Evaluation, Verification and Measurement Report Residential Home Energy Savings Program: Washington

PROGRAM YEARS 2019-2020

Prepared for:

Pacific Power

September 2021

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1 Executive Summary

ADM Associates, Inc. (ADM) is under contract with PacifiCorp to perform evaluation, measurement, and verification (EM&V) services to determine the energy savings (kWh) that resulted from Pacific Power's 2019-2020 Home Energy Savings Program in Washington. This report documents ADM's findings.

Program year 2019 (PY 2019) and program year 2020 (PY 2020) coincide with the respective calendar years. The purpose of this report is to present ADM's impact evaluation of the energy savings (kWh) that resulted from the program and ADM's process evaluation of the program, focusing on participant and program staff perspectives regarding the program's implementation and ADM's observations about the program.

1.1 Description of Program

The program provides financial incentives (discounts, rebates, and free products) for Pacific Power residential customers to purchase and install energy efficient products. The program leverages relationships with manufacturers, distributors, and retailers to ensure effective program implementation and optimize participation. Products included in the program are reported in Table 1-1.

Table 1-1: Quantities Delivered through Program by Measure Category

Measure Category	2019	2020	Total
Appliances	**111**	**106**	**217**
Clothes Washer - Electric DHW & Electric Dryer	76	82	158
Clothes Washer - Electric DHW & Gas Dryer	1	8	9
Clothes Washer - Gas DHW & Electric Dryer	29	9	38
Heat Pump Clothes Dryer	5	7	12
Building Shell (sq ft)	**301,316**	**132,722**	**434,038**
Attic Insulation	170,331	88,630	258,961
Floor Insulation	89,505	20,637	110,142
Roof/Attic Insulation	12,480	11,591	24,071
Wall Insulation	26,880	10,000	36,880
Window Upgrade	2,120	1,865	3,985
Energy Kits	**830**	**5,795**	**6,625**
Best Kit	647	865	1,512
LED Kit	183	4,930	5,113
HVAC	**1,107**	**765**	**1,873**
Central Air Conditioner	39	56	95
Duct Sealing and/or Insulation	500	33	533
Heat Pump - Air Source	299	408	707
Heat Pump - Ductless	206	132	338
Heat Pump Commissioning	7	6	13
Smart Thermostat	56	130	186
Lighting	**207,227**	**155,002**	**362,229**
Energy Star	5,513	2,587	8,100
LED	201,714	152,415	354,129
Water Heating	**20**	**13**	**33**
Heat Pump Water Heater	20	13	33
Whole Home	**79**	**24**	**103**
New Home - Performance Path	57	12	69
New Homes - Energy Star Manufactured	22	12	34
Total	**510,690**	**294,427**	**805,117**

1.2 Impact Evaluation Results

Table 1-2 through Table 1-4 present impact evaluation results including claimed savings, evaluated savings and realization rates for each measure category across both program years.

Table 1-2: Total Program Savings 2019-2020

Measure Category	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate	% Program Savings
HVAC	4,408,882	4,151,506	94%	45%
Lighting	4,574,455	3,598,149	79%	40%
Energy Kits	853,656	724,816	85%	8%
Whole Home	323,769	278,854	86%	3%
Building Shell	236,632	197,149	83%	2%
Water Heating	45,481	45,481	100%	1%
Appliances	36,396	37,976	104%	0.40%
Total	**10,479,271**	**9,033,931**	**86%**	**100%**

Table 1-3: Total Program Savings 2019

Measure Category	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate	% Program Savings
HVAC	2,279,506	2,158,318	95%	45%
Lighting	2,662,335	2,106,029	79%	40%
Energy Kits	349,304	283,337	81%	8%
Whole Home	244,739	199,907	82%	3%
Building Shell	178,025	147,408	83%	2%
Water Heating	27,775	27,775	100%	1%
Appliances	17,208	17,812	104%	0.40%
Total	**5,758,893**	**4,940,586**	**86%**	**100%**

Table 1-4: Total Program Savings 2020

Measure Category	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate	% Program Savings
HVAC	2,129,376	1,993,188	94%	45%
Lighting	1,912,119	1,492,120	78%	40%
Energy Kits	504,352	441,479	88%	8%
Whole Home	79,029	78,948	100%	3%
Building Shell	58,607	49,740	85%	2%
Appliances	19,188	20,165	105%	1%
Water Heating	17,706	17,706	100%	0.40%
Total	**4,720,378**	**4,093,345**	**87%**	**100%**

In addition to completing an impact evaluation using UES from applicable TRL source documentation for a census of measures included in the program, ADM also completed a supplemental billing analysis of homes that received incentives for the purchase and installation of heat pump and duct sealing measures.

1.3 Process Evaluation Results

ADM made the following key findings during its process analysis.

