies, rather than an online source that could be tracked, the administrator could not tie the marketing to actual purchases and installations.

One primary HES website objective, as the administrator noted, was to drive customers toward applying for incentives online. The administrator did report an increase in the number of year-over-year visits to the application landing page from 2014 to 2015 (535 vs. 1,652), but the site experienced a decrease in 2016 (1,043).

Program Challenges and Successes

The program administrator saw trade ally participation decline, primarily due to turnover, and noted that only a “handful” of trade allies were truly engaged in Wyoming.

As found in 2013–2014, making HES available to the Wyoming market’s rural customer population continues to present significant challenges. Program staff introduced the Starter Kits in 2015 to reach these customers. The administrator also considered developing an online store platform for lighting measures in the 2017 or 2018 timeframe to increase customer access and to assure equity for customers residing too far from a participating store.³³

The administrator noted that online applications have been a notable success.

Customer Response

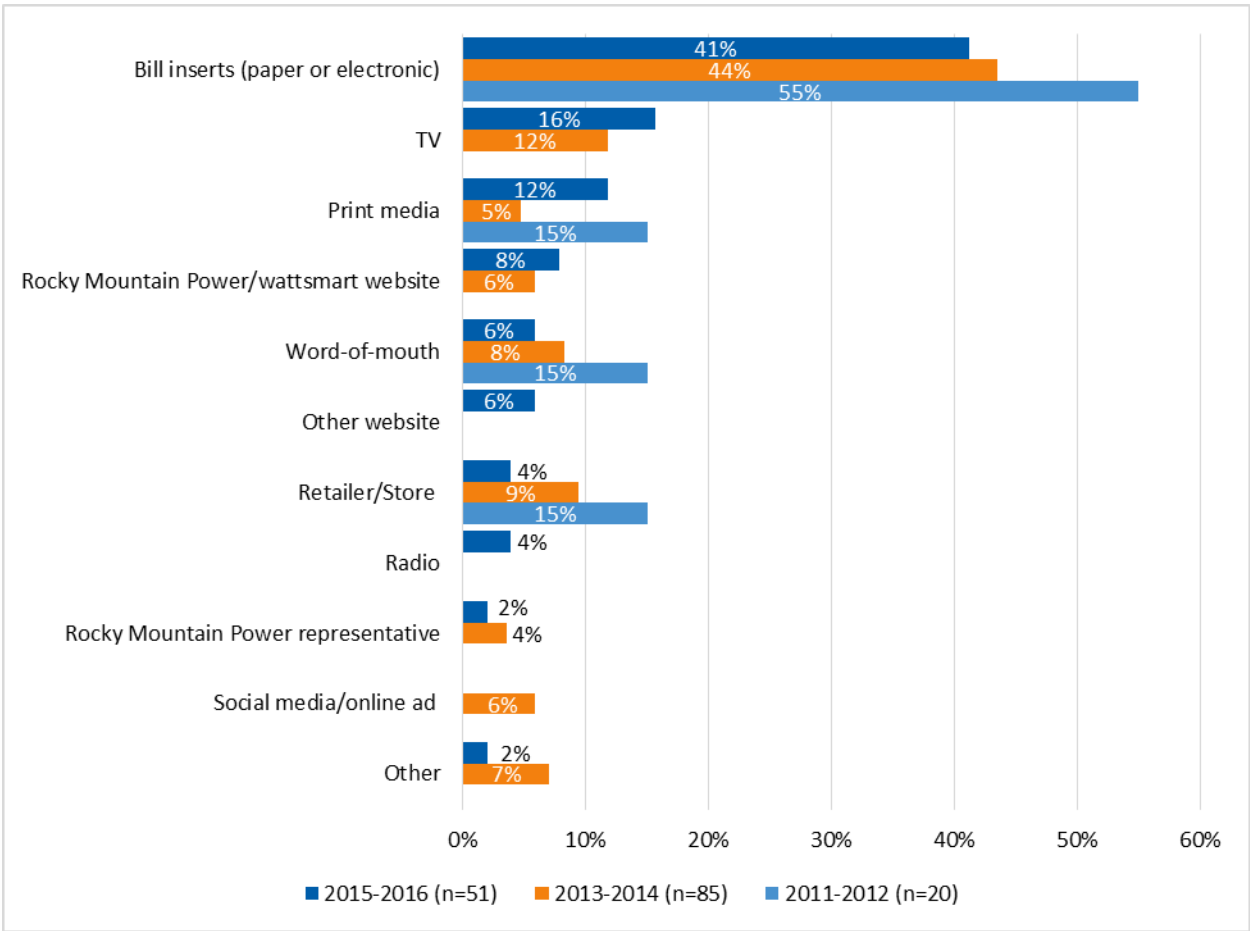
Awareness

As in the 2013–2014 HES evaluation, respondents most commonly cited bill inserts as serving as the primary source of awareness about the program, followed by TV. Similarly, in 2015–2016, 41% of respondents learned about the program through bill inserts, and 16% learned from TV ads. Print media offered the third most common source of program awareness, cited by 12% of respondents. Figure 7 presents awareness sources over these time periods.

³³ One example of a similar online store can be found at Orange & Rockland’s website.
<https://www.myorustore.com/>



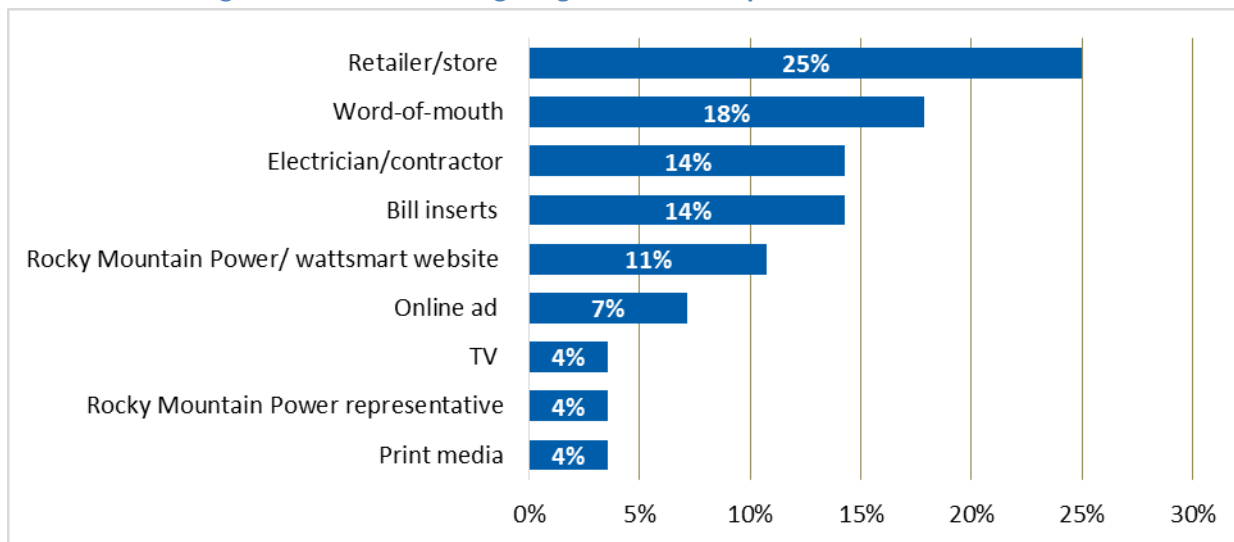
Figure 7. General Population Survey Source of wattsmart’s HES Program Awareness



Source: Rocky Mountain Power Wyoming HES Residential General Population Survey (QB2, 2011–2012; QD3, 2013–2014; QE3 2015–2016). Don’t know and refused responses removed.

Figure 8 shows respondents’ awareness sources regarding available rebates for downstream lighting fixtures. Unlike the upstream lighting program, where the retailer provided the most recent source of awareness for only 4% of respondents in 2015–2016, the retailer served as the primary source of awareness for downstream rebates (25%, n=28). Many participants also learned about rebates through word-of-mouth (18%)—the second most common source of information about the rebates.

Figure 8. Downstream Lighting Fixture Participant Source of Awareness



Rocky Mountain Power Wyoming Downstream Lighting Fixture Rebate Survey, QC1, n=28.
 Don't know and refused responses removed.

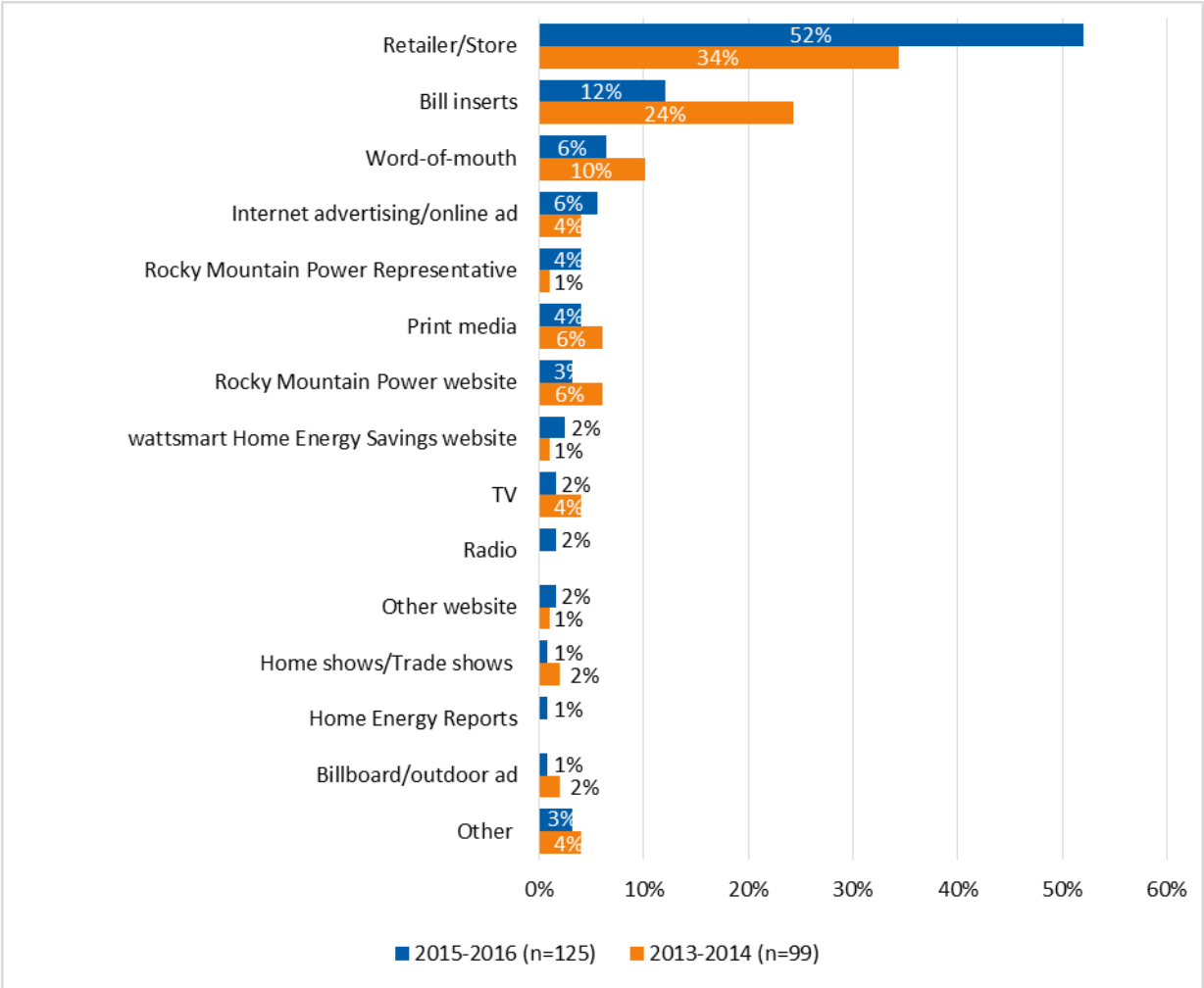
As shown in Figure 9, non-lighting participants most commonly learned of the program through a retailer (52%, n=125). Although it was also the most common response in 2013–2014, the 2015–2016 cycle showed a significant increase.³⁴ Bill inserts served as the second most common response in 2015–2016, with 12% of respondents indicating this source provided the most recent information on the program. This percentage, however, significantly fell from 2013–2014, when 24% of respondents learned about the program through this channel.³⁵ “Other” responses included past participation, local electricians, and employers.

³⁴ Statistically significant change (p-value <0.10).

³⁵ Statistically significant change (p-value <0.10).



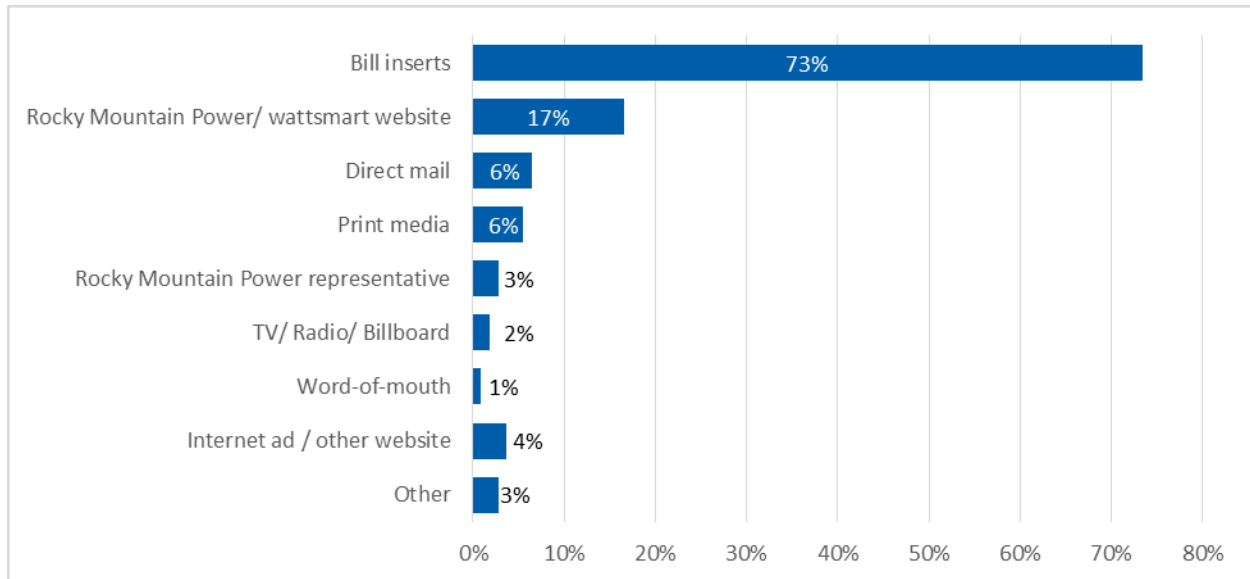
Figure 9. Non-Lighting Participant Source of Awareness



Source: Rocky Mountain Power Wyoming HES Residential Non-lighting Survey (QC1 2013–2014 and 2015–2016). Refused responses removed. Multiple responses allowed.

The 2015–2016 program years marked the first time that **wattsmart** Starter Kits became available to Rocky Mountain Power Wyoming customers. The majority of participants learned about the kits in the same way: through bill inserts (73%). Another 17% learned about the kits through **wattsmart**’s website. “Other” responses included e-mail and place of employment. Figure 10 illustrates how participants learned about **wattsmart** Starter Kits.

Figure 10. wattsmart Starter Kits Sources of Awareness



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

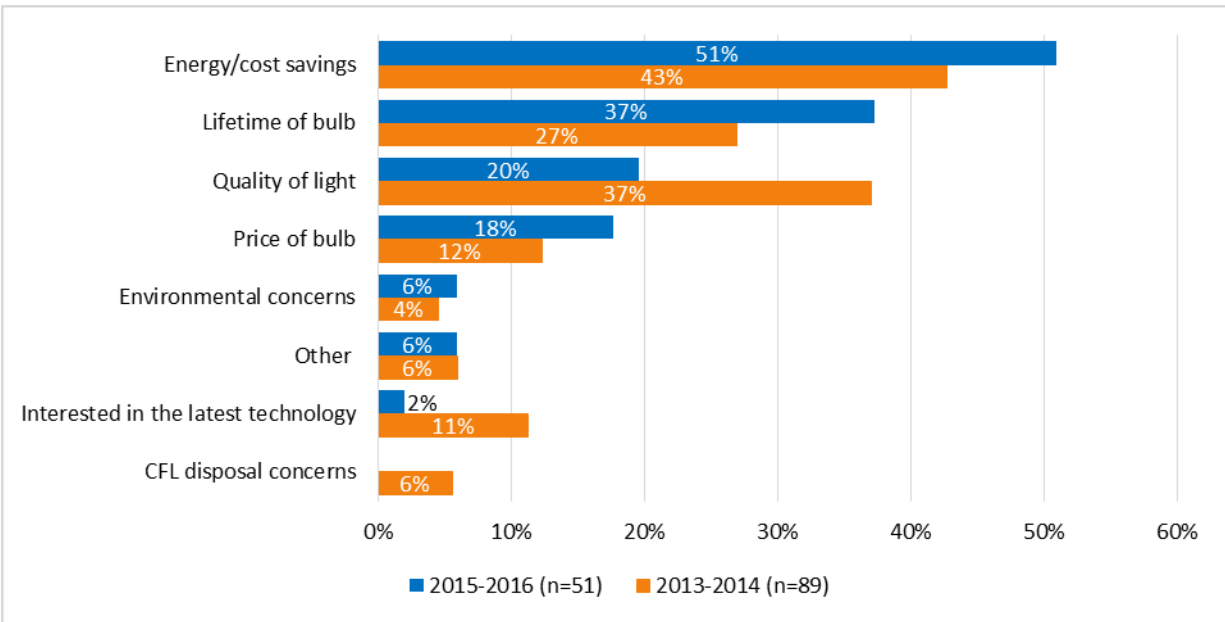
Lighting Purchasing Decisions

In the general population survey, Rocky Mountain Power’s Wyoming customers expressed a variety of reasons for purchasing LEDs (see Figure 11). As in previous years, respondents most commonly cited energy savings (51%). While respondents cited quality of light as the second most common reason in 2013–2014 (37%), only 20% of respondents cited this in 2015–2016, a significant decrease.³⁶ Instead, bulb lifetimes provided the second most common response in 2015–2016 (37%).

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



Figure 11. General Population Reasons for Purchasing LEDs



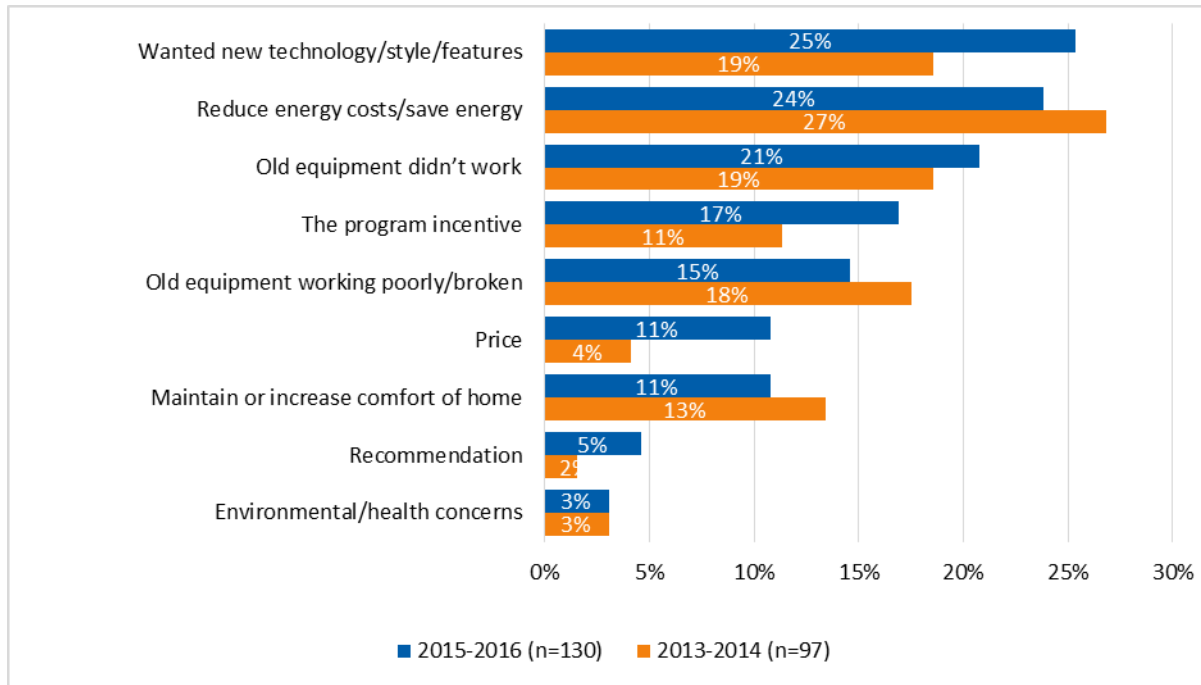
Source: Rocky Mountain Power Wyoming HES Residential General Population Survey (QC7 2015–2016 and 2013–2014). Don’t know and refused responses removed. Multiple responses allowed.

Non-Lighting Participation Decisions

As shown in Figure 12, Rocky Mountain Power non-lighting participants reported that different factors influenced their decisions to purchase efficient measures for which they received rebates. Most commonly, participants cited an interest in the product’s style or features (25%) or a desire to reduce energy costs (24%). Other common responses included replacing non-working equipment, the program incentive, and replacing poorly working equipment. In 2015–2016, only price significantly differed from the 2013–2014 survey, with the percentage of respondents citing price as an important factor increasing from 4% in 2013–2014 to 11% in 2015–2016.³⁷

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

Figure 12. Reasons for Participation (Non-Lighting)



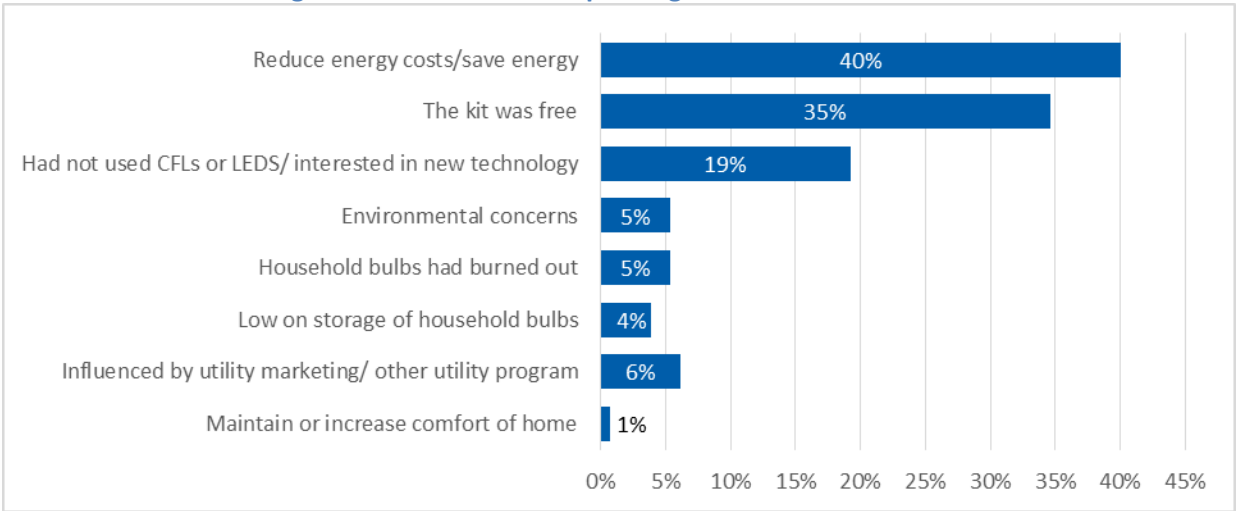
Source: Rocky Mountain Power Wyoming HES Residential Non-lighting Survey (QC5, 2013–2014 and 2015–2016). Don't know and refused responses removed. Multiple responses allowed.

wattsmart Starter Kits Participation Decisions

When asked why they applied for the HES **wattsmart** Starter Kit, Rocky Mountain Power customers expressed a variety of reasons, most commonly citing a desire to reduce energy use or costs (40%), and the kit's free cost (35%). Respondents' third most common reason, mentioned by 19%, was curiosity about LEDs. Figure 13 illustrates customers' various motivations to request a kit.



Figure 13. Reasons for Requesting a wattsmart Starter Kit

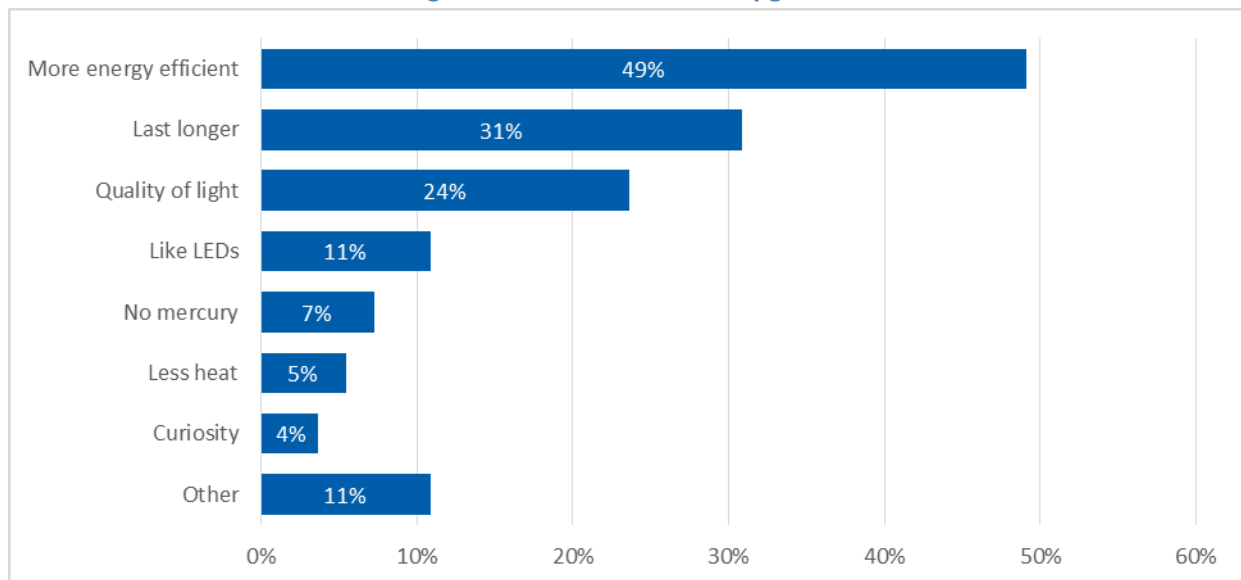


Source: Rocky Mountain Power Wyoming HES Residential Energy Kit Survey (QE10, n=130). Don't know and refused removed. Multiple responses allowed.

During the application process, customers could upgrade their kits from CFLs to LEDs for \$4.99. Nearly one-half (49%) of those choosing to upgrade reported doing so because of LEDs' higher efficiency. Customers' other common reasons for upgrades included LEDs lasting longer (31%) or having better light quality (24%). Some customers simply liked LEDs (11%). Customer also cited lack of mercury, less heat, and curiosity about LEDs as motivating factors for upgrading their kits. Figure 14 shows reasons that customers upgraded their kits to include LEDs rather than CFLs.

Those ordering CFL kits were more likely to have CFLs installed in their homes (60%, n=68) than LED kit participants were likely to have LEDs installed (48%, n=71). In addition, 49% of CFL participants planned to buy CFLs, compared to 38% of LED participants planning to buy LEDs.

Figure 14. Reasons for LED Upgrades



Source: Rocky Mountain Power Wyoming HES Residential Energy Kit Survey (QB20 2015–2016, n=55). 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 38 customers responding to the question, eight knew of the upgrade option. Four of those respondents did not upgrade due to cost; the remainder had other reasons or did not know. Fourteen of 30 customers who were not aware said they would have upgraded had they known of the option.

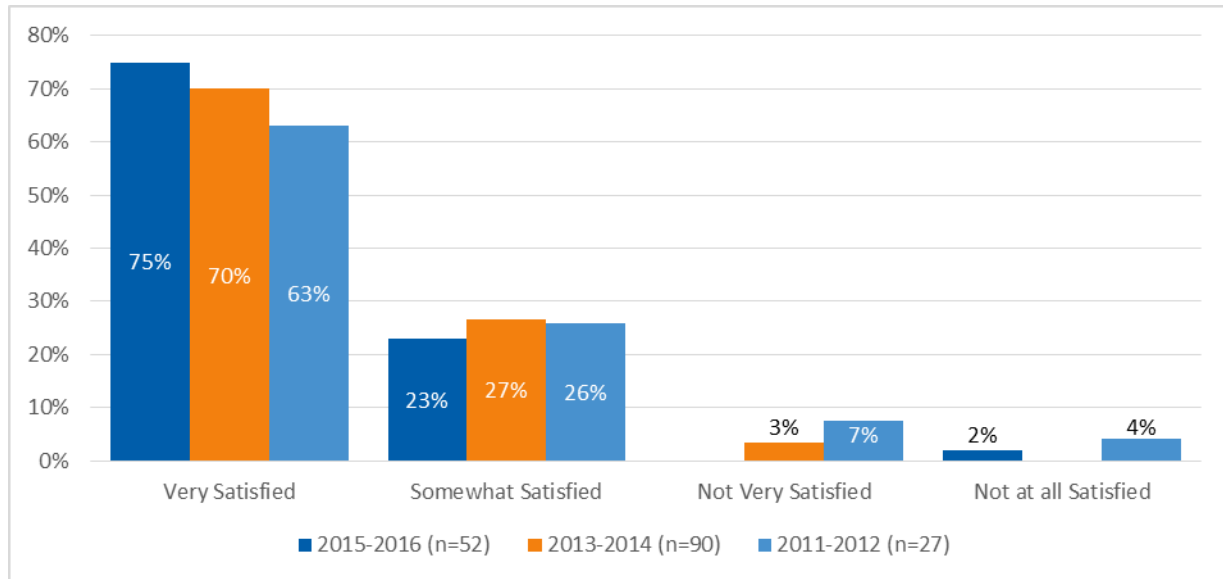
Satisfaction

Upstream Lighting

The general population indicated that satisfaction with LEDs remained consistent over the past six years. The great majority of users (75%, n=52) were very satisfied with the bulbs, and another 23% were somewhat satisfied. Only 2% of respondents in 2015–2016 indicated they were less than satisfied with their LEDs, as shown in Figure 15.



Figure 15. General Population LED Satisfaction



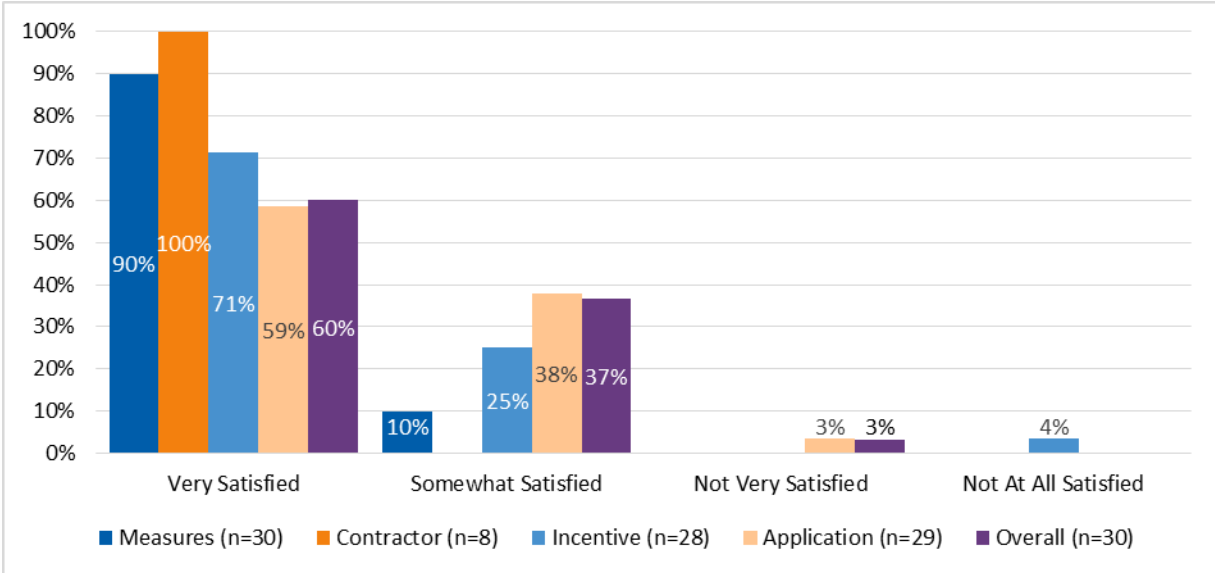
Source: Rocky Mountain Power Wyoming HES Residential General Population Survey (QG1, 2011–2012, QC14, 2013–2014; QC16, 2015–2016). Don't know and refused responses removed.

Totals may not sum due to rounding.

Downstream Light Fixtures

According to survey results, participants using a downstream lighting rebate expressed overall satisfaction with their experiences (97%). Figure 16 shows that nearly all respondents (90%) were very satisfied with the fixtures they purchased, and all (100%) of those having fixtures professionally installed were very satisfied with their contractors. Respondents were less likely to be very satisfied with the incentive amounts, with 71% reporting they were very satisfied and 25% reporting they were somewhat satisfied. Respondents were least likely to be very satisfied with the application process (59%) and the program overall (60%), though no more than 4% of respondents were less than satisfied with any individual program aspect.

Figure 16. Satisfaction with Downstream Light Fixture Measures, Contractors, Incentive Amounts



Source: Rocky Mountain Power Wyoming HES Residential Downstream Light Fixture Survey (QD1, D3, D6, D9, D10 2015–2016). Don’t know and refused responses removed. Totals may not sum due to rounding.

Non-lighting

Non-lighting customers overwhelmingly expressed satisfaction with the HES program, with 95% of participants reporting satisfaction. In most cases, participants tied this satisfaction with the incentive, the easy process, and learning how to save energy. Satisfied respondents offered the following comments:

- “It’s a great program to get you to think about energy usage and make a better decision.”
- “It’s just nice to have a program that helps you know how to save energy and help you save money.”

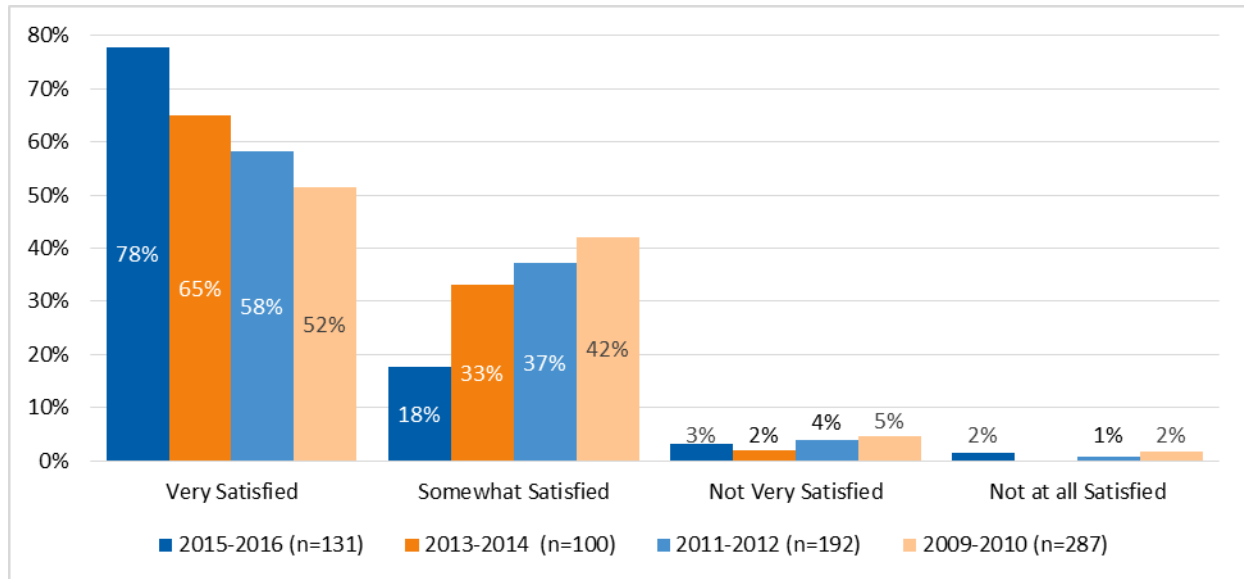
Customers not too satisfied or not at all satisfied with the program most often reported difficulties in completing the application or delays in receiving their rebates. One respondent noted: “It’s so complicated, it’s totally Greek to me, I don’t know what anything means.”

Comparing year-over-year, satisfaction levels remained fairly consistent from 2009 through 2014, as shown in Figure 17. The percentage of respondents indicating they were “very satisfied” with the program in 2015–2016 (78%) increased significantly from 2013–2014 (65%).³⁸

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



Figure 17. Non-Lighting Satisfaction with the wattsmart HES Program

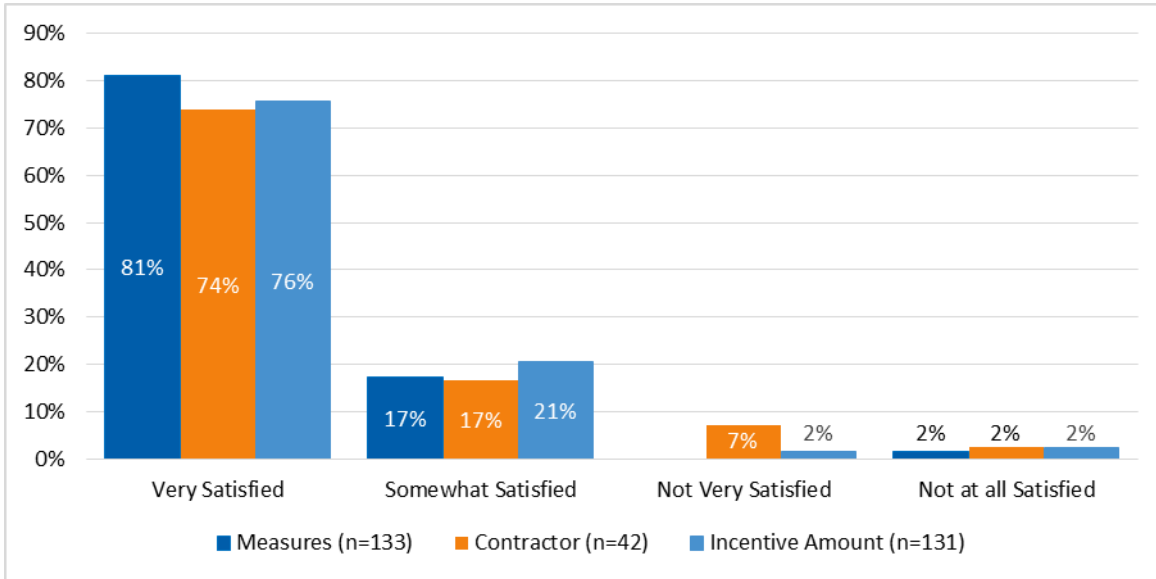


Source: Rocky Mountain Power Wyoming HES Residential Non-lighting Survey (QF9, 2011–2012, QE10, 2013–2014 and 2015–2016). Don't know and refused responses removed. Totals may not sum due to rounding.

Participation in the program appears to positively or neutrally affect most customers' perceptions of Rocky Mountain Power. When asked whether their program participation caused their satisfaction with Rocky Mountain Power to change, 45% of non-lighting customers said it increased their satisfaction, 49% said it stayed the same, and 6% said it decreased.

In addition to their overall satisfaction with the program, non-lighting customers expressed high satisfaction levels with measures they installed, their contractors, and incentive amounts they received. As shown in Figure 18, 81% of non-lighting customers were very satisfied with measures installed, and 17% were somewhat satisfied.

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



Source: Rocky Mountain Power Wyoming HES Residential Non-lighting Survey (QE1, E3, E6 2015–2016). Don’t know and refused responses removed. Totals may not sum due to rounding.

About 40% of participants hired contractors to install measures for which they received program incentives; 74% of these participants reported being very satisfied with their contractors, and 17% were somewhat satisfied. A similar share of participants expressed satisfaction with incentive amounts they received, with 76% reporting they were very satisfied with incentive amounts. An additional 21% said they were somewhat satisfied, and just 4% said they were not very or not at all satisfied.

Non-lighting customers also found the HES program incentive application easy to fill out, with 64% of respondents reporting it was very easy to fill out, 33% reporting it was somewhat easy, 2% reporting it was not very easy, and 1% reporting it was not at all easy. Participants experiencing difficulty with filling out the application noted the following challenges:

- “Because I filled it out and had to keep adjusting it. And I didn’t get the full credit that the contractor said I was supposed to get.”
- “I thought it was quite easy until I got it returned because they said it wasn’t filled out correctly.”

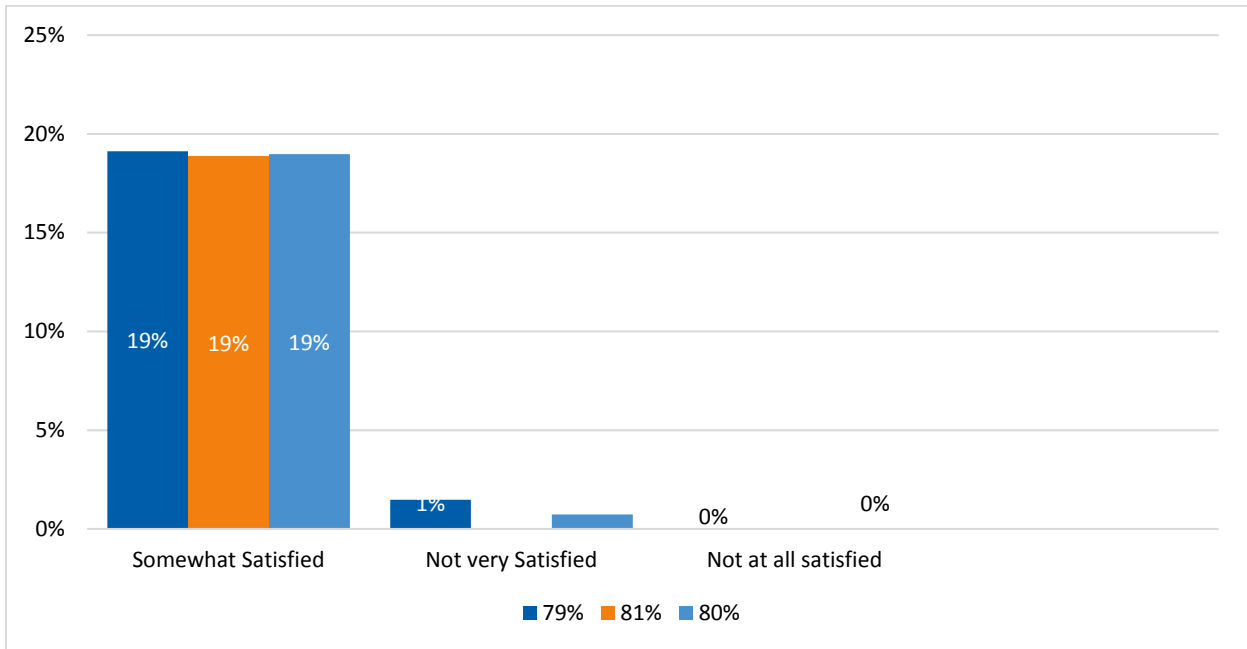
wattsmart Starter Kits

Program Satisfaction

As shown in Figure 19, nearly all kit recipients expressed satisfaction with the **wattsmart** Starter Kit overall, with 98% of all participants very or somewhat satisfied with the kit, and satisfaction levels about equal between CFL and LED kit participants.



Figure 19. Energy Kit Participant Satisfaction with the wattsmart Starter Kit



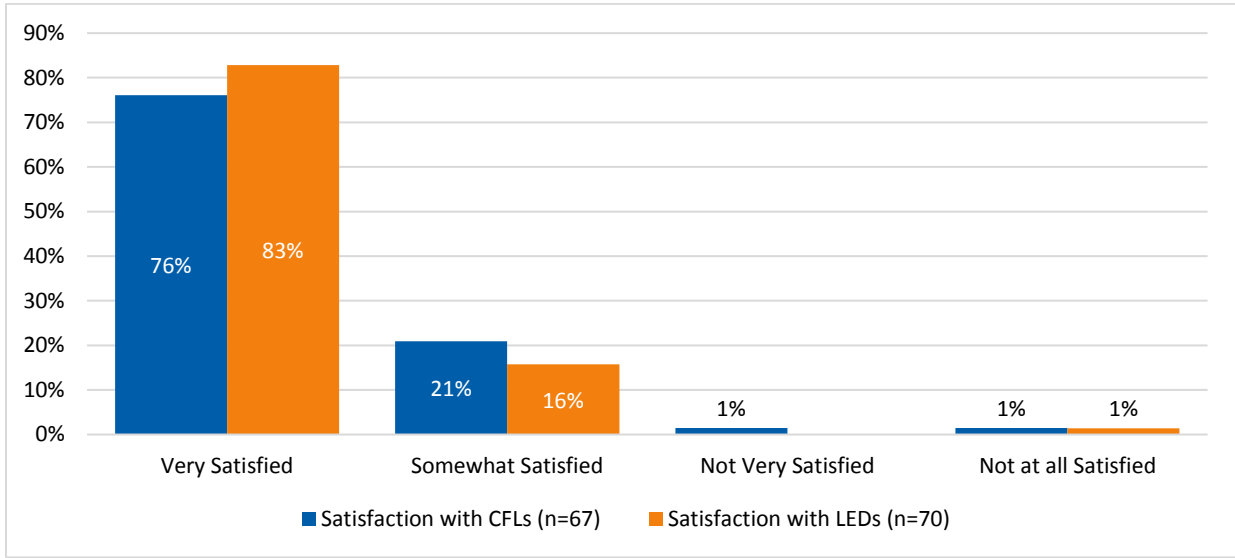
Source: Rocky Mountain Power Wyoming HES Residential Kit Survey (QE4 2015–2016).
Don't know responses were removed. Totals may not sum due to rounding.

Satisfaction with Kit Measures

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

Half (50%, n=68) of CFL kit participants installed all 4 bulbs received, and another 31% installed at least 2 of the bulbs. LED participants were more likely to install the kit lighting, with 69% of LED participants indicating they installed all bulbs received, and 27% indicating they installed at least 2 of the four bulbs. Nearly all respondents were satisfied with lighting measures included in the kits (97% of CFL recipients and 99% of LED recipients were somewhat or very satisfied, as shown in Figure 20).

Figure 20. Satisfaction with *wattsmart* Starter Kit CFLs and LEDs



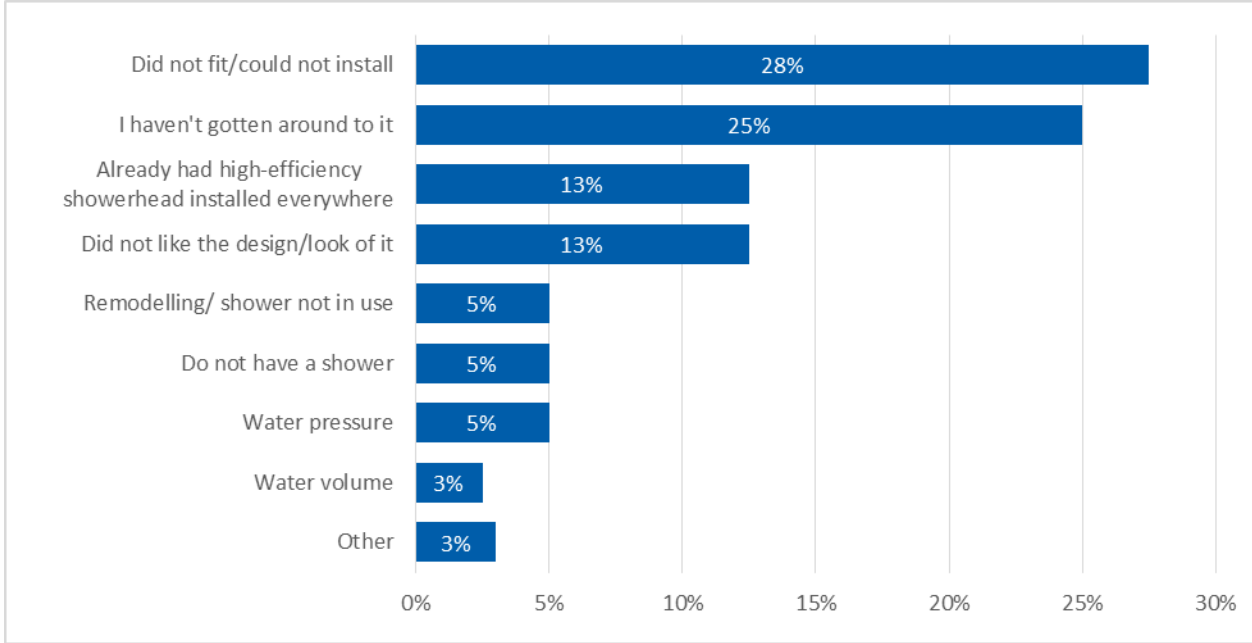
Source: Rocky Mountain Power Wyoming HES Residential Kit Survey (QB6 and B21, 2015–2016).
 Don't know and refused responses removed. Totals may not sum due to rounding.

Starter Kit participants expressed satisfaction with the number of CFL and LED bulbs provided: 73% of CFL kit customers (n=68) and 64% of LED kit customers (n=71) were very satisfied with the number of bulbs in the kit.

Kits contained two, one, or no showerheads. Thirty-nine percent (n=71) of customers installed all high-efficiency showerheads provided, and another 25% of customers installed one of the two showerheads received. Of customers reporting they did not install all units provided, 28% (n=40) said they could not install the showerhead or it did not fit. A similar percentage of customers (25%) said they had yet to install the showerhead, in some cases because they were remodeling their bathrooms or did not use the second shower. Figure 21 shows all responses.