- Pacific Power transitioned between implementation contractors during the evaluation period. Pacific Power engaged both contractors during an overlapping period to facilitate data and process transfer.
- The new implementation team provided synergies gained from previous work on the utility's commercial programs and provided enhanced web-based program interfaces for the Home Energy Savings program.
- The technical reference library (TRL) is a key program reference resource that documents ex ante savings values for all versions of all measures included in the program. Maintaining TRL version control, timeliness and completeness was a challenge complicated by the transition to a new implementation team. The new implementer replaced the TRL that was in use during the evaluation period with a new Measure Library (ML) which incorporated several process improvements. The transition to the new ML was completed in June 2021.
- Program tracking data documents the measures and quantities of each that were installed in the service area through of the program. Pacific Power receives and maintains the program tracking dataset. Additional information, such as upstream sales details, downstream product model specifications, and new home model details, are maintained by the implementer.
- The program dataset was missing some data elements required to evaluate program savings. as described in detail in *Section 3 Impact Evaluation*.
- Kits were removed from the program on January 4, 2021.
- Twenty-five percent of Pacific Power customers who responded to the general population survey indicated they have a household income below the federal poverty level.

1.4 Cost Effectiveness Results

Guidehouse estimated program cost-effectiveness results based on 2019 and 2020 costs and savings estimates provided by Pacific Power. Cost-effectiveness was tested using the 2017 and 2019 IRP decrement. The program passed cost-effectiveness for the Participant Cost Test (PCT). Cost-effectiveness results both without and with non-energy benefits are reported below.

1.4.1 Cost-effectiveness Results without Non-energy Benefits (NEBs)

Table 1-5 through Table 1-7 provide cost-effectiveness results for inputs without non-energy benefits (NEBs).

Table 1-5: Program Cost-Effectiveness Results – 2019-2020
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1043	$7,380,018	$5,298,879	-$2,081,139	0.72
Total Resource Cost Test (TRC) No Adder	$0.1043	$7,380,018	$4,817,164	-$2,562,854	0.65
Utility Cost Test (UCT)	$0.0737	$5,182,575	$4,817,164	-$365,411	0.93
Rate Impact Test (RIM)		$11,571,144	$4,817,164	-$6,753,980	0.42
Participant Cost Test (PCT)		$4,689,801	$8,880,927	$4,191,126	1.89
Lifecycle Revenue Impacts ($/kWh)	$0.0000473161				

Table 1-6: Program Cost-Effectiveness Results – 2019
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1101	$4,373,008	$2,080,349	-$2,292,659	0.48
Total Resource Cost Test (TRC) No Adder	$0.1101	$4,373,008	$1,891,227	-$2,481,781	0.43
Utility Cost Test (UCT)	$0.0632	$2,509,871	$1,891,227	-$618,644	0.75
Rate Impact Test (RIM)		$6,211,886	$1,891,227	-$4,320,659	0.30
Participant Cost Test (PCT)		$3,271,127	$5,110,005	$1,838,878	1.56
Lifecycle Revenue Impacts ($/kWh)	$0.0000078213				

Table 1-7: Program Cost-Effectiveness Results – 2020
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0973	$3,007,010	$3,218,530	$211,520	1.07
Total Resource Cost Test (TRC) No Adder	$0.0973	$3,007,010	$2,925,937	-$81,073	0.97
Utility Cost Test (UCT)	$0.0865	$2,672,704	$2,925,937	$253,233	1.09
Rate Impact Test (RIM)		$5,359,258	$2,925,937	-$2,433,321	0.55
Participant Cost Test (PCT)		$1,418,674	$3,770,922	$2,352,248	2.66
Lifecycle Revenue Impacts ($/kWh)	$0.0000955000				

1.4.2 Cost-effectiveness Results with Non-energy Benefits (NEBs)

Table 1-8 through Table 1-10 provide cost-effectiveness results by year for inputs with non-energy benefits.

Table 1-8: Program Cost-Effectiveness Results – 2019-2020
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1043	$7,380,018	$6,525,879	-$854,139	0.88
Total Resource Cost Test (TRC) No Adder	$0.1043	$7,380,018	$6,044,163	-$1,335,854	0.82
Utility Cost Test (UCT)	$0.0737	$5,182,575	$4,817,164	-$365,411	0.93
Rate Impact Test (RIM)		$11,571,144	$4,817,164	-$6,753,980	0.42
Participant Cost Test (PCT)		$4,689,801	$10,107,927	$5,418,126	2.16
Lifecycle Revenue Impacts ($/kWh)	$0.0000473161				