Figure 21. Reasons for Not Installing High-Efficiency Showerheads



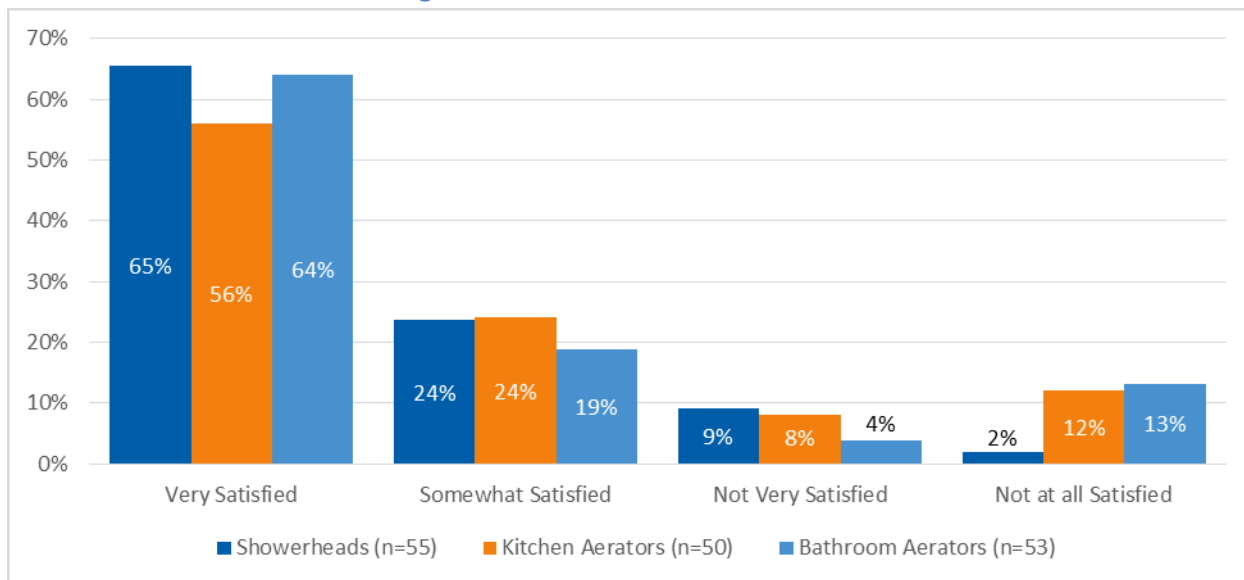
Source: Rocky Mountain Power Wyoming Residential Kit Survey (QC2 2015–2016, n=40). Don't know removed. Multiple responses allowed.

Despite the low installation rates, customers expressed satisfaction with showerheads received: 65% were very satisfied; and 24% were somewhat satisfied. Further, 70% 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. Nearly one-half (47%) of respondents said they had not installed the kitchen faucet aerator in their homes, most often because the aerator did not fit or they could not install it (64%). Similarly, 45% of respondents did not install all bathroom aerators they received, most commonly because the aerators did not fit or the recipient could not install them (48%). Customers next most commonly reported they had not had time (30%), including at least one recipient who intended to remodel their bathroom. Other responses included: the recipient did not like the design, water pressure, water volume, or the recipient already had aerators installed in all bathroom faucets.

Kit recipients' reported satisfaction levels with aerators similar to those with showerheads: 56% and 64% of customer were very satisfied with their kitchen aerator or bathroom aerators, respectively. Figure 22 shows satisfaction levels with each water measure.

Figure 22. Water Measure Satisfaction



Source: Rocky Mountain Power Wyoming HES Residential Kit Survey (QC4, QD4, QD12 2015–2016).

Customers found the kit applications easy to fill out, with 82% of respondents reporting the process very easy and 14% reporting it somewhat easy. Nearly three-fourths (72%) of customers received their kits within four weeks of submitting the application, and 25% received it within four to eight weeks. Only 3% said it took longer than eight weeks.

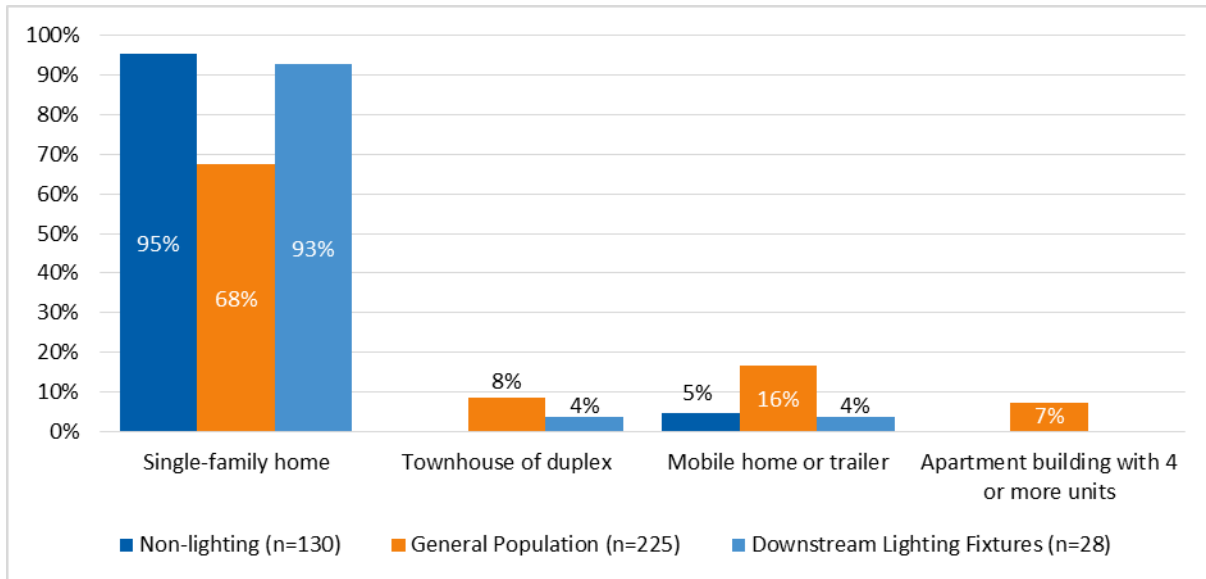
Customer Demographics

Housing Characteristics

As shown in Figure 23, most customers surveyed lived in single-family homes, though non-lighting and downstream fixtures respondents were more likely to live in a single-family home than the general population. General population survey respondents more commonly responded that they lived in in townhomes, duplexes, mobile homes or apartments.



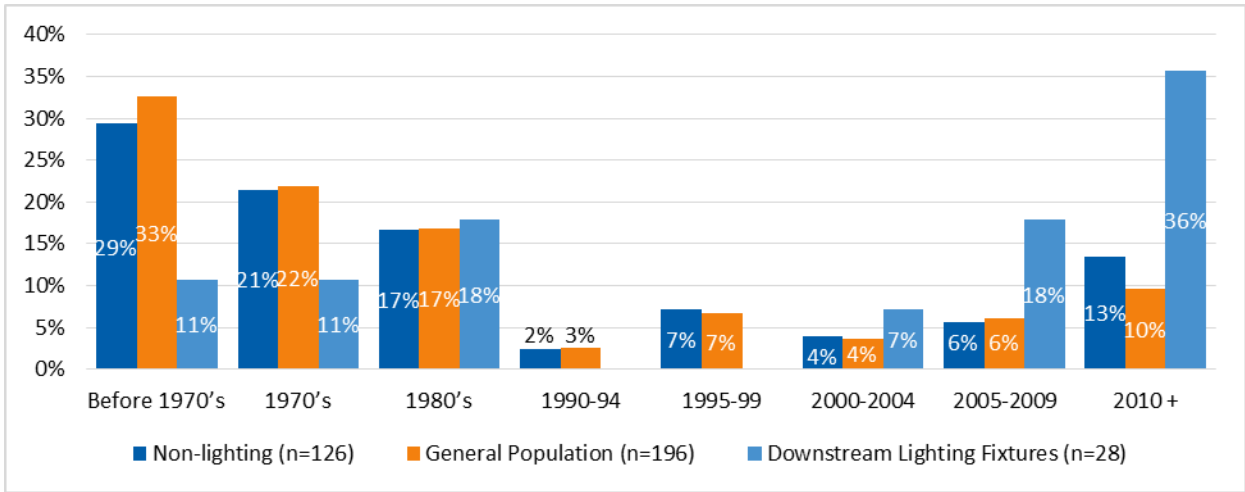
Figure 23. General Population and Non-Lighting Residence Types



Source: Rocky Mountain Power Wyoming HES Residential Non-lighting, General Population and Downstream Lighting Fixtures Surveys, 2015–2016 (QH1 Non-lighting, QG1 General Population, and QG6 Downstream Lighting Fixtures.) Don't know and refused responses removed. Totals may not sum due to rounding.

The great majority of non-lighting participants, the general population, and downstream fixtures respondents reported owning their own homes—92% of the non-lighting participants, 76% of the general population, and 100% of downstream fixtures participants. However, Figure 24 shows that while non-lighting and general population respondents had similar home vintages, downstream participants were less likely than either group to own an older home. The majority of non-lighting and general population respondents, 51% and 55%, respectively, reported owning a home built before 1980, compared to 22% of downstream fixtures respondents. Downstream fixtures participants were correspondingly more likely to own a home built in 2005 or later, with 54% reporting a home vintage in this range, compared to 19% of non-lighting respondents and 16% of general population respondents.

Figure 24. General Population and Non-Lighting Home Age



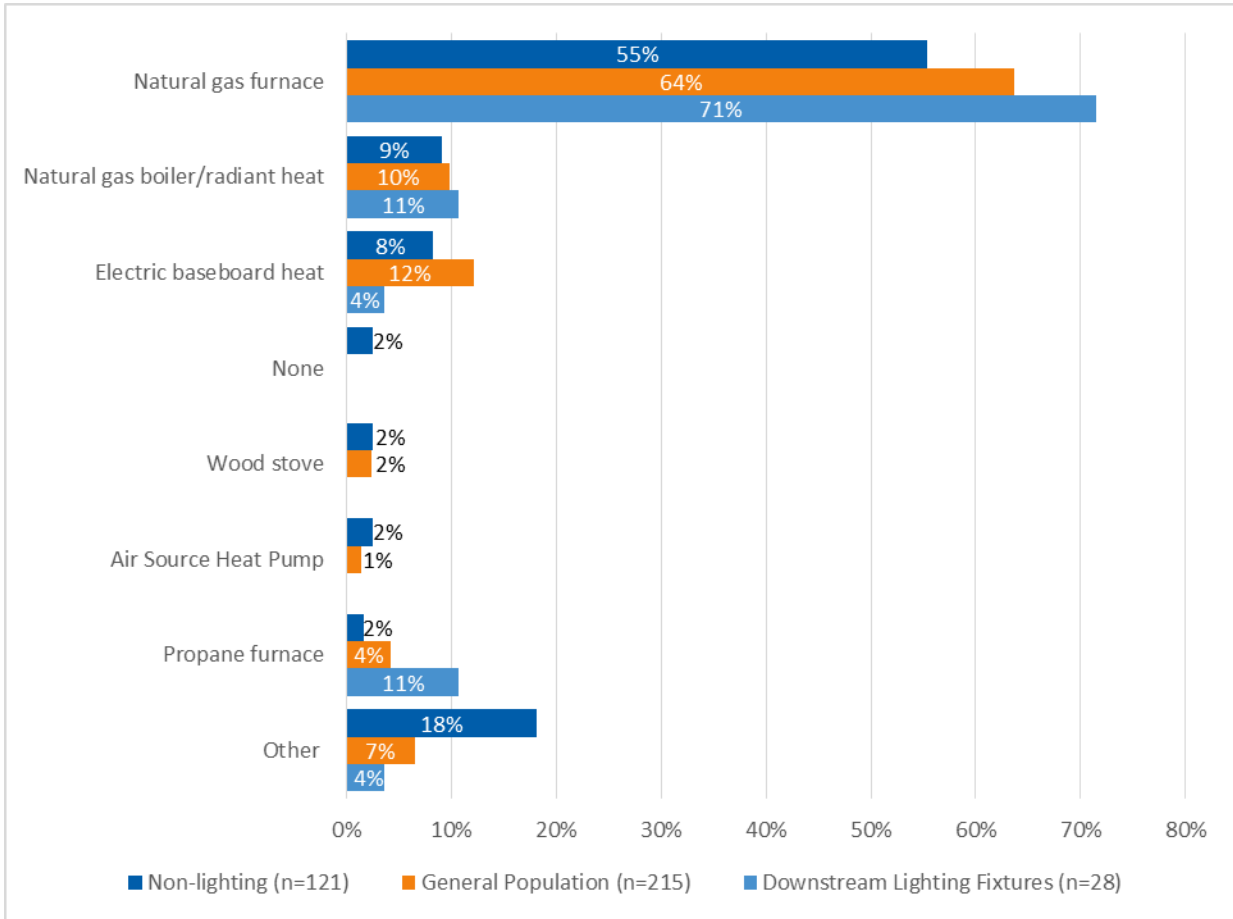
Source: Rocky Mountain Power Wyoming HES Residential Non-lighting, General Population and Downstream Lighting Fixtures Surveys, 2015–2016 (QH4 Non-lighting, QG3 General Population and QG9 Downstream Lighting Fixtures). Don't know and refused responses removed.
 Totals may not sum due to rounding.

Fuel and Equipment Characteristics

All respondents reported using primarily forced air natural gas furnaces for space heating, as shown in Figure 25. Responses in the “other” category included propane, oil, or electric boilers with radiant heat, wood stoves, air source heat pumps, ductless heat pumps, passive solar, cook stoves and no heating. On-lighting respondents reported an average age of 13.6 years for their heating equipment, relative to 12.3 years for general population respondents, and 8.1 years on average for downstream fixtures participants.



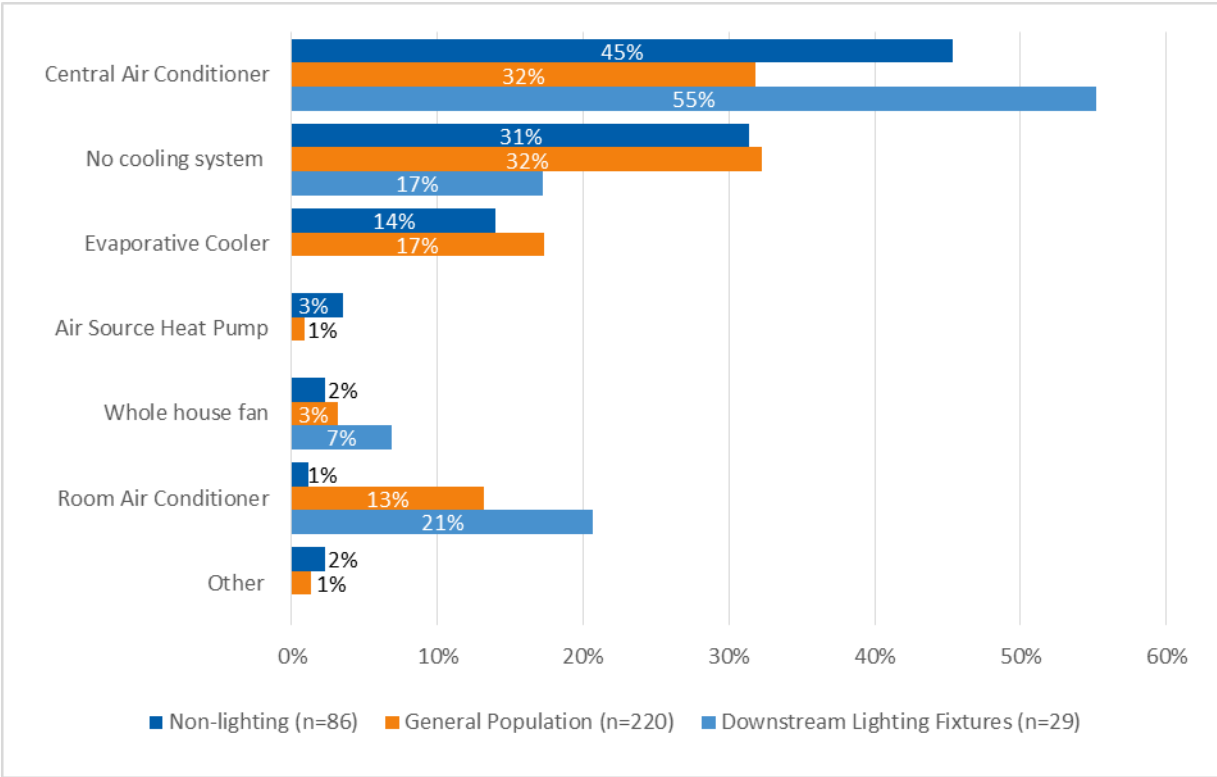
Figure 25. Space Heating Fuel and Equipment



Source: Rocky Mountain Power Wyoming HES Non-lighting, General Population and Downstream Lighting Fixtures Rebates Surveys (QD10 and QD12 Non-lighting, G3 General Population, QG1 and QG3 Downstream Lighting Fixtures). Don't know and refused responses removed.

Figure 26 shows common cooling equipment used by survey respondents. For non-lighting, general population and downstream lighting fixtures respondents, the most common type of equipment was central air system, used by 45%, 32%, and 55% of respondents respectively. The next most common response for non-lighting and general population respondents was that they did not have cooling equipment (31% and 32% respectively, while the next most common response for downstream fixtures respondents was that they used a room air conditioner.

Figure 26. Cooling Equipment



Source: Rocky Mountain Power Wyoming HES Non-lighting, General Population and Downstream Lighting Fixtures Rebates Surveys (QD13 Non-lighting, QG4 General Population and Downstream Lighting Fixtures). Don't know and refused responses removed.

The majority of non-lighting and general population respondents reported using natural gas for water heating (63% and 65% respectively), followed by electricity (31% for each).

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 two to 20 years, with one to 80 employees.

Company Engagement with HES

Trade allies said their companies had been involved with the HES program from one to 10 years. One trade ally, listed in the program data and on the program website as a Tier 2 participating trade ally, said, although they had been periodically contacted by a program representative, they did not feel they had sufficient information to understand the program and promote it (this trade ally did not consider themselves “part of the program”). The respondent self-reported as the Sales Representative/Marketing Manager/Office Manager for the company during the past two and one-half to three years. Cadmus cannot explain the difference between the Tier 2 rating and the trade ally’s perception except that

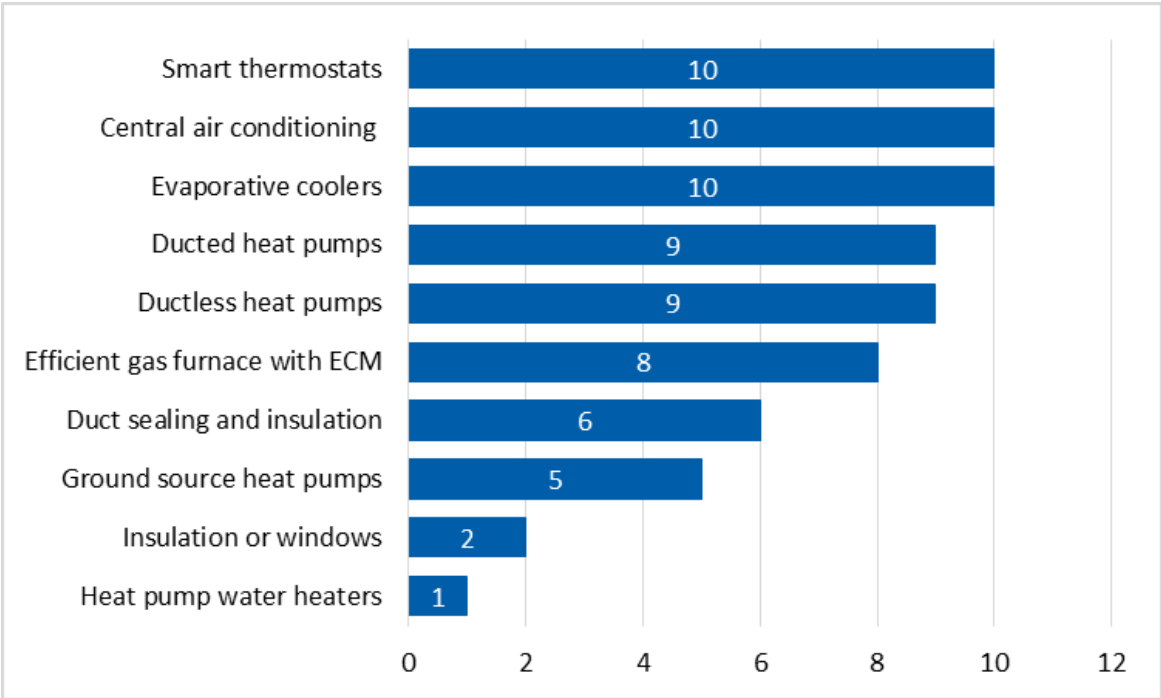


perhaps they don't think of being in a program as much as taking advantage of program offerings from time to time.

Trade allies learned of the program in a variety of ways (e.g., contacted by a Rocky Mountain Power representative, through customers wanting a program incentive, online, from a prior employer). Figure 27 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 requested equipment they do not install (e.g., heat pumps, heat pump water heaters).

One of 10 respondents, a Tier 2 trade ally, received training through the HES program over the last three years, describing visits from a program representative in which the representative provided updates about HES, which the trade ally found very useful.

Figure 27. HES Eligible Equipment Installed by Surveyed Trade Allies



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

Customer Outreach and Marketing

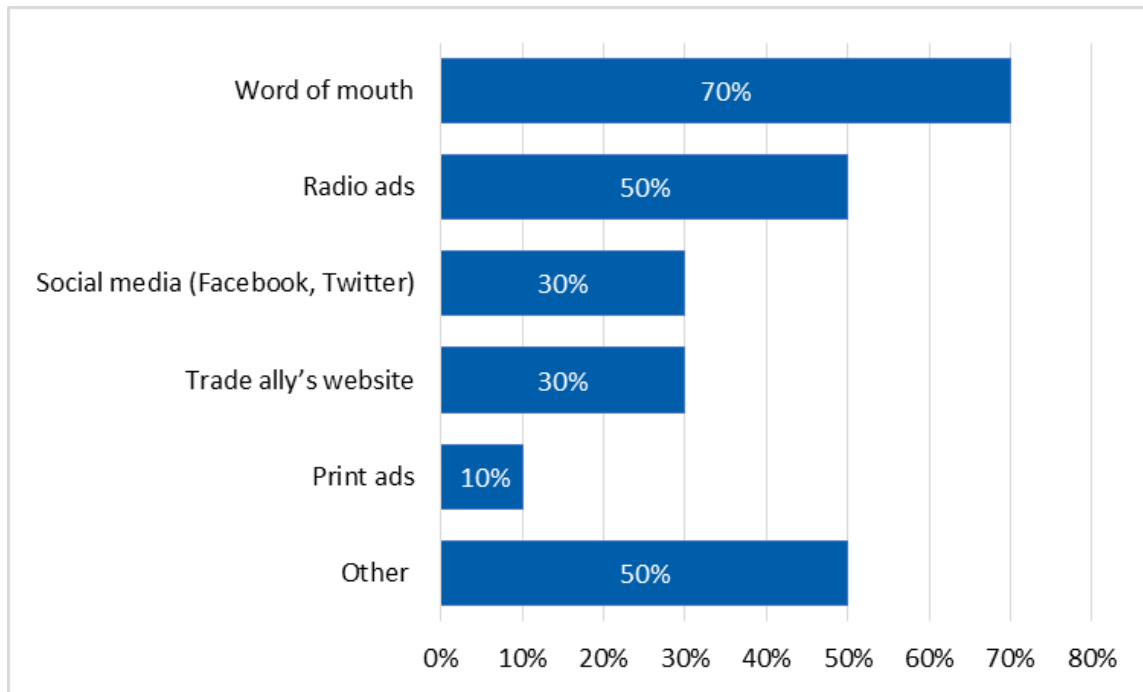
Trade allies characterized customers purchasing high-efficiency equipment as follows:

- Not price sensitive
- People who can afford a long-term investment in their home
- Energy conscious or “techy high-end people”

Trade allies overwhelmingly said customers learned about their businesses by word-of-mouth. As shown in Figure 28, customers next most frequently learned of trade allies through radio advertisements. The “Other” category included the following:

- Search engines/web searches
- Advertisements placed on company trucks
- Phone book

Figure 28. Ways Customers Learned about Trade Ally’s Business



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

Trade allies represented a mix of rural vs. urban customers. While four trade allies reported their customers evenly split (i.e., 50% rural, 50% urban), one served predominately rural customers (85% of their customer base), and four served predominately urban populations; one did not know the population's rural/urban mix. The majority (8 of 10) said they did not promote the HES program differently to rural customers. The two trade allies that did said rural customers (who use propane) can save more money with high-efficiency equipment.

Four trade allies said they promoted the HES program to their customers frequently or all of the time through scheduled service calls to a customer’s home, when customers called their businesses, as part of a proposal, through materials on display in the office, or via radio advertisements. Those not promoting the program frequently cited the financial risk for their business or their customers, rebates not justifying the extra cost, lack of program materials, and a lack of understanding about the program



details and who is eligible. Trade allies said Rocky Mountain Power could help them increase program awareness and activity among their customers through the following actions:

- Provide trade allies with more program information and materials
- Provide information more regularly to keep trade allies up to date about the program
- Make incentives more compelling

Three of 10 trade allies reported using HES program materials in marketing the program to their customers (e.g., incentive overview flier, incentive application, or referring customers to the program website) and rated the materials as very or somewhat useful. Trade allies not using program materials said they did not have program materials or had run out, or they did not understand the program well enough to explain it to customers. One trade ally suggested that program representatives review the program benefits with trade allies; so they could explain it to customers. Two trade allies said the marketing materials did not present a problem, but high-efficiency measures did not prove cost-effective for their customers.