Table 1-9: Program Cost-Effectiveness Results – 2019
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1101	$4,373,008	$2,992,488	-$1,380,520	0.68
Total Resource Cost Test (TRC) No Adder	$0.1101	$4,373,008	$2,803,365	-$1,569,642	0.64
Utility Cost Test (UCT)	$0.0632	$2,509,871	$1,891,227	-$618,644	0.75
Rate Impact Test (RIM)		$6,211,886	$1,891,227	-$4,320,659	0.30
Participant Cost Test (PCT)		$3,271,127	$6,022,144	$2,751,017	1.84
Lifecycle Revenue Impacts ($/kWh)	$0.0000078213				

Table 1-10: Program Cost-Effectiveness Results – 2020
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0973	$3,007,010	$3,533,391	$526,381	1.18
Total Resource Cost Test (TRC) No Adder	$0.0973	$3,007,010	$3,240,798	$233,788	1.08
Utility Cost Test (UCT)	$0.0865	$2,672,704	$2,925,937	$253,233	1.09
Rate Impact Test (RIM)		$5,359,258	$2,925,937	-$2,433,321	0.55
Participant Cost Test (PCT)		$1,418,674	$4,085,783	$2,667,109	2.88
Lifecycle Revenue Impacts ($/kWh)					$0.0000955000

1.5 Conclusions and Recommendations

Pacific Power's 2019-2020 Home Energy Savings program resulted in a savings of 9,033,931 kWh with a resulting realization rate of 86 percent as reported in Table 1-11.

Table 1-11: Total Program Savings by Year

Year	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate
2019	5,758,893	4,940,586	86%
2020	4,720,378	4,093,345	87%
Total	**10,479,271**	**9,033,931**	**86%**

HVAC measures accounted for 45 percent of program savings, lighting measures accounted for 40 percent of savings, and energy kits represent 8 percent of program savings. The remaining measure categories account for 6 percent of program savings. This shift in distribution of program savings from the previous evaluation cycle is the result of declining savings available from lighting and water savings measures, and reflects the transformation of the lighting market (see Table 1-12).

Table 1-12: Total Program Savings by Measure Category

Measure Category	2019-2020				2017-2018	
	Claimed Saving	Evaluated Savings	Realization Rate	% Program Savings	% Program Savings	Realization Rate
HVAC	4,408,882	4,151,506	94%	45%	27%	80%
Lighting	4,574,455	3,598,149	79%	40%	53%	71%
Energy Kits	853,656	724,816	85%	8%	16%	106%
Whole Home	323,769	278,854	86%	3%	2%	100%
Building Shell	236,632	197,149	83%	2%	1%	100%
Appliances	45,481	45,481	100%	1%	1%	100%
Water Heating	36,396	37,976	104%	0.4%	0.3%	100%
Total	**10,479,271**	**9,033,931**	**86%**	**100%**	**100%**	**79%**

1.5.1 Conclusions

ADM draws the following conclusions from its evaluation:

- HVAC measures account for 45 percent of program savings, with a 92 percent realization rate when evaluated using unit savings from TRL reference files. Additional analysis of billing data finds RTF unit savings values may exceed actual savings.
- Lighting accounts for 40 percent of program savings, down from 53 percent from the previous evaluation, reflecting lower lighting savings as the market transformation continues. At the same time, realization rates increased by 8 percent over the past evaluation. This was driven primarily by relatively strong ISRs for highest quantity lighting measures.
- The percentage of savings from Energy Kits fell from 16 percent to 8 percent; realization rates also declined. This decrease was the driven by water saving component ISRs and lower-than-expected percentage of bathroom kit recipients with electric water heaters. Energy saving kits were discontinued from the Home Energy Savings Program in January 2021.
- The drop in realization rate of whole homes measures was the result of data errors (12 duplicate records). Otherwise, whole homes would have resulted in a near 100 percent realization rate.
- Water heating and appliances each continue to represent roughly 1 percent of program savings, maintaining roughly 100 percent realization rate. The small increase in realization rate for appliances is the result of the opportunity to claim slightly higher savings based on higher than reported appliance efficiency ratings.

- Several program data elements collected by the implementer are stored as separate application files rather than in a program database (for example .pdf rebate application files). The same data would be more valuable and useful if it were collected and stored in electronic datasets and transferred to Pacific Power's program tracking dataset.
- The new program contractor has implemented new system and process improvements to replace the Technical Reference Library (TRL) and the rebate application process. The transition to the new Measure Library was completed in June 2021.
- Program data tracking and reporting challenges were exacerbated during the evaluation period by the transition to a new program implementer.
- General population survey results indicate that roughly 38 percent of Pacific Power customers indicated that they do not recall receiving any information about how to save energy from Pacific Power.
- Sixty-three percent of general population survey respondents who purchased LED lighting measures during the evaluation period from non-participating retailers indicated that they made their lighting purchases online.
- Twenty-five percent of customers who responded to the general population survey indicated their household income is below the federal poverty level.
- Pacific Power ended its relationship with Simple Steps program on March 30, 2020.