Application Process

A majority of the trade allies (eight of nine)³⁹ reported helping their customers complete incentive applications frequently or all of the time. Five of these respondents reported encountering the following challenges frequently or continually:

- Unclear equipment eligibility requirements
- Numbers of supporting documents required (e.g., energy savings calculations, contractor invoices)
- Excessive time required to complete the application
- Difficulty reaching program staff with questions
- Forms returned at the last minute for missing information not clearly requested on the application
- Difficulty finding Air Conditioning, Heating, Refrigeration, Institute (AHRI) certification to verify the equipment was eligible for program incentives

One trade ally noted that the program requires a value for static pressure, though not relevant for a ductless heat pump.

Three trade allies reported using the online application form, with one very satisfied, one somewhat satisfied, and one not very satisfied with the online form. A respondent suggested a link to the form would make it easier to find, and another, who experienced frequent challenges in determining equipment eligibility, suggested redesigning the form.

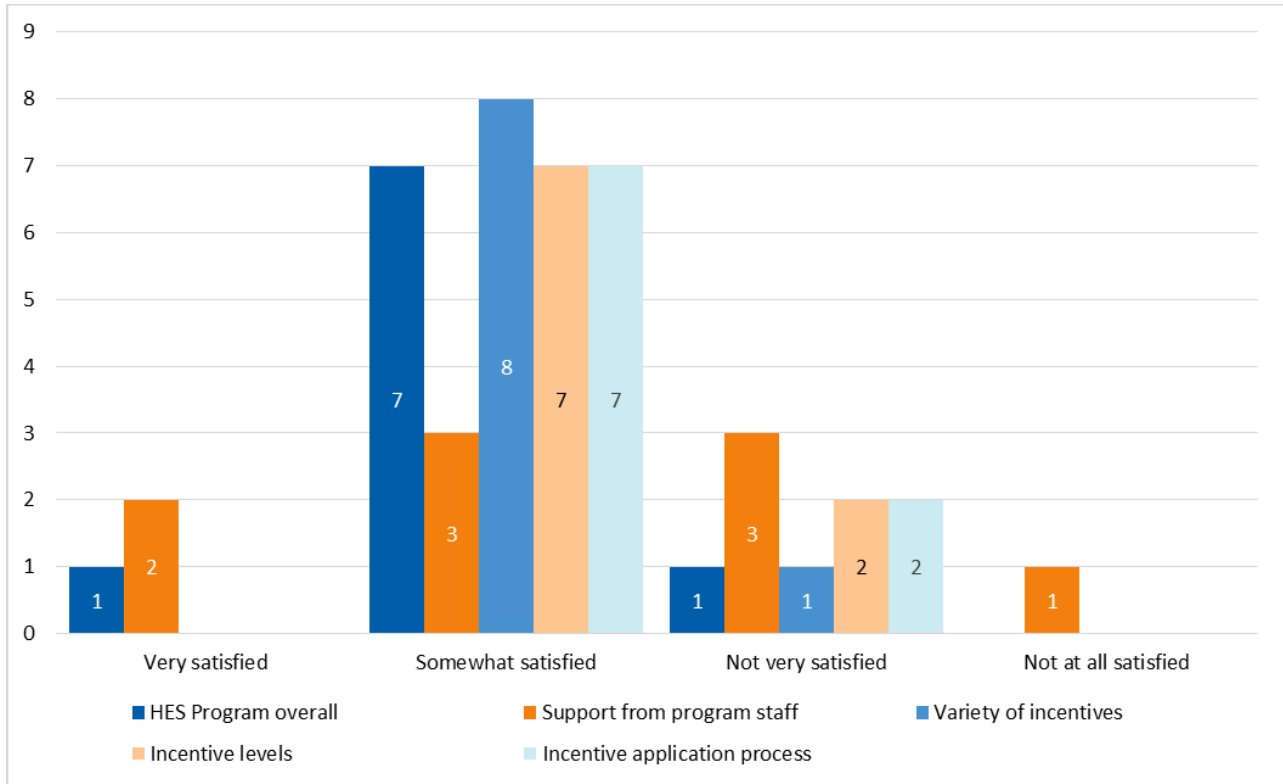
³⁹ One trade ally, who earlier reported not being part of the program, did not answer questions about the application process or with their satisfaction with the program.

Trade Ally Satisfaction

Nine trade allies reported their satisfaction levels with five HES program aspects: seven reported being somewhat satisfied with the HES program overall, one reported being very satisfied, and one reported being not very satisfied.

Trade allies reported mixed satisfaction levels for the remaining four program aspects; as illustrated in Figure 29, most reported they were somewhat satisfied.

Figure 29. Satisfaction with HES Program Aspects



Source: Rocky Mountain Power Wyoming 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 comments regarding program features with which they were less than very satisfied. These included: requests for higher incentives; noting their customers could not afford high-efficiency equipment; and, most predominately, finding program staff very difficult to reach, one trade ally resorted to calling CLEAResult’s California trade ally representative, to get help filling out the incentive application.

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.

Though the main report presents findings at a high level, Appendix G 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 summarizes these definitions as follows:

- **Upstream Programs:** Implemented as agreements between the program and the product's manufacturer, distributors, or retailers. 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 a 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) to reduce 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 do 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 required to the home’s price), 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 69.

Table 69. Summary of Upstream Lighting Programs

Utility/PA, State	Administrator	Measures	Program Year	Measure Quantity	Net MWh ¹	kWh/Measure ²
Rocky Mountain Power, WY	CLEAResult	CFLs, LEDs, Fixtures	2015–2016	319,359	2,789	9
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 unit between HES and other benchmarked programs results from variances in engineering algorithm inputs (e.g., ISR, HOU, WHF, NTG) in each evaluation. See appendix G for more detail.

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 70 summarizes these programs’ key aspects.



Table 70. 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	Downstream/Midstream Mix: Retail locations are the primary channel for HPWHs, and pool pumps are available from trade allies (instant rebates to customers)
		AS/GS Heat pumps, Central ACs, Furnaces	
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, 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

Cost-Effectiveness

In assessing HES program cost-effectiveness, Cadmus analyzed program benefits and costs from five different perspectives, using Cadmus' DSM Portfolio Pro model.⁴⁰ The California Standard Practice Manual for assessing demand-side management (DSM) program cost-effectiveness describes the benefit-cost ratios Cadmus used for the following five tests:

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

Table 71 lists the five tests' components.

⁴⁰ 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 71. 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 72 provides selected cost analysis inputs for each year, including evaluated energy savings, discount rate, line loss, inflation rate, and total program costs. Rocky Mountain Power provided all of these values, except for energy savings and the discount rate, which Cadmus derived from Rocky Mountain Power's 2015 *Integrated Resource Plan*.

Table 72. Selected Cost Analysis Inputs

Input Description	2015	2016	Total
Evaluated Gross Energy Savings (kWh/year) ¹	4,159,654	1,713,902	5,873,557
Discount Rate	6.88%	6.88%	N/A
Line Loss	9.51%	9.51%	N/A
Inflation Rate ²	1.9%	1.9%	N/A
Total Program Costs	\$1,123,582	\$665,237	\$1,788,819

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

²Future retail rates determined using a 1.9% annual escalator.

HES program benefits included energy savings and their associated avoided costs. For the cost-effectiveness analysis, Cadmus used this study's evaluated energy savings and measure lives from sources such as the RTF.⁴¹ For all analyses, Cadmus used avoided costs associated with Rocky Mountain Power's 2015 *IRP Eastside Decrement Values*.⁴²

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

⁴¹ See Appendix G for detailed cost-effectiveness inputs and results at the measure category level.

⁴² 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

Table 73 presents the 2015–2016 program cost-effectiveness analysis results. Table 74 and Table 75 represent these years individually. For both 2015 and 2016, Cadmus found the HES program was not cost-effective from any perspective except the PCT test.

The primary criterion for assessing cost-effectiveness in Wyoming is the TRC, which achieved a 0.73 benefit-cost ratio for the combined years’ net savings. These results include the evaluated NTG.

Table 73. HES Program Cost-Effectiveness Summary for 2015–2016 (Evaluated Net)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.080	\$1,949,012	\$1,570,770	(\$378,243)	0.81
TRC No Adder	\$0.080	\$1,949,012	\$1,427,972	(\$521,040)	0.73
UCT	\$0.072	\$1,747,281	\$1,427,972	(\$319,308)	0.82
RIM		\$4,381,980	\$1,427,972	(\$2,954,007)	0.33
PCT		\$1,614,891	\$5,029,177	\$3,414,287	3.11
Lifecycle Revenue Impacts (\$/kWh)					\$0.000056363
Discounted Participant Payback (years)					1.78

Table 74. HES Program Cost-Effectiveness Summary for 2015 (Evaluated Net)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.078	\$1,282,233	\$1,031,396	(\$250,837)	0.80
TRC No Adder	\$0.078	\$1,282,233	\$937,633	(\$344,600)	0.73
UCT	\$0.068	\$1,123,582	\$937,633	(\$185,949)	0.83
RIM		\$2,876,656	\$937,633	(\$1,939,023)	0.33
PCT		\$1,106,486	\$3,263,978	\$2,157,492	2.95
Lifecycle Revenue Impacts (\$/kWh)					\$0.000036997
Discounted Participant Payback (years)					1.33

Table 75. HES Program Cost-Effectiveness Summary for 2016 (Evaluated Net)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.084	\$711,186	\$575,296	(\$135,891)	0.81
TRC No Adder	\$0.084	\$711,186	\$522,996	(\$188,190)	0.74
UCT	\$0.079	\$665,237	\$522,996	(\$142,241)	0.79
RIM		\$1,605,578	\$522,996	(\$1,082,582)	0.33
PCT		\$542,264	\$1,882,761	\$1,340,497	3.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000021610
Discounted Participant Payback (years)					1.66



Conclusions and Recommendations

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

- **wattsmart Kit Participant Phone Numbers:** As the **wattsmart** 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 the evaluation efforts and on Rocky Mountain Power to update program administrator data with kit participant phone numbers.
 - **Recommendation:** Require that **wattsmart** 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 merchandizing within retail locations. Though decreasing the price of efficient lighting products primarily drives sales, merchandizing 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 merchandizing and product placements. Providing model numbers, store locations, dates, and display types (e.g., end caps, pallet displays) would allow more precise estimates of program-generated sales lift.
- **Trade Ally Support:** A majority of trade allies (seven of ten) reported they were somewhat satisfied with the program overall, one reported very satisfied, one reported not very satisfied, and one did not report a satisfaction level. Four trade allies marketed the program frequently or all the time, while four trade allies said they marketed it seldom, and two said never. These six trade allies that were less than very satisfied and did not aggressively market the program, reported multiple reasons for being less than very satisfied. Three did not fully understand the program, three cited incentives that were too low to justify the additional cost of the more energy-efficient equipment, five did not receive the program support they feel they needed, and two found the application process difficult and time consuming. Only one trade ally reported receiving formal training in the last three years (i.e., program updates such as changes to program incentives, eligible equipment, or application processes). Additionally, trade allies’ supplies of program materials were not replenished in a timely manner when exhausted, and some trade allies did not know program material were available. The program currently supports Wyoming trade allies with periodic visits from an account manager in Utah, who also supports trade allies in Idaho.
 - **Recommendation:** To encourage more engaged trade ally participation and outreach to their customers, the program administrator should consider ways to increase the

frequency of face-to-face contacts with trade allies, renew exhausted program material supplies, improve trade ally training, and support trade allies in the field and respond quickly to their questions.

- **HVAC Equipment Applications:** Trade allies have experienced difficulty understanding which equipment qualifies for the program incentives and with understanding, finding, and supplying information required by the program. Additionally, one trade ally pointed out a program requirement to provide a static pressure value for ductless heat pumps—a test that is designed for split systems and packaged HVAC equipment, not ductless heat pumps.

Program staff only recently (at the end of 2016) finished implementing online applications for most measures, therefore trade ally frustration may be decreasing since completing the evaluation interviews in mid-2017.

- **Recommendation:** Direct the account manager to reach out to trade allies in Wyoming, either in person or via phone, to introduce them to the online application forms, walking them through them and determining if challenges are ongoing. This will serve two purposes: increasing the attention and support that trade allies say they lack, and identifying if underlying issues with the application form remain. With this information, the program staff can determine how best to address such issues.
- **Recommendation:** On the heat pump application, clarify testing requirements for ductless heat pumps by indicating the *Outside Air Temperature (Option I) True Flow Test* applies to ducted heap pumps only.



Appendices

A separate volume contains the following appendices:

Appendix A. Survey and Data Collection Forms

Appendix B. Lighting Impacts

Appendix C. Self-Report NTG Methodology

Appendix D. Nonparticipant Spillover

Appendix E. Measure Category Cost-Effectiveness

Appendix F. Logic Model

Appendix G. Benchmarking

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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/CLEARResult's] QA/QC processes in 2015-2016? [Probe: what are PC/CLEARResults 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?
- Did all five states use the same marketing plan and tactics?
 - How did the messaging differ in the five states?
 - How much of the marketing is **wattsmart** vs program specific (HES)?
 - 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?
- What was the most effective marketing channel? (Why do you say this?)
 - 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 pleased 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 did 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 *wattsmart* Starter Kit Survey

*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, **wattsmart**/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 wattsmart Home Energy Savings starter kit?	A3-A6
Installation of kit measures	How many of each kit item did the customer install? How many items were removed? How many items remain in storage?	B1, B2, B5, B15, B16, B19, C1, C3, C5, D1, 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 wattsmart Home Energy Savings Starter Kit? Are kit recipients familiar with Home Energy Savings program (Home Energy Savings)? Have they received other incentives from wattsmart ?	E5, E6, E7
NTG	What is the freeridership and spillover associated with this program.	B8-B14, B23-B26, C6-C8, 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 **wattsmart** Home Energy Savings starter kit online. Would you be willing to participate in a very quick 5 to 10 minute survey to talk about the kit?
1. Yes
 2. No **[THANK AND TERMINATE]**
 98. Don't know **["IS THERE SOMEONE ELSE THAT WOULD BE ABLE TO ANSWER?" IF YES, START AGAIN, IF NO, THANK AND TERMINATE]**
 99. Refused **[THANK AND TERMINATE]**

RESPONSES TO CUSTOMER QUESTIONS [IF NEEDED]

(Timing: This survey should take about 5-10 minutes of your time. Is this a good time for us to speak with you?)

(WHO ARE YOU WITH: I'M WITH [INSERT SURVEY FIRM], AN INDEPENDENT RESEARCH FIRM THAT HAS BEEN HIRED BY [INSERT UTILITY] TO CONDUCT THIS RESEARCH. I AM CALLING TO LEARN ABOUT THE wattsmart Home Energy Savings STARTER KIT THAT YOU RECEIVED FROM [INSERT UTILITY])

(Sales concern: I am not selling anything; we would simply like to learn about the **wattsmart** Home Energy Savings **STARTER** kit you received and hear your feedback on the items included. Your responses will be kept confidential. If you would like to talk with someone from the Home Energy Savings Program



about this study, feel free to call 1-800-942-0266, or visit their website:

[http://www.homeenergysavings.net/.](http://www.homeenergysavings.net/))

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

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

- A1. Have you, or anyone in your household, ever been employed by or affiliated with **[INSERT UTILITY]** or any of its affiliates?
 - 1. Yes **[THANK AND TERMINATE]**
 - 2. No **[CONTINUE]**
 - 98. Don't Know **[THANK AND TERMINATE]**
 - 99. Refused **[THANK AND TERMINATE]**

- A2. Thank you. To confirm, did you receive a kit containing energy-saving items from **[INSERT UTILITY]** by mail?
 - 1. Yes **[SKIP TO A5]**
 - 2. No **[CONTINUE TO A3]**
 - 98. Don't know **["THE WATTSMART HOME ENERGY SAVINGS STARTER KIT WAS A BOX THAT CONTAINED ENERGY EFFICIENT HOUSEHOLD ITEMS THAT WAS MAILED TO YOU BY [INSERT UTILITY]. IT CONTAINED FOUR CFLS OR LED LIGHT BULBS AND ALSO MAY HAVE CONTAINED FAUCET AERATORS AND HIGH-EFFICIENT SHOWERHEADS. DO YOU RECALL WHETHER YOUR HOUSEHOLD RECEIVED ONE OR MORE OF THESE KITS?" IF YES, ADJUST RESPONSE AND SKIP TO A5, IF NO, SKIP TO A4]**

- A3. Did you or a member of your household request a **wattsmart** Home Energy Savings Starter Kit?
 - 1. Yes **["WE APPOLOGIZE THAT YOU DID NOT RECEIVE YOUR REQUESTED KIT. WOULD YOU LIKE US TO NOTIFY [INSERT UTILITY] ON YOUR BEHALF?" IF YES, ASK FOR NAME AND PHONE NUMBER, THANK AND TERMINATE]**
 - 2. No **[THANK AND TERMINATE]**
 - 98. Don't know **[THANK AND TERMINATE]**

- A4. Is there anyone else in your household who would recall if you received a **wattsmart** Home Energy Savings starter kit from **[INSERT UTILITY]**?
 - 1. Yes **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN, IF UNAVAILABLE, UPDATE SAMPLE LIST WITH NEW CONTACT AND CALL BACK ANOTHER TIME]**
 - 2. No **[THANK AND TERMINATE]**
 - 98. Don't know **[THANK AND TERMINATE]**
 - 99. Refused **[THANK AND TERMINATE]**

- A5. **[ASK ONLY IF KIT TYPE = 7 OR 8, OTHERWISE SKIP TO A6]** My records show that you received a **wattsmart** Home Energy Savings Starter Kit that contained **[IF KIT TYPE = 7, “FOUR CFL LIGHT BULBS”, IF KIT TYPE = 8, “FOUR LED LIGHT BULBS”]**, is that correct?
1. Yes
 2. No **[ASK: WHAT DID YOU RECEIVE IN YOUR KIT?]**
 - A5a. (Specify _____) **[ADJUST QUANTITY OF MEASURES AND KIT TYPE AS APPROPRIATE]**
 98. Don't know **[THANK AND TERMINATE]**
 99. Refused **[THANK AND TERMINATE]**
- A6. **[ASK ONLY IF KIT TYPE = 1-6]** My records show that you received a **wattsmart** Home Energy Savings Starter Kit that contained several items such as energy efficient light bulbs, faucet aerators and showerheads. I'd like to confirm the number of each item that you received in your kit. I will read the quantity of each item, please confirm if they are correct. My records show that you received **[READ A-D AND USE RESPONSE OPTIONS BELOW FOR EACH]:**
- A6a. **[IF KIT TYPE = 1-4, “FOUR CFL LIGHT BULBS”, IF KIT TYPE = 5 OR 6, “FOUR LED LIGHT BULBS”]**
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 **wattsmart** Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)]**
1. Very Satisfied
 2. Somewhat Satisfied
 3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
 4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
 5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
 98. Don't Know
 99. Refused
- B8. Before you signed up for the kit, did you already have CFLs installed in your home?
1. (Yes)
 2. (No)
 98. (DON'T KNOW)
 99. (REFUSED)
- B9. **[ASK IF B8 = 1]** How many CFLs were you using in your home at the time you signed up for the kit?
1. (# of Bulbs): _____
 98. (DON'T KNOW)
 99. (REFUSED)



B10. At the time you signed up for the kit, were you already planning to purchase CFLs?

- 1. (Yes)
- 2. (No)
- 3. (No, I already had them installed in all available sockets)
- 98. (DON'T KNOW)
- 99. (REFUSED)

B11. **[ASK IF B10 = 1]** In terms of timing, when would you have purchased the CFLs?

- 1. (Around the same time I received the kit)
- 2. (Later but within the same year)
- 3. (In one year or more)
- 98. (Don't know)
- 99. (REFUSED)

B12. **[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 **wattsmart** Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)] [RECORD FIRST RESPONSE ONLY]**
1. Very Easy
 2. Somewhat Easy
 3. Not Very Easy **[PROBE FOR REASON AND RECORD]**
 4. Not At All Easy **[PROBE FOR REASON AND RECORD]**
 5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused
- E2. **AFTER YOU SUBMITTED THE REQUEST FOR THE wattsmart** Home Energy Savings Starter Kit **HOW LONG DID IT TAKE TO RECEIVE THE KIT FROM [INSERT UTILITY]? PLEASE CHOOSE FROM ONE OF THESE OPTIONS: [READ CATEGORIES IF NEEDED, RECORD ONLY FIRST RESPONSE]**
1. Less than 4 weeks
 2. Between 4 and 8 weeks
 3. More than 8 weeks
 98. **[DO NOT READ]** Don't Know **[SKIP TO E4]**
 99. **[DO NOT READ]** Refused **[SKIP TO E4]**

E3. Were you satisfied with how long it took to receive the **wattsmart** Home Energy Savings Starter Kit?

1. Yes
2. No **[PROBE FOR REASON AND RECORD]**
98. Don't Know
99. Refused

E4. Overall, how satisfied are you with your **wattsmart** Home Energy Savings Starter Kit? **[IF NEEDED: PLEASE CHOOSE FROM ONE OF THESE OPTIONS (READ RESPONSES)] [READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

1. Very Satisfied
2. Somewhat Satisfied
3. Not Very Satisfied
4. Not At All Satisfied
5. **[OPEN RESPONSE IF PARTICIPANT DOES NOT PROVIDE DIRECT ANSWER]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

E5. How did you first hear about **[INSERT UTILITY]'s wattsmart** Home Energy Savings Starter Kits? **[DO NOT PROMPT. RECORD ONLY THE FIRST WAY HEARD ABOUT THE PROGRAM]**

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



- E6. **[INSERT UTILITY]** also provides incentives for high-efficiency home equipment and upgrades such as appliances and insulation through the **wattsmart** Home Energy Savings program. Before today, were you aware of these offerings?
1. Yes
 2. No **[SKIP TO E8]**
 98. Don't Know **[SKIP TO E8]**
 99. Refused **[SKIP TO E8]**
- E7. Have you ever received an incentive from **[INSERT UTILITY]**'s **wattsmart** Home Energy Savings program?
1. Yes **[“WHAT DID YOU RECEIVE AN INCENTIVE FOR?” RECORD]**
 2. No
 98. Don't Know
 99. Refused
- E8. **[INSERT UTILITY]** also provides a Home Energy Reports Web portal to provide you with detailed information about your home's energy use and help you discover ways to save money. Before today, were you aware of this offering?
1. Yes
 2. No **[SKIP TO E10]**
 98. Don't Know **[SKIP TO E10]**
 99. Refused **[SKIP TO E10]**
- E9. Have you ever participated in the Home Energy Reports web portal?
1. Yes
 2. No
 98. Don't Know
 99. Refused
- E10. Please think back to the time when you were deciding to apply for the **wattsmart** Home Energy Savings Starter Kit. What were the reasons why you decided to request the kit? **[DO NOT READ. INDICATE ALL THAT APPLY. ONCE THEY RESPONDENT HAS FINISHED, SAY: “ARE THERE ANY OTHER FACTORS?”]**
1. Household bulbs had burned out
 2. Low on storage of household bulbs
 3. Did not have any CFLs or LEDs in my home prior
 4. Was interested in emerging technology
 5. The kit was free
 6. Wanted to save energy
 7. Wanted to reduce energy costs

8. Environmental concerns
9. Recommendation from friend, family member, or colleague
10. Advertisement in newspaper [PROBE: "FOR WHAT PROGRAM?" RECORD]
11. Radio advertisement [PROBE: "FOR WHAT PROGRAM?" RECORD]
12. Health or medical reasons
13. Maintain or increase comfort of home
14. Influenced by the Home Energy Reports the customer receives
15. Influenced by the **wattsmart** Home Energy Savings Program
16. Other [RECORD]
98. Don't Know
99. Refused

F. Spillover

F1. Since receiving the **wattsmart** Home Energy Savings Starter Kit have you added any other energy efficient equipment or services in your home that were not incentivized through the **wattsmart** Home Energy Savings Program?

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

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

F2. What high-efficiency energy-saving equipment or services have you purchased since 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 **wattsmart** Home Energy Savings program was in your decision to add the [INSERT MEASURE FROM F2] to your home? Please choose from one of these options:

[REPEAT FOR EACH MEASURE LISTED IN F2]

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

G. Household Characteristics

Before we conclude the survey, I have a few more questions regarding some information about your household. Please be advised that responses to these questions will be kept strictly confidential and you may opt to refuse to answer any proceeding question.

- G1. What is the fuel used by your primary water heater?
1. Electric
 2. Natural Gas [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.

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 UTILITY]** sponsored discount?

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

C3. **[ASK IF C2= 1, OTHERWISE SKIP TO C4]** Did the **[INSERT UTILITY]** 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 UTILITY]** sponsored sale?
1. Yes
 2. No
 98. Don't Know
 99. Refused
- D8. **[ASK IF D7= 1, OTHERWISE SKIP TO D9]** Did the **[INSERT UTILITY]** 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 “**wattsmart** 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 most recently hear about **[INSERT UTILITY]'s wattsmart** Home Energy Savings program? **[DO NOT READ LIST. RECORD FIRST RESPONSE. ONE ANSWER ONLY]**
- 1. Newspaper/Magazine/Print Media
 - 2. Paper or Electronic Bill Inserts
 - 3. Rocky Mountain Power/Pacific Power website
 - 4. **wattsmart** 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 **wattsmart** Home Energy Savings Website?

- 1. Yes
- 2. No

E5. [ASK ONLY IF E4=1] How often do you visit the **wattsmart** 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 **wattsmart** 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) ENERGY 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.



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 wattsmart website (feedback)? Why did the customer purchase the program measure?	Section Error! Reference source not found.
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 Error! Reference source not found.
Net-to-Gross	Self-reported freeridership and spillover batteries	Section Error! Reference source not found. and Error! Reference source not found.
Demographics	Customer household information for statistical purposes	Section Error! Reference source not found.

- 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 WATTSMAST HOME ENERGY SAVINGS PROGRAM. [IF NEEDED] YOU MAY HAVE RECEIVED OTHER EQUIPMENT OR BENEFITS THROUGH [INSERT UTILITY]'S WATTSMAST 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 WATTSMAST HOME ENERGY SAVINGS PROGRAM ABOUT THIS STUDY, FEEL FREE TO CALL 1-800-942-0266, OR VISIT THEIR WEBSITE:

<http://www.homeenergysavings.net>

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

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

A2. Our records show that in **[INSERT YEAR]** your household received an incentive from **[INSERT UTILITY]** for purchasing **[IF QUANTITY =1; "A OR AN"] [INSERT MEASURE NAME]** through the

wattsmart Home Energy Savings program. We're talking with customers about their experiences with the incentive program. Are you the best person to talk with about this?

1. Yes
2. No, not available [SCHEDULE CALLBACK]
3. No, no such person [THANK AND TERMINATE]
98. Don't Know [TRY TO REACH RIGHT PERSON; OTHERWISE TERMINATE]
99. Refused [THANK AND TERMINATE]

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

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

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

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

B. Measure Verification

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



[FOR SECTION B “MEASURE VERIFICATION”, FOLLOW THE RULES BELOW TO DETERMINE WHICH QUESTIONS TO ASK BEFORE CONTINUING TO SECTION C:

IF MEASURE TYPE = SEALING OR SERVICE SKIP TO B7 AND ASK QUESTIONS B7 TO B8;

IF MEASURE TYPE = INSULATION OR WINDOWS SKIP TO B9 AND ASK QUESTIONS B9 TO B14;

ALL REMAINING MEASURE TYPES, CONTINUE TO B1 AND ASK QUESTIONS B1 TO B6]

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

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

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

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

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

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

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

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

1. Yes **[SKIP TO 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 **wattsmart** Home Energy Savings program? **[DO NOT PROMPT. RECORD ONLY THE FIRST WAY HEARD ABOUT THE PROGRAM.]**

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

C2. **[ASK IF E5 < 13 OR 17, OTHERWISE SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]** Have you been to the **[INSERT UTILITY]** **wattsmart** Home Energy Savings program website? **[DO NOT READ RESPONSES]**

1. Yes
2. No

C3. **[ASK IF E5 = 13 OR 17, OR IF ERROR! REFERENCE SOURCE NOT FOUND. = 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 ERROR! REFERENCE SOURCE NOT FOUND.= 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 ERROR! REFERENCE SOURCE NOT FOUND.]**
2. LESS THAN 25%
3. 25-50%
4. 50-75%
5. 75- 99%
6. Always or 100%
98. Don't know **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
99. Refused **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**

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 ERROR! REFERENCE SOURCE NOT FOUND. or heating/cooling skip to D20]



D10. What type of heating system do you primarily use... **[READ]**

1. Furnace
2. Boiler
3. Air Source Heat Pump
4. Ground Source Heat Pump
5. Ductless Heat Pump
6. Stove
7. Baseboard
8. No heating system **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
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] [UTILITY]** 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 **[SPECIFY]**
- 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 ERROR! REFERENCE SOURCE NOT FOUND. 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 ERROR! REFERENCE SOURCE NOT FOUND. = 3 OR 4]** Why were you not satisfied with the contractor that installed the **[INSERT MEASURE](S)**?

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

E5. How easy did you find filling out the **wattsmart** Home Energy Savings Program incentive application? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

- 1. Very Easy
- 2. Somewhat Easy
- 3. Not Very Easy **[PROBE FOR REASON AND RECORD]**
- 4. Not At All Easy **[PROBE FOR REASON AND RECORD]**
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** Refused

E6. How satisfied were you with the amount of the incentive you received for the **[INSERT MEASURE](S)**?

- 1. Very Satisfied
- 2. Somewhat Satisfied
- 3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
- 4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
- 98. Don't Know
- 99. Refused

E7. **AFTER YOU SUBMITTED THE INCENTIVE APPLICATION FOR THE [INSERT MEASURE](S), HOW LONG DID IT TAKE TO RECEIVE THE INCENTIVE CHECK FROM [INSERT UTILITY]? WAS IT...** **[READ CATEGORIES IF NEEDED, RECORD ONLY FIRST RESPONSE]**

- 1. Less than 4 weeks
- 2. Between 4 and 6 weeks
- 3. Between 7 and 8 weeks
- 4. More than 8 weeks
- 5. Have not received the incentive yet
- 98. **[DO NOT READ]** Don't Know **[SKIP TO E9]**
- 99. **[DO NOT READ]** Refused **[SKIP TO E9]**



E8. **[ASK IF E7<> 5]** Were you satisfied with how long it took to receive the incentive?

- 1. Yes
- 2. No **[PROBE FOR REASON AND RECORD]**
- 98. Don't Know
- 99. Refused

E9. How satisfied were you with the entire application process?

- 1. Very Satisfied
- 2. Somewhat Satisfied
- 3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
- 4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**

E10. Overall, how satisfied are you with the **wattsmart** Home Energy Savings program? **[READ CATEGORIES; RECORD ONLY FIRST RESPONSE]**

- 1. Very Satisfied **[PROBE FOR REASON AND RECORD]**
- 2. Somewhat Satisfied **[PROBE FOR REASON AND RECORD]**
- 3. Not Very Satisfied **[PROBE FOR REASON AND RECORD]**
- 4. Not At All Satisfied **[PROBE FOR REASON AND RECORD]**
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** Refused

E11. Did your participation in **[INSERT UTILITY]'s wattsmart** Home Energy Savings Program cause your satisfaction with **[INSERT UTILITY]** to...

- 1. Increase
- 2. Stay the same
- 3. Decrease
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** Refused

F. Freeridership

Now I'd like to talk with you a little more about the **[INSERT MEASURE](S)** you purchased.

F1. When you first heard about the incentive from **[INSERT UTILITY]**, had you already been planning to purchase the **[INSERT MEASURE](S)**?

- 1. Yes
- 2. No **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**

- 98. Don't Know *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*
- 99. Refused *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*

F2. Ok. Had you already purchased or installed the new *[INSERT MEASURE](S)* before you learned about the incentive from the **wattsmart** Program?

- 1. Yes
- 2. No *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*
- 98. Don't Know *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*
- 99. Refused *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*

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 ERROR! REFERENCE SOURCE NOT FOUND.]*
- 2. No
- 98. Don't Know
- 99. Refused

[IF F3= 1 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]

F4. Would you have purchased the same *[INSERT MEASURE](S)* without the incentive from the **wattsmart** Home Energy Savings program?

- 1. Yes *[SKIP TO F6]*
- 2. No
- 98. Don't Know
- 99. Refused

[IF ERROR! REFERENCE SOURCE NOT FOUND. = 1 THEN SKIP TO F6]

F5. *[ASK IF ERROR! REFERENCE SOURCE NOT FOUND. = 2, -98 OR -99]* Help me understand, would you have purchased something without the **wattsmart** Home Energy Savings program incentive? **[DO NOT READ RESPONSES]**

- 1. Yes, I would have purchased something
- 2. No, I would not have purchased anything *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*
- 98. Don't Know *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*
- 99. Refused *[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]*

[IF F5 = 2 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.. IF F5 = -98 OR -99 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]



F6. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.= 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 ERROR! REFERENCE SOURCE NOT FOUND.= 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 ERROR! REFERENCE SOURCE NOT FOUND.= 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 ERROR! REFERENCE SOURCE NOT FOUND.]

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)** at all?

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

[IF ERROR! REFERENCE SOURCE NOT FOUND. = 1 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]

- F10. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND. = 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 ERROR! REFERENCE SOURCE NOT FOUND.= 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 ERROR! REFERENCE SOURCE NOT FOUND. = 2, -98, -99]** And, would you have purchased the **[INSERT MEASURE](S)... [READ]**
1. At the same time
 2. Within one years?
 3. In more than one year?
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused
- F13. In your own words, please tell me the influence the Home Energy Saving incentive had on your decision to purchase **[INSERT MEASURE](S)?**
1. _____ **[RECORD RESPONSE]**

G. Spillover

- G1. Since participating in the program, have you added any other energy efficient equipment or services in your home that were not incentivized through the **wattsmart** Home Energy Savings Program?
1. Yes
 2. No
 98. Don't Know
 99. Refused

[IF 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.

PacifiCorp Home Energy Savings Downstream Lighting Participant Survey

Audience: This survey is designed for PacifiCorp residential customers in Utah and Wyoming that received a rebate for the purchase of one or more lighting fixtures in 2015 and 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.

Note that a light fixture is not the same as a light bulb. Light fixture refers to the body and the light socket that hold the lamp/light bulb (s) and allow for its/their replacement. The fixtures rebated through the program are designed to work specifically with energy efficient CFLs or LED light bulbs. Aside from the program-incented downlights or ceiling cans, which were sold without the bulb, the other incented fixtures came with integrated energy efficient bulbs. Some participants purchased both LED and CFL light fixtures but we are asking about only one kind or the other in this survey.

Quota: Aim for the survey quota listed below for UT and WY

	Lighting
	Sample (survey quota)
UT	1080 (70)
WY	160 (as many as possible)

Topics	Researchable Questions	Survey Questions
Measure Verification	Did program measure(s) get installed in the household? What was replaced when the new measure was installed?	Section B
Program Awareness and Purchase Decisions	How did the customer learn about the program? Has the customer been to the wattsmart website (feedback)? Why did the customer purchase the program measure?	Section Error! Reference source not found.
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 Error! Reference source not found.
Net-to-Gross	Self-reported freeridership and spillover batteries	Section Error! Reference source not found. and Error! Reference source not found.
Demographics	Customer household information for statistical purposes	Section Error! Reference source not found.

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

[UTILITY]

Utah, Wyoming: Rocky Mountain Power

[MEASURE]

[YEAR OF PARTICIPATION]

[MEASURE QUANTITY]

Measure Name	Measure Type
LED Light Fixture	LIGHT FIXTURE
CFL Light Fixture	LIGHT FIXTURE

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 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 YOUR EXPERIENCES WITH THE [INSERT MEASURE NAME] INCENTIVE 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 NAME] INCENTIVE 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 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 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.)

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](S)** through the wattsmart Home Energy Savings program. We're talking with customers about their experiences with the incentive program. Are you the best person to talk with about this?

A2. **[IF NEEDED: LIGHT FIXTURE REFERS TO THE BODY AND THE LIGHT SOCKET THAT HOLD THE LIGHT BULB AND ALLOW FOR ITS REPLACEMENT. THE FIXTURES REBATED THROUGH THE WATTSMART HOME ENERGY SAVINGS PROGRAM WERE DESIGNED TO WORK SPECIFICALLY WITH ENERGY EFFICIENT CFLS OR LED LIGHT BULBS.]**

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 NAME](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.

- 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 NAME](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 [INSERT MEASURE NAME] PURCHASED DURING THE YEAR MENTIONED."]

[IF NEEDED SAY: "THE LIGHT FIXTURE INCENTIVE WAS FOR DOWNLIGHTS OR CEILING CAN LIGHTS, CANDELABRA, GLOBE, OR OMNIDIRECTIONAL LIGHT FIXTURES THAT WERE SPECIFICALLY DESIGNED TO WORK WITH ENERGY EFFICIENT CFLS OR LED BULBS."]

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 B4]**
 5. No, year is incorrect **[SKIP TO B5]**
 98. Don't Know **[TERMINATE]**
 99. Refused **[TERMINATE]**
- B2. **[ASK IF B1 = 2]** For how many **[INSERT MEASURE NAME](S)** did you apply for an incentive ? **[NUMERIC OPEN ENDED. DOCUMENT AND USE AS QUANTITY FOR REMAINDER OF SURVEY]**
1. **[RECORD 0-200] [IF QUANTITY IS ZERO THANK AND TERMINATE OTHERWISE, SET MEASURE QUANTITY AS B2.1 SKIP TO B7]**
 98. Don't Know **[THANK AND TERMINATE]**
 99. Refused **[THANK AND TERMINATE]**
- B3. **[ASK IF B1 = 3]** Please tell me for what type of equipment you applied for an incentive in **[YEAR OF PARTICIPATION]**?
1. CFL Light Fixture **[SET [NEW MEASURE NAME] AS 'CFL LIGHT FIXTURE' AND SKIP TO B6 AND INSERT [NEW MEASURE NAME], USE [NEW MEASURE NAME] FOR THE REMAINDER OF THE SURVEY]**
 2. LED Light Fixture **[SET [NEW MEASURE NAME] AS 'LED LIGHT FIXTURE' AND SKIP TO B6 AND INSERT [NEW MEASURE NAME], USE [NEW MEASURE NAME] FOR THE REMAINDER OF THE SURVEY]**
 3. Other **[THANK AND TERMINATE]**
 4. Don't Know **[THANK AND TERMINATE]**
 99. Refused **[THANK AND TERMINATE]**



B4. **[ASK IF B1 = 4]** Please tell me for what type of equipment you applied for an incentive:

- 1. CFL Light Fixture **[SET [NEW MEASURE NAME] AS 'CFL LIGHT FIXTURE' AND ASK B4A]**
 - B4a. For how many **[NEW MEASURE NAME]** did you apply for an incentive?

[RECORD 0 - 200] [SET AS [NEW MEASURE QUANTITY] IF MEASURE QUANTITY = 0 THANK AND TERMINATE OTHERWISE SKIP TO B6 AND INSERT [NEW MEASURE NAME] AND [NEW MEASURE QUANTITY], USE FOR THE REMAINDER OF THE SURVEY]

Don't Know **[THANK AND TERMINATE]**

- 2. LED Light Fixture **[SET [NEW MEASURE NAME] AS 'LED LIGHT FIXTURE' AND ASK B4B]**
 - B4b. For how many **[NEW MEASURE NAME]** did you apply for an incentive?

[RECORD 0 - 200] [SET AS [NEW MEASURE QUANTITY] IF MEASURE QUANTITY = 0 THANK AND TERMINATE OTHERWISE SKIP TO B6 AND INSERT [NEW MEASURE NAME] AND [NEW MEASURE QUANTITY], USE FOR THE REMAINDER OF SURVEY]

Don't Know **[THANK AND TERMINATE]**

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

B5. **[ASK IF B1= 5]** What year did you apply for the incentive?

- 1. 2015 **[SET [NEW YEAR OF PARTICIPATION] AS '2015' AND ASK B6 AND INSERT [NEW YEAR OF PARTICIPATION], USE FOR THE REMAINDER OF THE SURVEY]**
- 2. 2016 **[SET [NEW YEAR OF PARTICIPATION] AS '2016' AND ASK B6 AND INSERT [NEW YEAR OF PARTICIPATION], USE FOR THE REMAINDER OF THE SURVEY]**
- 3. Other **[THANK AND TERMINATE]**
- 98. Don't Know **[THANK AND TERMINATE]**
- 99. Refused **[THANK AND TERMINATE]**

B6. Just to confirm, you applied for an incentive for [MEASURE QUANTITY/NEW MEASURE QUANTITY] [MEASURE NAME/NEW MEASURE NAME] in [YEAR OF PARTICIPATION/NEW YEAR OF PARTICIPATION] is that correct?

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

- B7. **DID [IF MEASURE QUANTITY >1 SAY "ALL OF"] the [INSERT MEASURE NAME](S) get installed? [DO NOT READ RESPONSES]**
1. Yes **[SET MEASURE QUANTITY AS INSTALLED QUANTITY AND SKIP TO B10]**
 2. No **[CONTINUE TO B5]**
 98. Don't know **[SKIP TO B10]**
 99. Refused **[SKIP TO B10]**
- [ASK B5 IF B4 = 2 AND MEASURE QUANTITY > 1 OTHERWISE SKIP TO B6]**
- B8. **HOW MANY [INSERT MEASURE NAME](S) got installed?**
1. **[RECORD 0-200] [SET B8.1 AS INSTALLED QUANTITY AND CONTINUE TO B6]**
 98. Don't Know **[CONTINUE TO B6]**
 99. Refused **[CONTINUE TO B6]**
- B9. **[ASK IF B4 = 2] Why haven't you installed [IF MEASURE QUANTITY >1 SAY "ALL OF"] the [INSERT MEASURE NAME](S) [MULTIPLE RESPONSE UP TO 3; DO NOT READ]**
1. Failed or broken unit
 2. Because did not like it
 3. Have not had time to install it yet
 4. In-storage
 5. Back up equipment to install when other equipment fails
 6. Have not hired a contractor to install it yet
 7. Purchased more than was needed
 8. Other **[RECORD]**
 98. Don't Know
 99. Refused
- B10. **[ASK IF B4=1 OR B8.1>0] Was/were [IF INSTALLED MEASURE QUANTITY >1 SAY "ALL OF"] the [INSERT MEASURE NAME](S), INSTALLED IN THE HOME THAT YOU RESIDE IN?**
1. **YES**
 2. **NO [PROBE: "WHERE WERE THEY INSTALLED?" RECORD RESPONSE VERBATIM]**
 98. Don't know
 99. Refused



- B11. Were any of the **[INSERT MEASURE NAME]** that you received an incentive for, recessed ceiling can light fixtures? **[IF NEEDED: A RECESSED CEILING CAN LIGHT FIXTURE REPLACES THE ENTIRE CAN, NOT JUST THE BULB THAT WAS PREVIOUSLY INSTALLED IN THE CAN.]**
1. Yes
 2. No
 98. Don't Know
 99. Refused
- B12. Were any of the **[INSERT MEASURE NAME](S)** that you received an incentive for, intended to replace **[AN]** old light fixture(s)?
1. Yes **[CONTINUE TO B13]**
 2. No **[SKIP TO E5]**
 98. Don't Know **[SKIP TO E5]**
 99. Refused **[SKIP TO E5]**
- B13. **[ASK IF B11=1]** What kind of light bulb(s) did your new recessed ceiling 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 floodlight bulbs **[IF NEEDED: THIS IS A BULB THAT POINTS LIGHT IN ONE DIRECTION]**
 3. Both standard shaped bulbs and reflector/floodlight bulbs
 4. No light bulbs were replaced **[I.E. THERE DID NOT USE TO BE A LIGHT BULB WHERE I INSTALLED THE RECESSED CEILING OR CAN LIGHT FIXTURE]**
 5. **[DO NOT READ]** Other **[SPECIFY]**
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused
- B14. **[ASK IF B12 = 1]** What did you do with the old light fixture(s) **AFTER YOU GOT YOUR NEW [INSERT MEASURE NAME](S)? [READ CATEGORIES IF NEEDED]**
1. Still in home they were originally installed in, but permanently removed and stored
 2. Sold or gave it/them away
 3. Recycled it/them
 4. Installed it/them in another location/home
 5. Threw it/them away
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused

C. Program Awareness & Purchase Decisions

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

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

C2. **[ASK IF E5 < 13 OR 17, OTHERWISE SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]** Have you been to the **[INSERT UTILITY]** wattsmart Home Energy Savings program website? **[DO NOT READ RESPONSES]**

1. Yes
2. No

C3. **[ASK IF E5 = 13 OR 17, OR IF ERROR! REFERENCE SOURCE NOT FOUND. = 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 ERROR! REFERENCE SOURCE NOT FOUND.= 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 light fixture(s). What factors motivated you to purchase the **[INSERT MEASURE NAME](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 DEALER/RETAILER?" 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. Satisfaction

D1. Overall, how satisfied are you with your **[INSERT MEASURE NAME](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

D2. **DID A CONTRACTOR INSTALL THE [INSERT MEASURE NAME](S) FOR YOU?**

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

D3. **[ASK IF E2=1] HOW SATISFIED WERE YOU WITH THE CONTRACTOR THAT INSTALLED THE [INSERT MEASURE NAME](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

D4. **[IF ERROR! REFERENCE SOURCE NOT FOUND. = 3 OR 4]** Why were you not satisfied with the contractor that installed the **[INSERT MEASURE NAME](S)**?

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



D5. How easy did you find filling out the wattsmart Home Energy Savings Program incentive application? **[READ CATEGORIES; RECORD FIRST RESPONSE ONLY]**

- 1. Very Easy
- 2. Somewhat Easy
- 3. Not Very Easy **[PROBE: WHY DO YOU SAY THAT?]**
- 4. Not At All Easy **[PROBE: WHY DO YOU SAY THAT?]**
- 5. Did not fill out an application
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** Refused

D6. How satisfied were you with the amount of the incentive you received for the **[INSERT MEASURE NAME](S)**?

- 1. Very Satisfied
- 2. Somewhat Satisfied
- 3. Not Very Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
- 4. Not At All Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
- 98. Don't Know
- 99. Refused

D7. **[ASK IF D5<>5] 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
- 6. Did not fill out an application
- 98. **[DO NOT READ]** Don't Know **[SKIP TO E9]**
- 99. **[DO NOT READ]** Refused **[SKIP TO E9]**

D8. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.<> 5 OR D7<> 5]** Were you satisfied with how long it took to receive the incentive?

- 1. Yes
- 2. No **[PROBE: WHY DO YOU SAY THAT?]**
- 98. Don't Know
- 99. Refused

- D9. **[ASK IF D5<>5 OR D7<>6]** How satisfied were you with the entire application process?
1. Very Satisfied
 2. Somewhat Satisfied
 3. Not Very Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
 4. Not At All Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
- D10. Overall, how satisfied are you with the wattsmart Home Energy Savings program? **[READ CATEGORIES; RECORD ONLY FIRST RESPONSE]**
1. Very Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
 2. Somewhat Satisfied **[PROBE : WHY DO YOU SAY THAT?]**
 3. Not Very Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
 4. Not At All Satisfied **[PROBE: WHY DO YOU SAY THAT?]**
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused
- D11. Did your participation in **[INSERT UTILITY]**'s wattsmart Home Energy Savings Program cause your satisfaction with **[INSERT UTILITY]** to...
1. Increase
 2. Stay the same
 3. Decrease
 98. **[DO NOT READ]** Don't Know
 99. **[DO NOT READ]** Refused

E. Freeridership

Now I'd like to talk with you a little more about the **[INSERT MEASURE NAME](S)** you purchased.

- E1. When you first heard about the incentive from **[INSERT UTILITY]**, had you already been planning to purchase the **[INSERT MEASURE NAME](S)**?
1. Yes
 2. No **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
 98. Don't Know **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
 99. Refused **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**



E2. Ok. Had you already purchased or installed the new **[INSERT MEASURE NAME](S)** before you learned about the incentive from the wattsmart Program?

- 1. Yes
- 2. No **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
- 98. Don't Know **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
- 99. Refused **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**

E3. Just to confirm, you learned about the **[INSERT UTILITY]** rebate program after you had already purchased or installed the **[INSERT MEASURE NAME](S)**?

- 1. Yes **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
- 2. No
- 98. Don't Know
- 99. Refused

[IF F3= 1 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]

E4. Would you have purchased the same light fixture (S) without the incentive from the wattsmart Home Energy Savings program?

- 1. Yes **[SKIP TO F6]**
- 2. No
- 98. Don't Know
- 99. Refused

[IF ERROR! REFERENCE SOURCE NOT FOUND. = 1 THEN SKIP TO F6]

E5. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND. = 2, 98 OR 99]** Help me understand, would you have purchased something without the wattsmart Home Energy Savings program incentive? **[DO NOT READ RESPONSES]**

- 1. Yes, I would have purchased something
- 2. No, I would not have purchased anything **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
- 98. Don't Know **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**
- 99. Refused **[SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]**

[IF F5 = 2 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.. IF F5 = 98 OR 99 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]

- E6. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.= 1 OR F5 = 1]** Let me make sure I understand. When you say you would have purchased **[A]** light fixture (s) without the program incentive, would you have purchased a CFL or LED light fixture ?
1. Yes
 2. No
 98. Don't Know
 99. Refused
- E7. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.= 1 OR F5 = 1 AND MEASURE QUANTITY >1]** Without the program incentive would you have purchased the same amount of light fixtures?
1. Yes, I would have purchased the same amount
 2. No, I would have purchased less
 98. Don't Know
 99. Refused
- E8. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.= 1 OR F5 = 1]** Without the program incentive would you have purchased the light fixture(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 ERROR! REFERENCE SOURCE NOT FOUND.]**
- E9. **[ASK IF F5=2]** To confirm, when you say you would not have purchased the same light fixture without the program incentive, do you mean you would not have purchased the light fixtures at all?
1. Yes
 2. No
 98. Don't Know
 99. Refused

[IF ERROR! REFERENCE SOURCE NOT FOUND. = 1 SKIP TO ERROR! REFERENCE SOURCE NOT FOUND.]



- E10. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND. = 2, 98, 99]** Again, help me understand. Without the program incentive, would you have purchased the same type of light fixture(s) but a light fixture that was not designed specifically to work with CFLs or LED light bulbs?
1. Yes
 2. No
 98. Don't Know
 99. Refused
- E11. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND.= 2,98, 99 AND QTY MEASURE>1]** Without the program incentive would you have purchased the same amount of light fixtures?
1. Yes, I would purchase the same amount
 2. No, I would have purchased less
 98. Don't Know
 99. Refused
- E12. **[ASK IF ERROR! REFERENCE SOURCE NOT FOUND. = 2, 98, 99]** And, would you have purchased the light fixtures... **[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
- E13. In your own words, please tell me the influence the Home Energy Saving incentive had on your decision to purchase **[INSERT MEASURE NAME](S)?**
1. _____ **[RECORD RESPONSE]**

F. Spillover

- F1. Since participating in the program, have you added any other energy efficient equipment or services in your home that were not incentivized through the wattsmart Home Energy Savings Program?
1. Yes
 2. No
 98. Don't Know
 99. Refused

[IF F1 = 2, 98 OR 99 SKIP TO H1]

F2. What high-efficiency energy-saving equipment or services have you purchased since applying for the incentive, not including the **[INSERT MEASURE NAME]** that we have been discussing today? **[READ LIST]** .

PROMPT: WE ARE ONLY INTERESTED IN HIGH –EFFICIENCY ENERGY-SAVING EQUIPMENT OR SERVICES

[READ 1-18 BEFORE ENTERING 19, 98, OR 99]

1. Clothes Washer: **RECORD QUANTITY [NUMERIC]**
2. Refrigerator: **RECORD QUANTITY [NUMERIC]**
3. [Dishwasher](#): **RECORD QUANTITY [NUMERIC]**
4. Windows: **RECORD NUMBER OF WINDOWS [NUMERIC]**
5. Light Fixtures: **RECORD QUANTITY [NUMERIC]**
6. Heat Pump: **RECORD QUANTITY [NUMERIC]**
7. Central Air Conditioner: **RECORD QUANTITY [NUMERIC]**
8. Room Air Conditioner: **RECORD QUANTITY [NUMERIC]**
9. Ceiling Fans: **RECORD QUANTITY [NUMERIC]**
10. Electric Storage Water Heater: **RECORD QUANTITY [NUMERIC]**
11. Electric Heat Pump Water Heater: **RECORD [NUMERIC]**
12. CFLs: **RECORD QUANTITY [NUMERIC]**
13. LED bulbs: **RECORD QUANTITY [NUMERIC]**
14. Insulation: **RECORD QUANTITY IN SQ FT [NUMERIC]**
15. Air Sealing: **[PROBE: WHERE DID YOU INSTALL IT? RECORD LOCATION OF AIR SEALING]**
16. Duct Sealing: **[PROBE: WHERE WAS THE DUCT SEALING APPLIED? RECORD LOCATION OF DUCT SEALING]**
17. Programmable thermostat: **[RECORD QUANTITY[NUMERIC]**
18. Any other energy efficient equipment or measures? **[RECORD EQUIPMENT OR MEASURE PROBE: HOW MANY OR WHERE WAS IT INSTALLED? RECORD QUANTITY/LOCATION]**
19. None
98. Don't Know
99. Refused

[IF F2 = 19 (ONLY), 98 OR 99 SKIP TO H1. 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
- 3. 2017
- 4. Other **[RECORD YEAR]**
- 98. Don't Know
- 99. Refused

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

- 1. Yes **[PROBE: WHO PAID THE INCENTIVE?]**
- 2. No
- 98. Don't Know
- 99. Refused

F5. How influential would you say the wattsmart Home Energy Savings program was in your decision to add the energy efficient **[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 your household. Again, all your answers will be strictly confidential.

G1. 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 G4]**
9. Other **[SPECIFY]**
98. **[DO NOT READ]** Don't Know
99. **[DO NOT READ]** Refused

G2. How many years old is the heating system?

1. **[RECORD 0-97]**
98. Don't Know
99. Refused

G3. 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



G4. What type of cooling system do you primarily use? 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 G6]**
- 8. Other **[SPECIFY]**
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** Refused

G5. **[ASK IF G4 <> 7]** How many years old is your current cooling system?

- 1. **[RECORD 0-97]**
- 98. Don't Know
- 99. Refused

G6. 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 more units
- 5. Other **[RECORD]**
- 98. **[DO NOT READ]** Don't Know
- 99. **[DO NOT READ]** refused

G7. Do you rent or own your home?

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

G8. Including yourself and any children, how many people currently live in your home?

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

G9. 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

G10. 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

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.



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.

11. 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)

12. How long have you been in that role for this company?
 1. Record response **[SPECIFY NUMBER OF YEARS OR MONTHS]**

13. How long has the company been in business?
 1. Record response **[SPECIFY NUMBER OF YEARS OR MONTHS]**

14. 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 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 B7 provide lumen bins by lamp types applied in the gross evaluated lighting evaluation (e.g., CFLs, LEDs, light fixtures). The tables include evaluated baseline wattages by year and 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	700
450–799	29	18,411
800–1,099	43	225,581
1,100–1,599	53	16,704
1,600–1,999	72	24,275
2,000–2,600	72	0

Table B2. Lumen Bins and Quantities for Globe Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
250–349	25	419
350–499	29	835
500–574	43	398
575–649	53	74
650–1,099	72	455
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	0
90–149	15	0
150–299	25	1,904
300–499	29	2,558
500–699	43	301

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	40
2,000–2,600	150	4

Table B5. Lumen Bins and Quantities for D > 20 Reflector Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
300–639	30	1,379
640–739	40	814
740–849	45	153
850–1,179	50	65
1,180–1,419	65	223
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	3
400–449	40	0
450–499	45	45
500–649	50	849
650–1,179	65	16,497
1,180–1,419	65	161
1,420–1,789	75	59
1,790–2,049	90	0
2,050–2,579	100	0
2,580–3,429	120	0

Table B7. Lumen Bins and Quantities for R20 Reflector Lamps

Lumen Bin	Baseline Wattage	Lamp Quantity
300-399	30	0
400-449	40	0
450-719	45	152
720-999	50	0
1,000–1,199	65	0
1,200–1,519	75	0
1,520–1,729	90	0
1,730–2,189	100	0
2,190–2,899	120	0
2,900–3,850	150	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

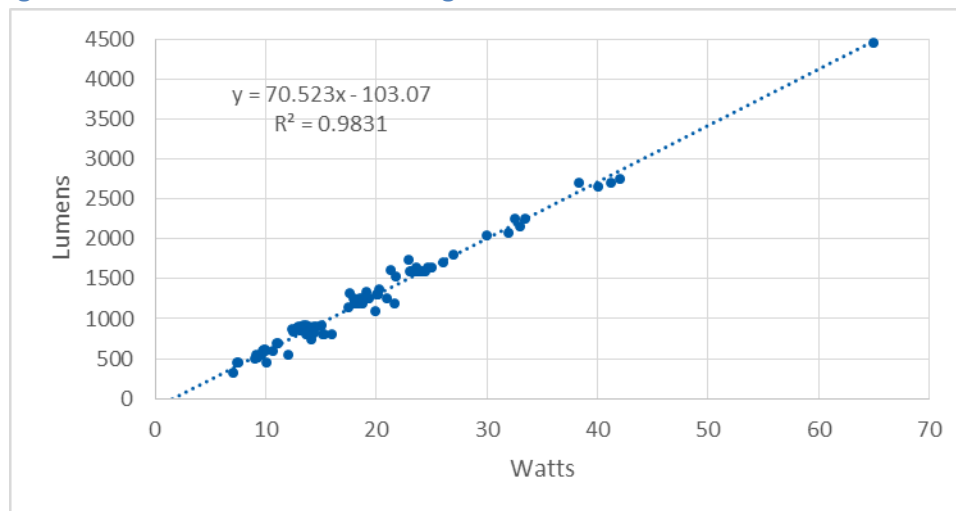




Figure B2. Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector CFLs

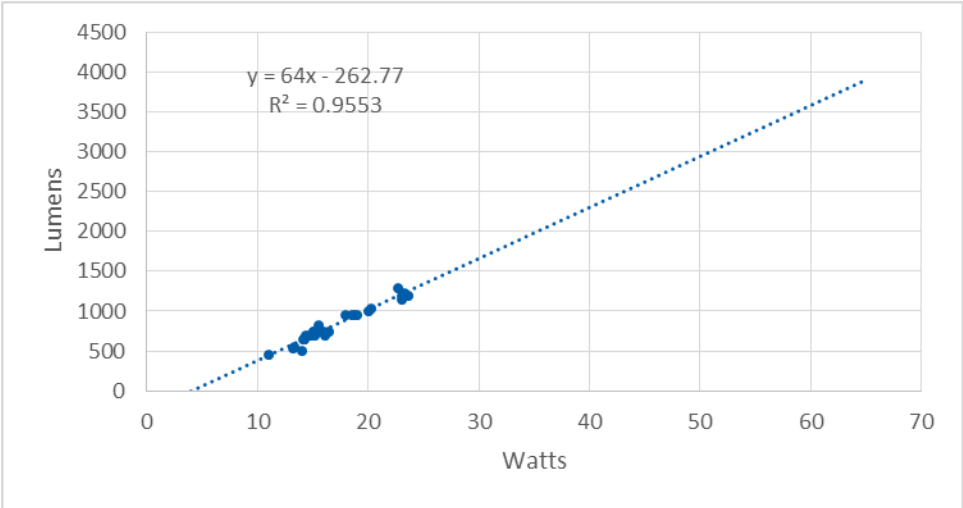


Figure B3. Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty CFLs

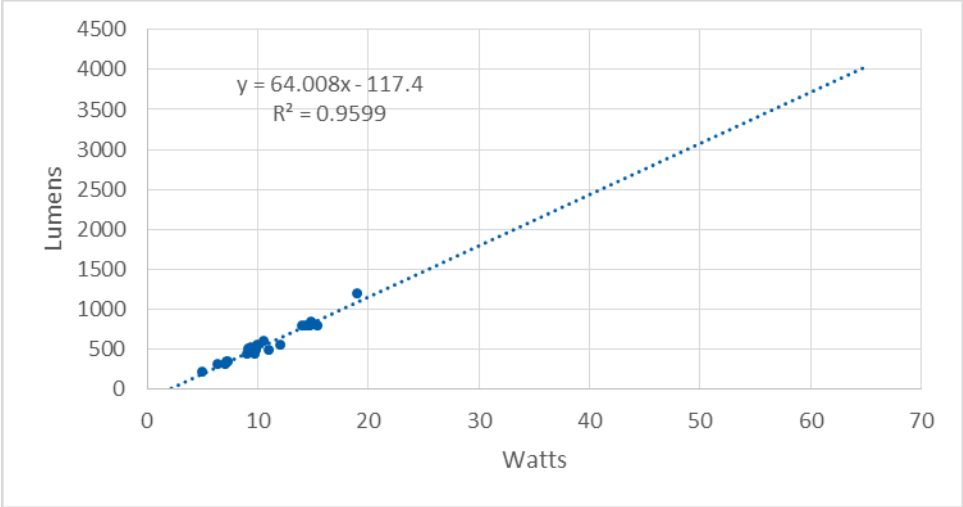


Figure B4. Median Lumens vs. Wattage for ENERGY STAR-Qualified CFL Fixtures

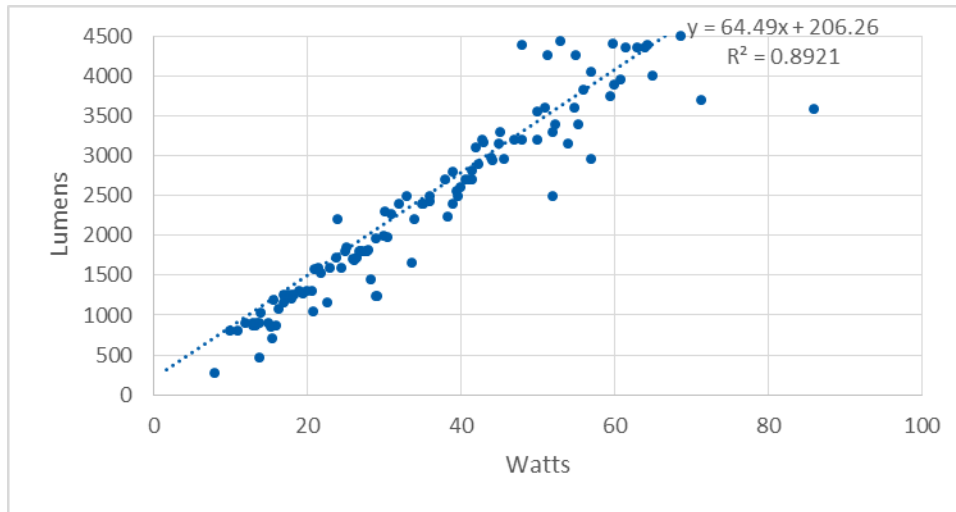


Figure B5. Median Lumens vs. Wattage for ENERGY STAR-Qualified Standard LEDs

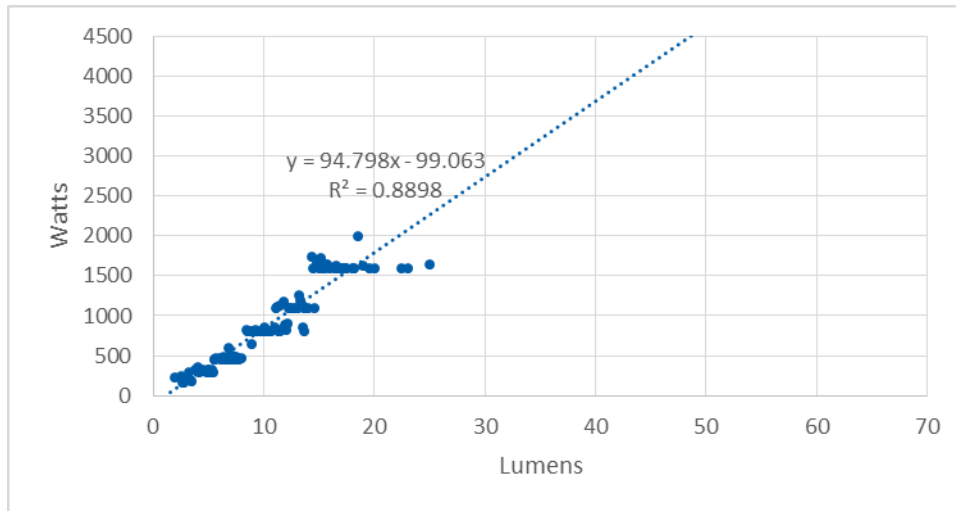




Figure B6. Median Lumens vs. Wattage for ENERGY STAR-Qualified Reflector LEDs

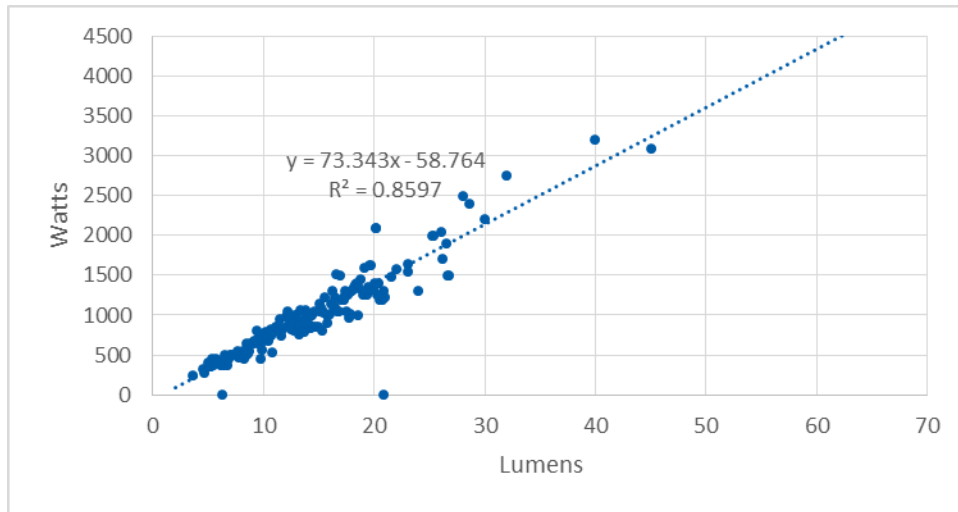


Figure B7. Median Lumens vs. Wattage for ENERGY STAR-Qualified Specialty LEDs

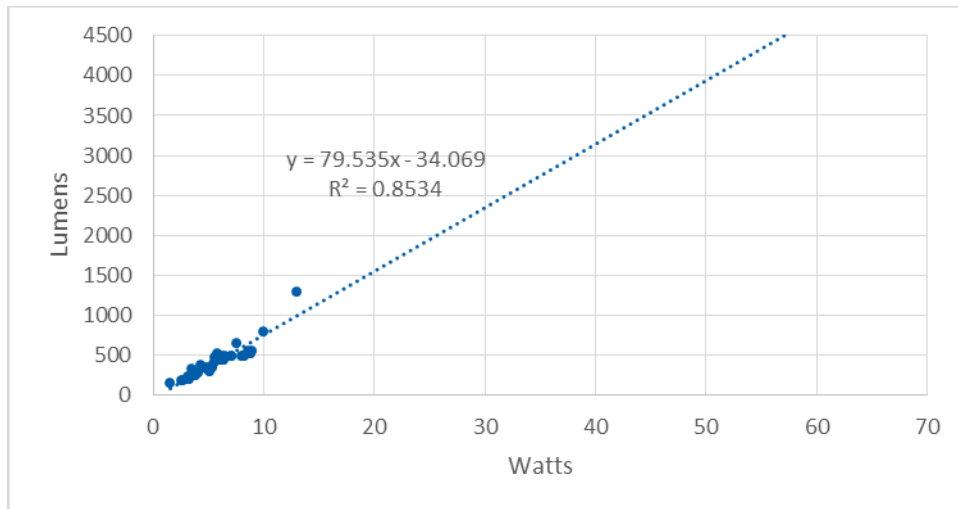
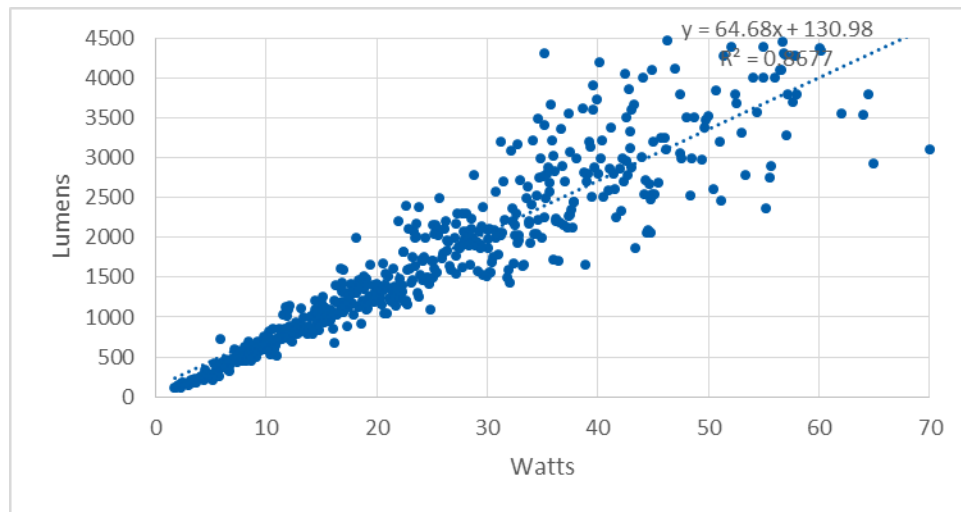


Figure B8. Median Lumens vs. Wattage for ENERGY STAR-Qualified LED Fixtures



Demand Elasticity Modeling

As lighting products incur price changes and promotion over the program period, they provide valuable information regarding the correlation between sales and prices. Cadmus developed a demand elasticity model to estimate freeridership for the upstream markdown channel in 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. Sales and pricing data provided for the 2015 and 2016 program years proved sufficient and improved from previous program years.

Price Variation

Cadmus measured price and sales variations 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, 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 manufacturers or pack sizes. Each monthly observation in the data reflected the average price per bulb and the total bulb sales within that specific location.

Defining cross-sections for the model this way 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 capturing changes in the bulb’s average price due to changes in pack size (e.g., a three-pack is introduced, displacing single-pack bulb sales, thus lowering the average price per bulb) or the introduction of new, comparable products to the program.

Table B8 shows the representativeness of data included in the model for each year as well as data combined for the evaluation cycle.

Table B8. Share of Sales Represented in Model

Year	Bulb Type	Total Sales	Share Represented by Year	Share Represented Combined
2015	CFL	188,473	88%	85%
2016	CFL	21,617	59%	
2015	LED	29,566	61%	81%
2016	LED	57,292	92%	

In both years and across both technologies, sales included in the model used to estimate elasticities represented a majority of sales. Representativeness was greater for CFLs in 2015 (when CFLs accounted for a larger share of sales) than in 2016. Conversely, LED representation was greater 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

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.

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. 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 and 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 sales variations, Cadmus used time fixed-effects in the model. Unique to each retail channel, these fixed effects 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 small peak in March and a larger peak in October and November.

Both technologies exhibited the highest sales in late spring 2015, with sales tapering off and achieving much smaller peaks in fall 2015. CFL sales dropped sharply after the first half of 2015, and price changes did not correspond with sales changes through 2016.

LED sales also dropped at the end of 2015. Sales in 2016 more closely followed a typical seasonal pattern, though, after the spring peak, the program experienced a sales decline sharper than typical seasonal patterns would predict.

Ultimately, including the seasonal sales trend from the national retailer produced positive elasticities for CFLs, leading to extremely 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 fixed-effects, Cadmus added dummy variables for specific months, retailers, and bulb types, where anomalous sales changes were observed. As these changes were unrelated to any program activity Cadmus observed in the data, these dummy variables absorbed impacts from these events, as to not bias the price elasticities.



Figure 9. CFL Sales and Prices by Month

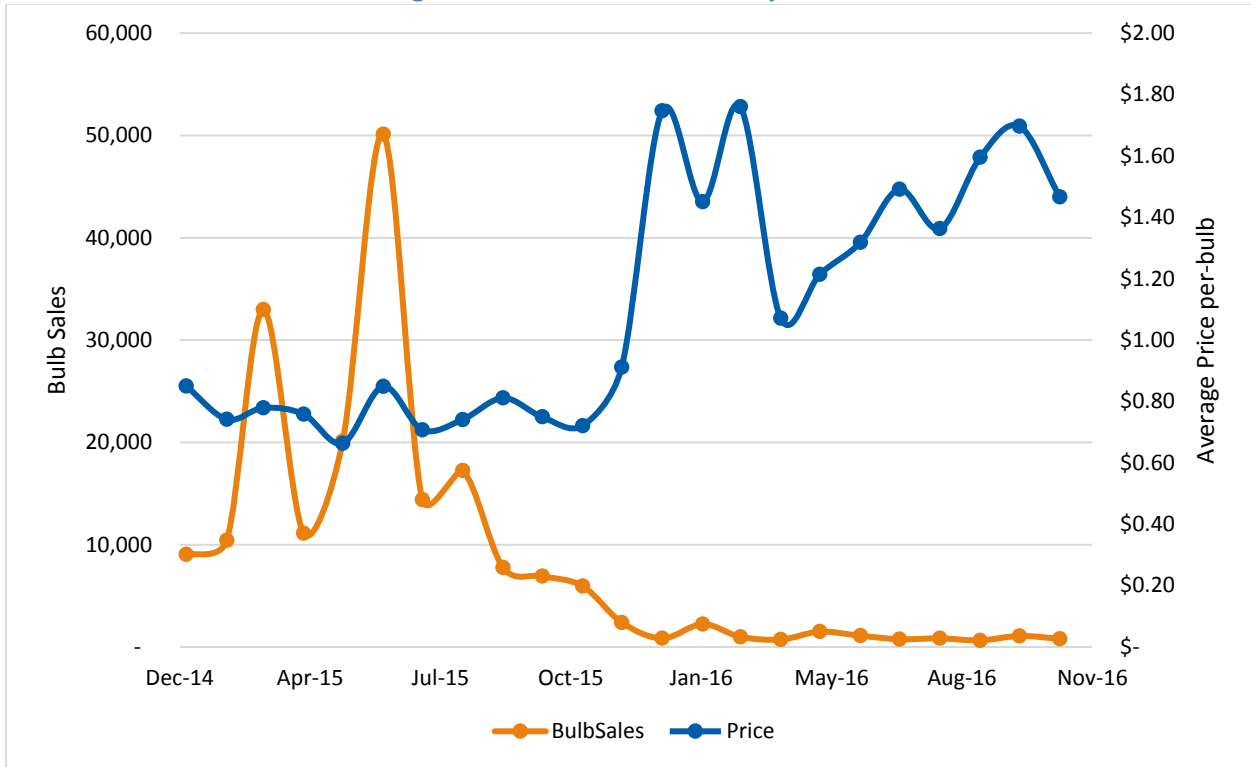
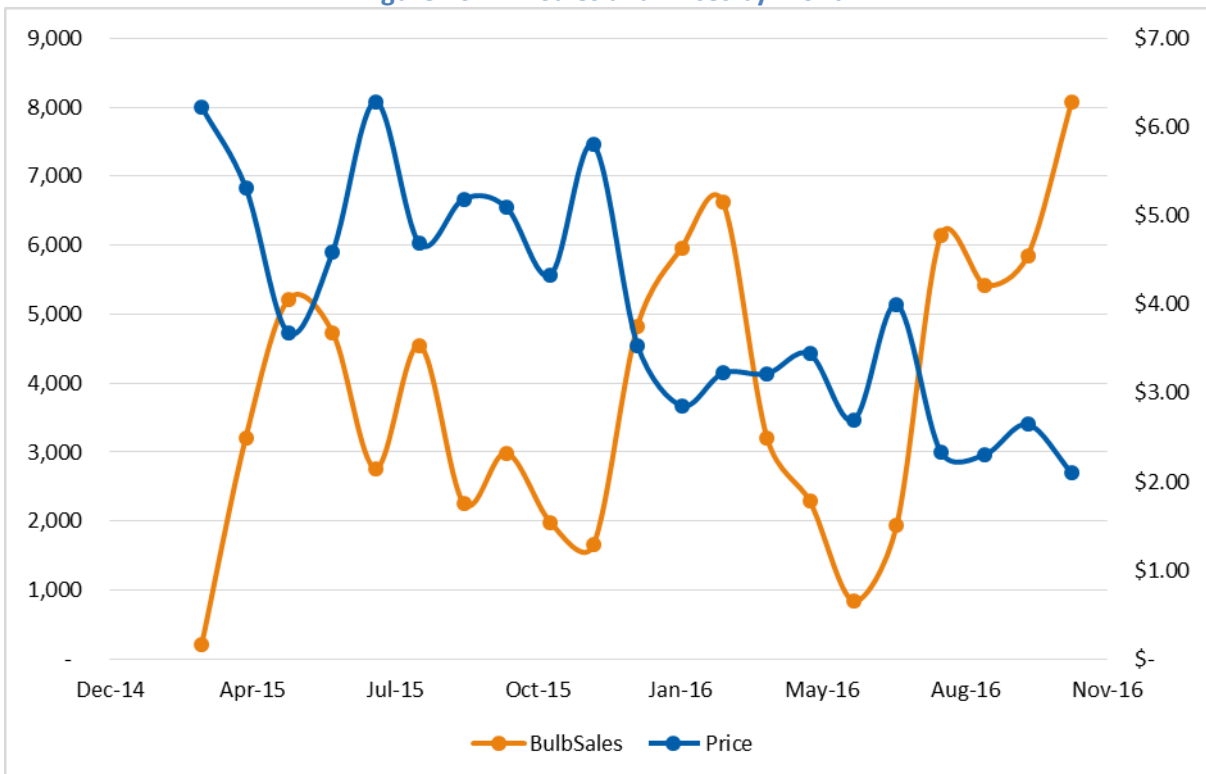


Figure 10. LED Sales and Prices by Month



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):

$$\begin{aligned} \ln(Q_{it}) = & \sum_{\pi} (\beta_{\pi} ID_{\pi,i}) \\ & + \sum_{\theta} (\beta_{\theta,i,j} [\ln(P_{it}) * (Retail Channel_{\theta,i}) * (Bulb Category_{\theta,j})]) \\ & + \sum_{\theta} (\beta_{ti} [Sales Month_t * (Retail Channel_{\theta,i})]) + \beta_3 * LED \\ & * Retailer_i Month_t + \varepsilon_i + \gamma_t \end{aligned}$$

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 $_i$ Month $_t$	= 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 within each retail channel, technology, and bulb type combination separately). 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):

$$\begin{aligned} \ln(Q_{it}) = & \sum_{\pi} (\beta_{\pi} ID_{\pi,i}) \\ & + \sum_{\theta} (\beta_{\theta,i,j} [\ln(P_{it}) * (Retail\ Channel_{\theta,i})]) \\ & + \sum_{\theta} (\beta_{\theta,i} [Sales\ Month_t * (Retail\ Channel_{\theta,i})]) + \beta_{i,t} * Retailer_i Month_t \\ & + \beta_3 \ln(P_{it}) * LED + \varepsilon_i + \gamma_t \end{aligned}$$

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 otherwise³
- 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.

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)

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 included 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.

- Model Akaike’s Information Criteria (AIC) (minimizing between models)⁵
- Minimizing multicollinearity
- Optimizing model fit

Overall, the model predicted sales within 1.6% of actual bulb sales over the evaluation period.

Findings

Cadmus estimated a combined CFL and LED freeridership of 51%. Table B9 shows the estimated freeridership ratio by bulb type. LEDs had slightly lower freeridership than CFLs.

Table B9. Modeling Results by Bulb Type

Bulb Type	Freeridership	Net of Freeridership
CFLs	45%	55%
LEDs	55%	45%
All Bulbs	49%	51%

Table B10 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 the net of the freeridership trend correlate: the higher the incentive, the lower the freeridership. This becomes particularly apparent in this case. The average markdown for LEDs increased between 2015 and 2016, leading to a decrease in freeridership. Conversely, markdowns for CFLs decreased in 2016 and freeridership increased.

Table B10. Modeling Results by Bulb Type

Year	Technology	Final Price per Bulb	Original Price per Bulb	Markdown %	Freeridership
2015	CFL	\$0.80	\$2.07	61%	42%
	LED	\$4.40	\$8.14	46%	61%
2016	CFL	\$1.34	\$2.01	33%	73%
	LED	\$2.80	\$5.76	51%	52%

Elasticities

Freeridership ratios derive from an estimate of price elasticities of demand: the price elasticity of demand 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 both CFLs and LEDs, meaning a 10% drop in price led to a 10% to 30% increase in quantities sold.

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).



As shown in Table B11, most elasticity estimates were relatively low, and a 1% drop in price resulted in a less than 1% sales increase. In 2016, club store LEDs were the exception, with an elasticity of -1.71, meaning that demand was nearly twice as elastic. Increasing the volume of LED sales through club stores could improve freeridership.

Table B11. Elasticity Estimates by Retail Channel and Bulb Type

Year	Channel	Technology	Average Elasticity
2015	Club	CFL	-0.87
		LED	-0.76
	DIY	CFL	-0.74
		LED	-0.76
	Mass Market	CFL	-1.03
		LED	-0.96
2016	Club	CFL	NA
		LED	-1.71
	DIY	CFL	-0.58
		LED	-0.87
	Mass Market	CFL	-0.67
		LED	-0.96

Appendix C. 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 an 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. This took the form of 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?

Table C1 lists the sample sizes of the rebate measure freeridership analysis by measure.



Table C1. Rebate Measure Freeridership Analysis Sample Size by Measure

Measure Category	Measure	Sample Size (n)
Appliance	Clothes Washer	33
	Dishwasher	3
	Evaporative Cooler	3
	Flat Panel TV	20
	Freezer	11
	Refrigerator	8
	Appliance Total	78
HVAC	Central AC Best Practice Installation & Sizing	2
	Efficient Gas Furnace with ECM	1
	Evaporative Cooler	31
	Heat Pump Upgrade	1
	Heat Pump Water Heater	2
	Heat Pump, Ductless	8
	HVAC Total	45
Building Shell	Attic Insulation	6
	Wall Insulation	2
	Windows	1
	Weatherization Total	9
Overall Total	132	

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 that had plans to install the measure before hearing about the program, but for whom the program exerted some influence over their decisions. Further, by including partial freeridership, 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 C2 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 C2. 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, assigning 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 C3.



Table C3. Kit Measure *Future Intent* Question Freeridership Scoring

Response	<i>Future Intent</i> 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 initially signing 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 they 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 (100%) was averaged with their *prior use* freeridership (0%), using the arithmetic mean to arrive at a participant’s final freeridership score: 50% for the measure. If the respondent said they would have purchased the measure at the same time they received the kit, and they 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:

$$\begin{aligned}
 & \text{Savings Weighted Freeridership} \\
 &= \frac{\sum(\text{Respondent FR Score}) * (\text{Rebated Measure kWh Savings})}{\sum(\text{Rebated Measure kWh Savings of All Respondents})}
 \end{aligned}$$

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 the equipment they installed:

$$\begin{aligned}
 & \text{Measure Level Savings Weighted Freeridership} \\
 &= \frac{\sum(\text{Kit Measure Respondent FR Score}) * (\text{Kit Measure kWh Savings})}{\sum(\text{Kit Measure kWh Savings of All Respondents})}
 \end{aligned}$$

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

$$= \frac{\sum(\text{Measure Level FR Score}) * (\text{Measure Level kWh Population Savings})}{\sum(\text{All Kit Measures Population kWh Savings})}$$

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 additional measures that 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 D. 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 23 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) neither applied nor received an incentive for. 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 **wattsmart** evaluation activities for the reported NPSO measures. Using the variables shown in Table D1, Cadmus determine total NPSO generated by Rocky Mountain Power’s marketing efforts during the 2015–2016 evaluation year.

Table D1. 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 D2
D	Total Residential Customer Nonparticipant Population	Based on 2017 Billing Data and 2015-2016 Program Tracking Data
E	NPSO kWh Savings Applied to Population	$[(A \div B) \times C] \times D$
F	Total Gross Evaluated Savings	2015-2016 Evaluation
G	NPSO as a Percentage of Total Residential Portfolio Evaluated Savings	$E \div F$

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 D2 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 D2. NPSO Response Summary

Reported Spillover Measures	Quantity	Unit Energy Savings (kWh)*	Total Savings (kWh)	Average Savings Per Spillover Measure (kWh)
ENERGY STAR Clothes Washer	2	170.5 per unit	341	
ENERGY STAR Freezer	1	66.5 per unit	67	
ENERGY STAR Refrigerator	1	83.1 per unit	83	
ENERGY STAR Room Air Conditioner	2	41.0 per unit	82	
Low Flow Faucet Aerator	1	80.6 per unit	81	
Low Flow Showerhead	1	94.1 per unit	94	
Total	8		747	93 (Variable C)

*Unit energy savings (kWh) estimated for each measure were generated from average 2015–2016 HES evaluated gross savings by measure.

Table D3 presents variables used to estimate overall NPSO for the HES Program, a figure Cadmus estimated as 4% of total evaluated savings for Rocky Mountain Power’s residential **wattsmart** program. Cadmus applied the 4% NPSO equally across the Rocky Mountain Power residential **wattsmart** program measures.

Table D3. NPSO Analysis Results

Variable	Metric	Value	Source
A	Number of Like Spillover Nonparticipant Measures	8	Survey data
B	Total Nonparticipant Customers Surveyed	227	Survey disposition
C	Weighted Average of Per Unit Measures Savings in kWh	298	Calculated in Table D2
D	Total Residential Customer Nonparticipant Population	77,274	Based on 2017 Billing Data and 2015-2016 Program Tracking Data
E	NPSO kWh Savings Applied to Population	254,374	$((A \div B) \times C) \times D$
F	Total Gross Evaluated Savings	5,873,558	2015-2016 Residential wattsmart Evaluated Savings
G	NPSO as a Percentage of Total Residential Portfolio Reported Savings	4%	$E \div F$

Appendix E. 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 E1 shows cost-effectiveness inputs for the evaluated results.

Table E1. Wyoming Measure Category Cost-Effectiveness Inputs

Input Description	2015	2016	Total
Average Measure Life*			
Appliances	14.5	15.4	14.7
Building Shell	30.2	30.0	30.1
Home Electronics	6.0	N/A	6.0
HVAC	15.6	18.1	17.0
Lighting	6.6	10.5	7.7
Kits	9.2	9.3	9.3
Water Heating	13.8	15.0	14.7
Evaluated Energy Savings (kWh/year)**			
Appliances	47,135	21,169	68,303
Building Shell	17,480	21,936	39,416
Home Electronics	21,305	N/A	21,305
HVAC	60,509	77,977	138,486
Lighting	3,542,630	1,402,776	4,945,406
Kits	468,503	182,869	651,372
Water Heating	2,094	7,176	9,270
Total Utility Cost (excluding incentives)***			
Appliances	\$84,324	\$26,651	\$110,975
Building Shell	\$37,845	\$36,403	\$74,248
Home Electronics	\$159,703	N/A	\$159,703
HVAC	\$140,392	\$181,021	\$321,413
Lighting	\$117,381	\$119,029	\$236,410
Kits	\$46,673	\$21,921	\$68,594
Water Heating	\$4,534	\$11,908	\$16,442
Incentives			
Appliances	\$15,860	\$7,470	\$23,330
Building Shell	\$5,528	\$6,272	\$11,800
Home Electronics	\$20,605	N/A	\$20,605
HVAC	\$22,115	\$36,800	\$58,915



Lighting	\$442,665	\$205,165	\$647,830
Kits	\$24,982	\$11,397	\$36,379
Water Heating	\$975	\$1,200	\$2,175
Retail Rate	\$0.11	\$0.11	

*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 E2, 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 PCT perspective, as shown in Table E2. Table E5 provides annual program non-energy impacts. Table E6, Table E7, and Table E8 provide cost-effectiveness results, including non-energy impacts. The appliance measure category (including non-energy impacts) proved cost-effective from the PCT perspective, as shown in Table E6.

**Table E2. Wyoming Appliance 2015-2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.251	\$179,337	\$49,316	(\$130,021)	0.27
TRC	\$0.251	\$179,337	\$44,833	(\$134,504)	0.25
UCT	\$0.185	\$132,174	\$44,833	(\$87,342)	0.34
RIM		\$212,318	\$44,833	(\$167,485)	0.21
PCT		\$70,026	\$103,007	\$32,980	1.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001270
Discounted Participant Payback (years)					7.70

**Table E3. Wyoming Appliance 2015 (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.289	\$143,997	\$33,830	(\$110,167)	0.23
TRC	\$0.289	\$143,997	\$30,754	(\$113,243)	0.21
UCT	\$0.201	\$100,184	\$30,754	(\$69,430)	0.31
RIM		\$155,562	\$30,754	(\$124,807)	0.20
PCT		\$59,673	\$71,238	\$11,565	1.19
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000973

Discounted Participant Payback (years)	10.52
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**Table E4. Wyoming Appliance 2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.163	\$37,694	\$16,518	(\$21,176)	0.44
TRC	\$0.163	\$37,694	\$15,016	(\$22,678)	0.40
UCT	\$0.147	\$34,121	\$15,016	(\$19,105)	0.44
RIM		\$60,536	\$15,016	(\$45,520)	0.25
PCT		\$11,043	\$33,885	\$22,842	3.07
Lifecycle Revenue Impacts (\$/kWh)					\$0.00000350
Discounted Participant Payback (years)					1.54

Table E5. Wyoming Appliance Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Clothes Washer 2015	\$3,424.20	TRC, PTRC, PCT
Clothes Washer 2016	\$4,214.40	TRC, PTRC, PCT

**Table E6. Wyoming Appliance 2015-2016 (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.251	\$179,337	\$119,539	(\$59,799)	0.67
TRC No Adder	\$0.251	\$179,337	\$115,055	(\$64,282)	0.64
UTC	\$0.185	\$132,174	\$44,833	(\$87,342)	0.34
RIM		\$212,318	\$44,833	(\$167,485)	0.21
PCT		\$70,026	\$173,229	\$103,203	2.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001270
Discounted Participant Payback (years)					3.84



**Table E7. Wyoming Appliance 2015 (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.289	\$143,997	\$66,432	(\$77,565)	0.46
TRC No Adder	\$0.289	\$143,997	\$63,356	(\$80,641)	0.44
UTC	\$0.201	\$100,184	\$30,754	(\$69,430)	0.31
RIM		\$155,562	\$30,754	(\$124,807)	0.20
PCT		\$59,673	\$103,840	\$44,167	1.74
Lifecycle Revenue Impacts (\$/kWh)	\$0.00000973				
Discounted Participant Payback (years)	5.79				

**Table E8. Wyoming Appliance 2016 (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.163	\$37,694	\$56,644	\$18,950	1.50
TRC No Adder	\$0.163	\$37,694	\$55,142	\$17,448	1.46
UTC	\$0.147	\$34,121	\$15,016	(\$19,105)	0.44
RIM		\$60,536	\$15,016	(\$45,520)	0.25
PCT		\$11,043	\$74,011	\$62,968	6.70
Lifecycle Revenue Impacts (\$/kWh)	\$0.00000350				
Discounted Participant Payback (years)	0.79				

Appliances—Net Savings

Table E9, Table E10, and Table E11 show cost-effectiveness results for net savings, excluding non-energy impacts. The appliance measure category (again, excluding non-energy impacts) proved cost-effective from the PCT perspective, as shown in Table E9.

Table E12 provides the annual program non-energy impacts. Table E13, Table E14, and Table E15 provide cost-effectiveness results, including non-energy impacts. The appliance measure category (including non-energy impacts) proved cost-effective from the PCT perspective, as shown in Table E13.

**Table E9. Wyoming Appliance 2015-2016 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.311	\$159,543	\$35,376	(\$124,167)	0.22
TRC	\$0.311	\$159,543	\$32,160	(\$127,383)	0.20
UCT	\$0.258	\$132,174	\$32,160	(\$100,015)	0.24
RIM		\$189,663	\$32,160	(\$157,503)	0.17
PCT		\$70,026	\$103,007	\$32,980	1.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001194
Discounted Participant Payback (years)					7.70

**Table E10. Wyoming Appliance 2015 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.356	\$127,129	\$24,267	(\$102,862)	0.19
TRC	\$0.356	\$127,129	\$22,061	(\$105,068)	0.17
UCT	\$0.281	\$100,184	\$22,061	(\$78,123)	0.22
RIM		\$139,908	\$22,061	(\$117,847)	0.16
PCT		\$59,673	\$71,238	\$11,565	1.19
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000918
Discounted Participant Payback (years)					10.52

**Table E11. Wyoming Appliance 2016 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.163	\$37,694	\$16,518	(\$21,176)	0.44
TRC	\$0.163	\$37,694	\$15,016	(\$22,678)	0.40
UCT	\$0.147	\$34,121	\$15,016	(\$19,105)	0.44
RIM		\$60,536	\$15,016	(\$45,520)	0.25
PCT		\$11,043	\$33,885	\$22,842	3.07
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000350
Discounted Participant Payback (years)					1.54



Table E12. Wyoming Appliance Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Clothes Washer 2015	\$2,456.26	PTRC, TRC, PCT
Clothes Washer 2016	\$3,023.09	PTRC, TRC, PCT

**Table E13. Wyoming Appliance 2015-2016 Net (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.311	\$159,543	\$85,748	(\$73,795)	0.54
TRC No Adder	\$0.311	\$159,543	\$82,532	(\$77,011)	0.52
UTC	\$0.258	\$132,174	\$32,160	(\$100,015)	0.24
RIM		\$189,663	\$32,160	(\$157,503)	0.17
PCT		\$70,026	\$173,229	\$103,203	2.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001194
Discounted Participant Payback (years)					3.84

**Table E14. Wyoming Appliance 2015 Net (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.356	\$127,129	\$47,653	(\$79,476)	0.37
TRC No Adder	\$0.356	\$127,129	\$45,447	(\$81,682)	0.36
UTC	\$0.281	\$100,184	\$22,061	(\$78,123)	0.22
RIM		\$139,908	\$22,061	(\$117,847)	0.16
PCT		\$59,673	\$103,840	\$44,167	1.74
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000918
Discounted Participant Payback (years)					5.79

**Table E15. Wyoming Appliance 2016 Net (Including Non-Energy Impacts)
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC + Conservation Adder	\$0.208	\$34,572	\$40,632	\$6,060	1.18
TRC No Adder	\$0.208	\$34,572	\$39,555	\$4,982	1.14
UTC	\$0.205	\$34,121	\$10,772	(\$23,349)	0.32
RIM		\$53,069	\$10,772	(\$42,298)	0.20
PCT		\$11,043	\$74,011	\$62,968	6.70
Lifecycle Revenue Impacts (\$/kWh)					\$0.00000325
Discounted Participant Payback (years)					0.79

HVAC—Evaluated Savings

Table E16, Table E17, and Table E18 show HVAC measure category cost-effectiveness results for evaluated savings, excluding non-energy impacts. The HVAC measure category proved cost-effective from the PCT perspective, as shown in Table E16.

**Table E16. Wyoming HVAC 2015-2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.189	\$288,676	\$116,105	(\$172,571)	0.40
TRC	\$0.189	\$288,676	\$105,550	(\$183,126)	0.37
UCT	\$0.240	\$366,727	\$105,550	(\$261,177)	0.29
RIM		\$542,057	\$105,550	(\$436,508)	0.19
PCT		(\$78,051)	\$175,330	\$253,382	N/A
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003309
Discounted Participant Payback (years)					N/A



**Table E17. Wyoming HVAC 2015
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.157	\$103,251	\$51,997	(\$51,254)	0.50
TRC	\$0.157	\$103,251	\$47,270	(\$55,981)	0.46
UCT	\$0.247	\$162,507	\$47,270	(\$115,237)	0.29
RIM		\$236,461	\$47,270	(\$189,191)	0.20
PCT		(\$59,256)	\$73,954	\$133,210	N/A
Lifecycle Revenue Impacts (\$/kWh)	\$0.000001474				
Discounted Participant Payback (years)	N/A				

**Table E18. Wyoming HVAC 2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.213	\$197,774	\$68,378	(\$129,396)	0.35
TRC	\$0.213	\$197,774	\$62,162	(\$135,612)	0.31
UCT	\$0.234	\$217,821	\$62,162	(\$155,659)	0.29
RIM		\$325,949	\$62,162	(\$263,788)	0.19
PCT		(\$20,047)	\$108,128	\$128,175	N/A
Lifecycle Revenue Impacts (\$/kWh)	\$0.000002028				
Discounted Participant Payback (years)	N/A				

HVAC—Net Savings

Table E19, Table E20, and Table E21 show HVAC measure category cost-effectiveness results for net savings. The HVAC measure category proved cost-effective from the PCT perspective, as shown in Table E19.

**Table E19. Wyoming HVAC 2015-2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.242	\$302,838	\$95,038	(\$207,800)	0.31
TRC	\$0.242	\$302,838	\$86,398	(\$216,440)	0.29
UCT	\$0.293	\$366,727	\$86,398	(\$280,329)	0.24
RIM		\$510,244	\$86,398	(\$423,846)	0.17
PCT		(\$78,051)	\$175,330	\$253,382	N/A
Lifecycle Revenue Impacts (\$/kWh)	\$0.000003213				
Discounted Participant Payback (years)	N/A				

**Table E20. Wyoming HVAC 2015 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.212	\$114,003	\$42,562	(\$71,441)	0.37
TRC	\$0.212	\$114,003	\$38,693	(\$75,310)	0.34
UCT	\$0.302	\$162,507	\$38,693	(\$123,814)	0.24
RIM		\$223,042	\$38,693	(\$184,349)	0.17
PCT		(\$59,256)	\$73,954	\$133,210	N/A
Lifecycle Revenue Impacts (\$/kWh)	\$0.000001437				
Discounted Participant Payback (years)	N/A				

**Table E21. Wyoming HVAC 2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.265	\$201,412	\$55,971	(\$145,441)	0.28
TRC	\$0.265	\$201,412	\$50,882	(\$150,529)	0.25
UCT	\$0.286	\$217,821	\$50,882	(\$166,939)	0.23
RIM		\$306,330	\$50,882	(\$255,447)	0.17
PCT		(\$20,047)	\$108,128	\$128,175	N/A
Lifecycle Revenue Impacts (\$/kWh)	\$0.000001964				
Discounted Participant Payback (years)	N/A				

Lighting – Evaluated Savings

Table E22, Table E23, and Table E24 show cost-effectiveness results for evaluated savings, excluding non-energy impacts. The lighting measure category proved cost-effective from all perspectives except for the RIM, as shown in Table E22.

Table E25 provides the annual program non-energy impacts. Table E26, Table E27, and Table E28 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 E26.

**Table E22. Wyoming Lighting 2015-2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.054	\$1,704,677	\$2,028,311	\$323,634	1.19
TRC	\$0.054	\$1,704,677	\$1,843,919	\$139,242	1.08
UCT	\$0.027	\$863,997	\$1,843,919	\$979,922	2.13
RIM		\$4,279,966	\$1,843,919	(\$2,436,046)	0.43
PCT		\$1,475,700	\$4,050,988	\$2,575,289	2.75
Lifecycle Revenue Impacts (\$/kWh)					\$0.000021744
Discounted Participant Payback (years)					1.91

**Table E23. Wyoming Lighting 2015 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.053	\$1,100,547	\$1,277,804	\$177,257	1.16
TRC	\$0.053	\$1,100,547	\$1,161,640	\$61,093	1.06
UCT	\$0.027	\$560,046	\$1,161,640	\$601,594	2.07
RIM		\$2,747,405	\$1,161,640	(\$1,585,766)	0.42
PCT		\$983,166	\$2,630,024	\$1,646,859	2.68
Lifecycle Revenue Impacts (\$/kWh)					\$0.000014762
Discounted Participant Payback (years)					1.42

**Table E24. Wyoming Lighting 2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.054	\$644,366	\$800,492	\$156,126	1.24

TRC	\$0.054	\$644,366	\$727,720	\$83,354	1.13
UCT	\$0.027	\$324,194	\$727,720	\$403,526	2.24
RIM		\$1,634,629	\$727,720	(\$906,909)	0.45
PCT		\$525,337	\$1,515,600	\$990,263	2.89
Lifecycle Revenue Impacts (\$/kWh)	\$0.000008329				
Discounted Participant Payback (years)	2.11				

Table E25. Wyoming Lighting Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Light Bulbs – CFL – 2015	\$3,933.00	PTRC, TRC, PCT
Light Bulbs – LED – 2015	\$27,340.34	PTRC, TRC, PCT
Light Bulbs – CFL -2016	\$176.64	PTRC, TRC, PCT
Light Bulbs – LED – 2016	\$51,661.63	PTRC, TRC, PCT

**Table E26. Wyoming Lighting 2015-2016 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.054	\$1,704,677	\$2,713,992	\$1,009,315	1.59
TRC	\$0.054	\$1,704,677	\$2,529,600	\$824,923	1.48
UCT	\$0.027	\$863,997	\$1,843,919	\$979,922	2.13
RIM		\$4,279,966	\$1,843,919	(\$2,436,046)	0.43
PCT		\$1,475,700	\$4,736,669	\$3,260,969	3.21
Lifecycle Revenue Impacts (\$/kWh)	\$0.000021744				
Discounted Participant Payback (years)	1.78				

**Table E27. Wyoming Lighting 2015 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.053	\$1,100,547	\$1,539,163	\$438,616	1.40
TRC	\$0.053	\$1,100,547	\$1,422,999	\$322,452	1.29
UCT	\$0.027	\$560,046	\$1,161,640	\$601,594	2.07
RIM		\$2,747,405	\$1,161,640	(\$1,585,766)	0.42
PCT		\$983,166	\$2,891,383	\$1,908,218	2.94
Lifecycle Revenue Impacts (\$/kWh)	\$0.000014762				
Discounted Participant Payback (years)	1.31				



**Table E28. Wyoming Lighting 2016 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.054	\$644,366	\$1,253,073	\$608,707	1.94
TRC	\$0.054	\$644,366	\$1,180,301	\$535,935	1.83
UCT	\$0.027	\$324,194	\$727,720	\$403,526	2.24
RIM		\$1,634,629	\$727,720	(\$906,909)	0.45
PCT		\$525,337	\$1,968,182	\$1,442,845	3.75
Lifecycle Revenue Impacts (\$/kWh)					\$0.000008329
Discounted Participant Payback (years)					1.57

Lighting—Net Savings

Table E29, Table E30, and Table E31 show cost-effectiveness results for net savings. The lighting measure category proved cost-effective from all perspectives except for the TRC and RIM perspectives, as shown in Table E29.

Table E32 provides the annual program non-energy impacts. Table E33, Table E34, and Table E35 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 perspective, as shown in Table E33.

**Table E29. Wyoming Lighting 2015-2016 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.060	\$1,056,020	\$1,124,274	\$68,254	1.06
TRC	\$0.060	\$1,056,020	\$1,022,067	(\$33,953)	0.97
UCT	\$0.049	\$863,997	\$1,022,067	\$158,070	1.18
RIM		\$2,760,574	\$1,022,067	(\$1,738,507)	0.37
PCT		\$1,475,700	\$4,050,988	\$2,575,289	2.75
Lifecycle Revenue Impacts (\$/kWh)					\$0.000015518
Discounted Participant Payback (years)					1.91

**Table E30. Wyoming Lighting 2015 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.057	\$697,237	\$746,292	\$49,055	1.07
TRC	\$0.057	\$697,237	\$678,448	(\$18,790)	0.97
UCT	\$0.046	\$560,046	\$678,448	\$118,402	1.21
RIM		\$1,839,694	\$678,448	(\$1,161,246)	0.37
PCT		\$983,166	\$2,630,024	\$1,646,859	2.68
Lifecycle Revenue Impacts (\$/kWh)					\$0.000010810
Discounted Participant Payback (years)					1.42

**Table E31. Wyoming Lighting 2016 Net (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.065	\$382,677	\$403,155	\$20,478	1.05
TRC	\$0.065	\$382,677	\$366,504	(\$16,173)	0.96
UCT	\$0.055	\$324,194	\$366,504	\$42,310	1.13
RIM		\$982,211	\$366,504	(\$615,706)	0.37
PCT		\$525,337	\$1,515,600	\$990,263	2.89
Lifecycle Revenue Impacts (\$/kWh)					\$0.000005655
Discounted Participant Payback (years)					2.11

Table E32. Wyoming Lighting Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Light Bulbs – CFL - 2015	\$2,438.46	PTRC, TRC, PCT
Light Bulbs – LED - 2015	\$11,756.35	PTRC, TRC, PCT
Light Bulbs – CFL -2016	\$54.76	PTRC, TRC, PCT
Light Bulbs – LED - 2016	\$26,864.05	PTRC, TRC, PCT

**Table E33. Wyoming Lighting 2015-2016 Net (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.060	\$1,056,020	\$1,460,464	\$404,444	1.38
TRC	\$0.060	\$1,056,020	\$1,358,257	\$302,237	1.29
UCT	\$0.049	\$863,997	\$1,022,067	\$158,070	1.18
RIM		\$2,760,574	\$1,022,067	(\$1,738,507)	0.37



PCT	\$1,475,700	\$4,736,669	\$3,260,969	3.21
Lifecycle Revenue Impacts (\$/kWh)	\$0.000015518			
Discounted Participant Payback (years)	1.78			

**Table E34. Wyoming Lighting 2015 Net (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.057	\$697,237	\$861,988	\$164,751	1.24
TRC	\$0.057	\$697,237	\$794,144	\$96,906	1.14
UCT	\$0.046	\$560,046	\$678,448	\$118,402	1.21
RIM		\$1,839,694	\$678,448	(\$1,161,246)	0.37
PCT		\$983,166	\$2,891,383	\$1,908,218	2.94
Lifecycle Revenue Impacts (\$/kWh)	\$0.000010810				
Discounted Participant Payback (years)	1.31				

**Table E35. Wyoming Lighting 2016 Net (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.065	\$382,677	\$638,334	\$255,657	1.67
TRC	\$0.065	\$382,677	\$601,683	\$219,006	1.57
UCT	\$0.055	\$324,194	\$366,504	\$42,310	1.13
RIM		\$982,211	\$366,504	(\$615,706)	0.37
PCT		\$525,337	\$1,968,182	\$1,442,845	3.75
Lifecycle Revenue Impacts (\$/kWh)	\$0.000005655				
Discounted Participant Payback (years)	1.57				

Building Shell—Evaluated Savings

Table E36, Table E37, and Table E38 show building shell measure category cost-effectiveness results for evaluated savings. The building shell measure category proved cost-effective from the PCT perspective, as shown in Table E36.

**Table E36. Wyoming Building Shell 2015-2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.161	\$91,914	\$40,836	(\$51,077)	0.44
TRC	\$0.161	\$91,914	\$37,124	(\$54,790)	0.40
UCT	\$0.146	\$83,383	\$37,124	(\$46,259)	0.45
RIM		\$153,555	\$37,124	(\$116,432)	0.24
PCT		\$19,939	\$81,581	\$61,642	4.09
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000695
Discounted Participant Payback (years)					2.64

**Table E37. Wyoming Building Shell 2015
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.191	\$50,175	\$18,461	(\$31,714)	0.37
TRC	\$0.191	\$50,175	\$16,783	(\$33,392)	0.33
UCT	\$0.165	\$43,373	\$16,783	(\$26,590)	0.39
RIM		\$75,323	\$16,783	(\$58,540)	0.22
PCT		\$12,330	\$37,478	\$25,148	3.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000350
Discounted Participant Payback (years)					3.80

**Table E38. Wyoming Building Shell 2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.135	\$44,518	\$23,866	(\$20,653)	0.54
TRC	\$0.135	\$44,518	\$21,696	(\$22,822)	0.49
UCT	\$0.130	\$42,675	\$21,696	(\$20,979)	0.51
RIM		\$83,443	\$21,696	(\$61,747)	0.26
PCT		\$8,115	\$47,040	\$38,925	5.80
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000387
Discounted Participant Payback (years)					0.93

Building Shell—Net Savings

Table E39, Table E40, and Table E41 show building shell measure category cost-effectiveness results for net evaluated savings. The building shell measure category proved cost-effective from the PCT perspective, as shown in Table E39.

**Table E39. Wyoming Building Shell 2015-2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.194	\$87,734	\$32,275	(\$55,458)	0.37
TRC	\$0.194	\$87,734	\$29,341	(\$58,393)	0.33
UCT	\$0.185	\$83,383	\$29,341	(\$54,042)	0.35
RIM		\$138,844	\$29,341	(\$109,503)	0.21
PCT		\$19,939	\$81,581	\$61,642	4.09
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001861
Discounted Participant Payback (years)					1.87

**Table E40. Wyoming Building Shell 2015 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.229	\$47,590	\$14,591	(\$32,999)	0.31
TRC	\$0.229	\$47,590	\$13,264	(\$34,326)	0.28
UCT	\$0.209	\$43,373	\$13,264	(\$30,109)	0.31
RIM		\$68,625	\$13,264	(\$55,360)	0.19
PCT		\$12,330	\$37,478	\$25,148	3.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000331
Discounted Participant Payback (years)					3.80

**Table E41. Wyoming Building Shell 2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.165	\$42,817	\$18,862	(\$23,955)	0.44
TRC	\$0.165	\$42,817	\$17,147	(\$25,670)	0.40
UCT	\$0.164	\$42,675	\$17,147	(\$25,528)	0.40
RIM		\$74,896	\$17,147	(\$57,749)	0.23
PCT		\$8,115	\$47,040	\$38,925	5.80
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000362

Discounted Participant Payback (years)	0.93
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Kits—Evaluated Savings

Table E42, Table E43, and Table E44 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 E42.

Table E45 provides the annual program non-energy impacts. Table E46, Table E47, and Table E48 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 E46.

**Table E42. Wyoming Kits 2015-2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.021	\$105,319	\$318,003	\$212,684	3.02
TRC	\$0.021	\$105,319	\$289,093	\$183,775	2.74
UCT	\$0.021	\$102,893	\$289,093	\$186,201	2.81
RIM		\$642,515	\$289,093	(\$353,421)	0.45
PCT		\$38,093	\$575,289	\$537,196	15.10
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003627
Discounted Participant Payback (years)					0.52

**Table E43. Wyoming Kits 2015 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.020	\$73,197	\$229,803	\$156,606	3.14
TRC	\$0.020	\$73,197	\$208,912	\$135,715	2.85
UCT	\$0.020	\$71,655	\$208,912	\$137,257	2.92
RIM		\$463,677	\$208,912	(\$254,765)	0.45
PCT		\$26,524	\$417,004	\$390,480	15.72
Lifecycle Revenue Impacts (\$/kWh)					\$0.000002768
Discounted Participant Payback (years)					0.35



**Table E44. Wyoming Kits 2016 (Excluding Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.024	\$34,261	\$94,074	\$59,813	2.75
TRC	\$0.024	\$34,261	\$85,522	\$51,260	2.50
UCT	\$0.023	\$33,318	\$85,522	\$52,204	2.57
RIM		\$190,748	\$85,522	(\$105,226)	0.45
PCT		\$12,340	\$168,827	\$156,487	13.68
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001128
Discounted Participant Payback (years)					0.39

Table E45. Wyoming Kits Annual Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Kits – 2015	\$39,932.72	PTRC, TRC, PCT
Kits – 2016	\$15,532.44	PTRC, TRC, PCT

**Table E46. Wyoming Kits 2015-2016 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.021	\$105,319	\$711,853	\$606,534	6.76
TRC	\$0.021	\$105,319	\$682,944	\$577,625	6.48
UCT	\$0.021	\$102,893	\$289,093	\$186,201	2.81
RIM		\$642,515	\$289,093	(\$353,421)	0.45
PCT		\$38,093	\$969,139	\$931,046	25.44
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003627
Discounted Participant Payback (years)					0.41

**Table E47. Wyoming Kits 2015 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.020	\$73,197	\$517,698	\$444,501	7.07
TRC	\$0.020	\$73,197	\$496,807	\$423,610	6.79
UCT	\$0.020	\$71,655	\$208,912	\$137,257	2.92
RIM		\$463,677	\$208,912	(\$254,765)	0.45
PCT		\$26,524	\$704,899	\$678,375	26.58
Lifecycle Revenue Impacts (\$/kWh)					\$0.000002768

Discounted Participant Payback (years)	0.23
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**Table E48. Wyoming Kits 2016 (Including Non-Energy Impacts)
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.024	\$34,261	\$207,086	\$172,825	6.04
TRC	\$0.024	\$34,261	\$198,534	\$164,273	5.79
UCT	\$0.023	\$33,318	\$85,522	\$52,204	2.57
RIM		\$190,748	\$85,522	(\$105,226)	0.45
PCT		\$12,340	\$281,839	\$269,499	22.84
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001128
Discounted Participant Payback (years)					0.26

Kits—Net Savings

Table E49, Table E50, and Table E51 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 E49, which Table E50 provides the annual program non-energy impacts.

Table E52 provides the annual program non-energy impacts. Table E53, Table E54, and Table E55 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 E53.

**Table E49. Wyoming Kits 2015-2016 (Excluding Non-Energy Impacts) Net
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.024	\$102,893	\$273,482	\$170,590	2.66
TRC	\$0.024	\$102,893	\$248,620	\$145,728	2.42
UCT	\$0.024	\$102,893	\$248,620	\$145,728	2.42
RIM		\$566,967	\$248,620	(\$318,347)	0.44
PCT		\$38,093	\$572,382	\$534,289	15.03
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003267
Discounted Participant Payback (years)					0.52



**Table E50. Wyoming Kits 2015 (Excluding Non-Energy Impacts) Net
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.023	\$71,655	\$197,631	\$125,976	2.76
TRC	\$0.023	\$71,655	\$179,664	\$108,009	2.51
UCT	\$0.023	\$71,655	\$179,664	\$108,009	2.51
RIM		\$408,794	\$179,664	(\$229,130)	0.44
PCT		\$26,524	\$414,833	\$388,309	15.64
Lifecycle Revenue Impacts (\$/kWh)					\$0.000002489
Discounted Participant Payback (years)					0.35

**Table E51. Wyoming Kits 2016 (Excluding Non-Energy Impacts) Net
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.027	\$33,318	\$80,903	\$47,585	2.43
TRC	\$0.027	\$33,318	\$73,549	\$40,231	2.21
UCT	\$0.027	\$33,318	\$73,549	\$40,231	2.21
RIM		\$168,707	\$73,549	(\$95,159)	0.44
PCT		\$12,340	\$168,042	\$155,702	13.62
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001020
Discounted Participant Payback (years)					0.39

Table E52. Wyoming Kits Annual Net Non-Energy Impacts

Measure	Annual Value	Perspective Adjusted
Kits – 2015	\$34,342.14	PTRC, TRC, PCT
Kits – 2016	\$13,357.90	PTRC, TRC, PCT

**Table E53. Wyoming Kits 2015-2016 (Including Non-Energy Impacts) Net
(2015 IRP East Residential Lighting 47% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.024	\$102,893	\$612,194	\$509,301	5.95
TRC	\$0.024	\$102,893	\$587,332	\$484,439	5.71
UCT	\$0.024	\$102,893	\$248,620	\$145,728	2.42
RIM		\$566,967	\$248,620	(\$318,347)	0.44
PCT		\$38,093	\$966,233	\$928,139	25.36
Lifecycle Revenue Impacts (\$/kWh)					\$0.000003267

Discounted Participant Payback (years)	0.41
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Table E54. Wyoming Kits 2015 (Including Non-Energy Impacts) Net (2015 IRP East Residential Lighting 47% Preferred Decrement)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.023	\$71,655	\$445,220	\$373,565	6.21
TRC	\$0.023	\$71,655	\$427,254	\$355,599	5.96
UCT	\$0.023	\$71,655	\$179,664	\$108,009	2.51
RIM		\$408,794	\$179,664	(\$229,130)	0.44
PCT		\$26,524	\$702,727	\$676,204	26.49
Lifecycle Revenue Impacts (\$/kWh)					\$0.000002489
Discounted Participant Payback (years)					0.23

Table E55. Wyoming Kits 2016 (Including Non-Energy Impacts) Net (2015 IRP East Residential Lighting 47% Preferred Decrement)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.027	\$33,318	\$178,094	\$144,776	5.35
TRC	\$0.027	\$33,318	\$170,739	\$137,421	5.12
UCT	\$0.027	\$33,318	\$73,549	\$40,231	2.21
RIM		\$168,707	\$73,549	(\$95,159)	0.44
PCT		\$12,340	\$281,055	\$268,714	22.78
Lifecycle Revenue Impacts (\$/kWh)					\$0.000001020
Discounted Participant Payback (years)					0.26

Electronics—Evaluated Savings

Table E56 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 E56. Wyoming Electronics 2015
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$2.020	\$242,133	\$6,889	(\$235,244)	0.03
TRC	\$2.020	\$242,133	\$6,263	(\$235,870)	0.03
UCT	\$1.504	\$180,308	\$6,263	(\$174,045)	0.03
RIM		\$192,791	\$6,263	(\$186,527)	0.03
PCT		\$82,430	\$33,088	(\$49,342)	0.40
Lifecycle Revenue Impacts (\$/kWh)	\$0.000003515				
Discounted Participant Payback (years)	N/A				

Electronics—Net Savings

Table E57 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 E57. Wyoming Electronics 2015 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$2.545	\$218,832	\$4,942	(\$213,890)	0.02
TRC	\$2.545	\$218,832	\$4,493	(\$214,339)	0.02
UCT	\$2.097	\$180,308	\$4,493	(\$175,815)	0.02
RIM		\$189,262	\$4,493	(\$184,769)	0.02
PCT		\$82,430	\$33,088	(\$49,342)	0.40
Lifecycle Revenue Impacts (\$/kWh)	\$0.000003482				
Discounted Participant Payback (years)	N/A				

Water Heating —Evaluated Savings

Table E58, Table E59, and Table E60 show 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, as shown in Table E58.

**Table E58. Wyoming Water Heating 2015-2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.237	\$22,452	\$6,675	(\$15,778)	0.30
TRC	\$0.237	\$22,452	\$6,068	(\$16,384)	0.27
UCT	\$0.188	\$17,799	\$6,068	(\$11,731)	0.34
RIM		\$28,500	\$6,068	(\$22,432)	0.21
PCT		\$6,754	\$12,802	\$6,048	1.90
Lifecycle Revenue Impacts (\$/kWh)	\$0.000000200				
Discounted Participant Payback (years)	6.01				

**Table E59. Wyoming Water Heating 2015
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.285	\$6,154	\$1,456	(\$4,697)	0.24
TRC	\$0.285	\$6,154	\$1,324	(\$4,830)	0.22
UCT	\$0.255	\$5,509	\$1,324	(\$4,185)	0.24
RIM		\$7,898	\$1,324	(\$6,574)	0.17
PCT		\$1,620	\$3,364	\$1,744	2.08
Lifecycle Revenue Impacts (\$/kWh)	\$0.000000061				
Discounted Participant Payback (years)	2.95				

**Table E60. Wyoming Water Heating 2016
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.223	\$17,384	\$5,566	(\$11,818)	0.32
TRC	\$0.223	\$17,384	\$5,060	(\$12,324)	0.29
UCT	\$0.168	\$13,108	\$5,060	(\$8,048)	0.39
RIM		\$21,974	\$5,060	(\$16,914)	0.23
PCT		\$5,476	\$10,066	\$4,590	1.84
Lifecycle Revenue Impacts (\$/kWh)	\$0.000000155				
Discounted Participant Payback (years)	5.99				

Water Heating —Net Savings

Table E61, Table E62, and Table E63 show water heating measure category cost-effectiveness results for net savings. The water heating measure category proved cost-effective only from the PCT perspective, as shown in Table E61.

**Table E61. Wyoming Water Heating 2015-2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.277	\$21,154	\$5,383	(\$15,771)	0.25
TRC	\$0.277	\$21,154	\$4,894	(\$16,260)	0.23
UCT	\$0.233	\$17,799	\$4,894	(\$12,905)	0.27
RIM		\$26,425	\$4,894	(\$21,532)	0.19
PCT		\$6,754	\$12,802	\$6,048	1.90
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000192
Discounted Participant Payback (years)					6.01

**Table E62. Wyoming Water Heating 2015 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.351	\$5,787	\$1,112	(\$4,675)	0.19
TRC	\$0.351	\$5,787	\$1,011	(\$4,776)	0.17
UCT	\$0.335	\$5,509	\$1,011	(\$4,498)	0.18
RIM		\$7,332	\$1,011	(\$6,321)	0.14
PCT		\$1,620	\$3,364	\$1,744	2.08
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000059
Discounted Participant Payback (years)					2.95

**Table E63. Wyoming Water Heating 2016 Net
(2015 IRP East Residential House 31% Preferred Decrement)**

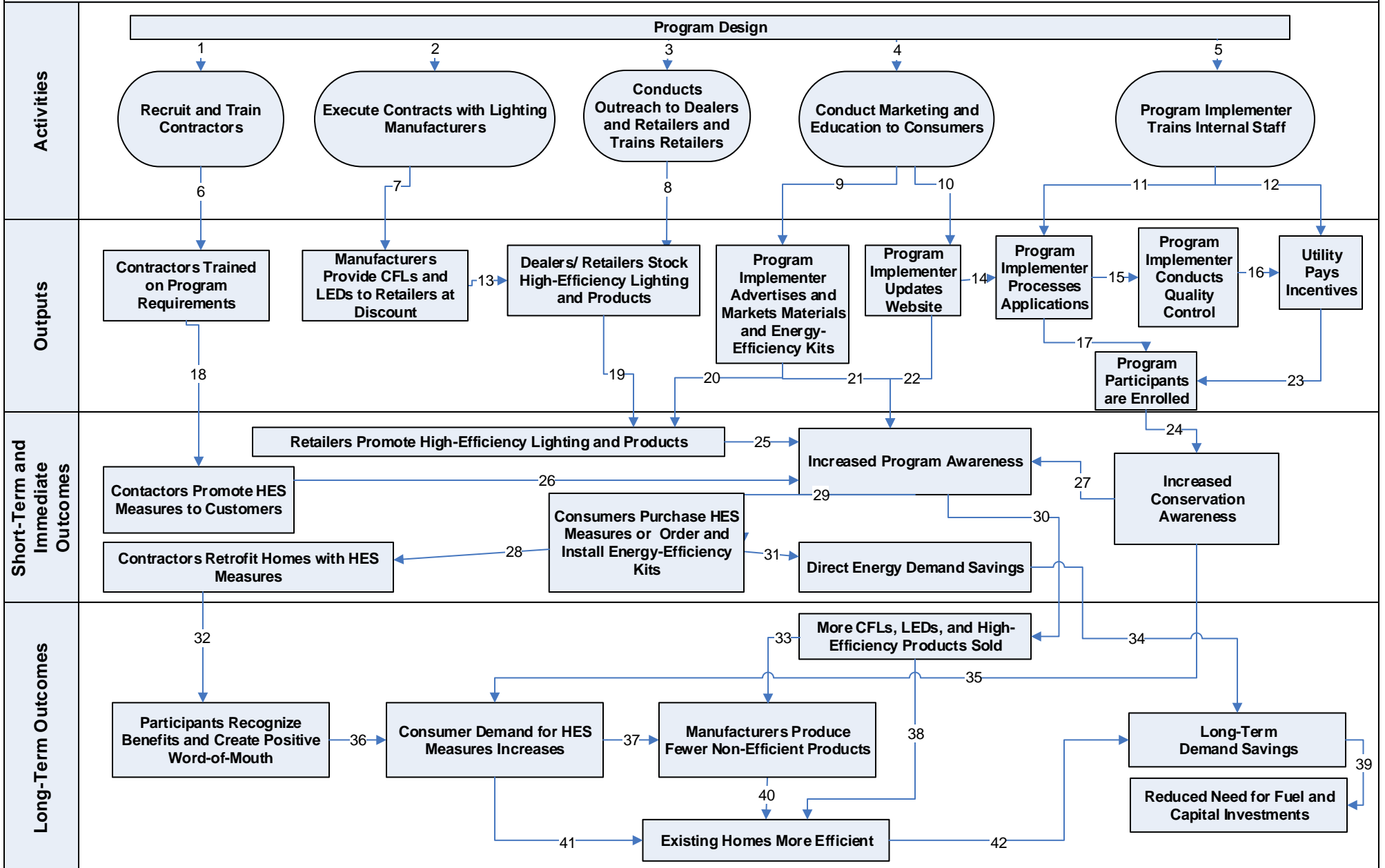
Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.257	\$16,390	\$4,556	(\$11,835)	0.28
TRC	\$0.257	\$16,390	\$4,142	(\$12,249)	0.25
UCT	\$0.205	\$13,108	\$4,142	(\$8,966)	0.32
RIM		\$20,365	\$4,142	(\$16,224)	0.20
PCT		\$5,476	\$10,066	\$4,590	1.84
Lifecycle Revenue Impacts (\$/kWh)					\$0.000000149

Discounted Participant Payback
(years)

5.99

Rocky Mountain Power Home Energy Savings (HES) Program Logic Model

Inputs: Funds, Experienced Staff, Allies, Market Knowledge, Synergistic Program Management



Appendix G. Benchmark Detail

The tables in this appendix provide additional detail on programs included in Cadmus' benchmark review of residential lighting and non-lighting.



Table G1. Residential Upstream Lighting Programs

Utility, State	Program Name	Implementer	Measure Detail	Program Year	Units	Net MWh	kWh/Unit	NTG	WHF	HOU	ISR
Pacific Power, WY	HES	CLEAResult	CFLs (Gen Purpose) CFLs (Specialty) CFL Fixtures	2015–2016	319,359	2,789	9	60%	0.967	1.84	71%
			LEDs (Gen Purpose) LEDs (Specialty) LED Fixtures							1.85	73%
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 G2. 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 CI Washer Tier 2: \$75 ES CI Washer Tier 3: \$100 ES Refrig Tier 2: \$100 ES Refrig Tier 3: \$150 ES Room AC Tier: 2 \$30 ES Elec CI 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, defined as values determined by evaluators, derived from final evaluation reports.