1.5.2 Recommendations

ADM recommends that Pacific Power consider the following actions.

Add data elements to tracking and reporting

Pacific Power relies on implementation partners to collect and store critical data that is required to evaluate the program and verify the resulting energy savings. ADM recommends that Pacific Power adds the following additional data elements to its internal program tracking datasets:

- Product manufacturer and model numbers for installed measures
- Efficiency specifications for installed measures
- Sales or distribution location for all upstream measures
- Baseline conditions (specifics varies by measure)
- AHRI and ENERGY STAR identification numbers
- Additional data fields as required to define correct measure (e.g. installation location for water heaters).

Continue process improvement of program controls

ADM recommends that Pacific Power work with program implementers to eliminate data errors, ensure that all necessary data elements are reported in the tracking data, and verify that all program eligibility requirements are met for all measures.

Evaluate program on an annual basis

Annual evaluations would allow Pacific Power to monitor program controls and data collection throughout the program year, allowing the utility to respond to program performance mid-cycle. ADM recommends that Pacific Power implement annual rather than biannual program evaluations.

Upgrade leakage modeling methodology

ADM recommends that Pacific Power employ a geospatial modeling method to replace the RSTAT model to estimate upstream program leakage. ADM recommends the methodology documented in the Arkansas TRM V8.1

Confirm matching ex ante savings on partnership programs

ADM recommends that Pacific Power verify coordinated ex ante savings values are used in any future partnership program like the Simple Steps program.

1.5.3 Process Changes in Process

The following process changes have been initiated by the implementor or Pacific Power that address a number of ADM's conclusions and recommendations:

- The Technical Reference Library (TRL) was replaced with a upgraded Measure Library (ML) with enhanced functionality that includes a quality control process to verify that all measure versions include reference documents.
- Pacific Power has revised its leakage estimate methodology to a geospatial modeling method.
- Pacific Power and the implementer have added or are in the process of adding the following data elements to the program dataset: baseline and efficient conditions, AHRI and ENERGY STAR identification numbers, sales and distribution location information for upstream measures.
- A quality control process has been added to ensure that data necessary to calculate savings is collected and reported and that incentives are paid only for applications that meet measure eligibility requirements.
- Quality control processes are in development to improve the use of cooling zone data to use in estimating savings for applicable measures.

2 Introduction and Purpose of Study

ADM Associates, Inc. (ADM) is under contract with PacifiCorp to perform evaluation, measurement, and verification (EM&V) services to determine the energy savings (kWh) that resulted from Pacific Power's 2019-2020 Home Energy Savings Program in Washington. This report documents ADM's findings.

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2.1 Description of Programs

The program provides financial incentives (discounts, rebates, and free products) for Pacific Power residential customers to purchase and install energy efficient products. The program leverages relationships with manufacturers, distributors, and retailers to ensure effective program implementation and optimize participation. Products included in the program are reported in Table 2-1.

Table 2-1: Quantities Delivered through Program by Measure Category

Measure Category	2019	2020	Total
Appliances	**111**	**106**	**217**
Clothes Washer - Electric DHW & Electric Dryer	76	82	158
Clothes Washer - Electric DHW & Gas Dryer	1	8	9
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HVAC	**1,107**	**765**	**1,872**
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New Home - Performance Path	57	12	69
New Homes - Energy Star Manufactured	22	12	34
Total	**510,690**	**294,427**	**805,117**

Table 2-2 reports the methods by which the program provides incentives to customers for each measure category.

Table 2-2: Incentive Delivery Method

Measure Category	Incentive Delivery
Appliances	Post purchase rebate application
Building Shell	Post purchase rebate application
Energy Kits	Free kit requested online for mail delivery Food bank distribution
HVAC	Post purchase rebate application
Lighting	Point-of-sale pricing
Water Heating	Post purchase rebate application
Whole Home	Post installation rebate application

Upstream lighting measures are offered at a discounted price at the point of sale. The program pays the discount incentive to the manufacturer. These point-of-sale incentives do not require the consumer to apply for the financial benefit; it is an efficient and cost-effective means to encourage customers to purchase relatively high-volume, low-cost measures such as LEDs.

Higher value incentives for larger measures (appliances, HVAC, etc.) are processed through a post-purchase application form that is designed to verify that installed measures meet energy efficiency requirements.

Additionally, Pacific Power offered customers the opportunity to request free Starter Kits comprised of energy saving lighting and water saving measures through an online application process and through food bank distribution. Starter Kits were discontinued on January 4, 2021.

2.2 Impact Evaluation Objectives

The objective of the impact evaluation is to determine the energy savings (kWh) that resulted from the program. ADM completed the following steps to evaluate the program:

- Reviewed and reconciled program tracking data to the claimed participation counts and ex-ante savings in 2019 and 2020 annual reports.
- Administered participant surveys to determine installation rates for starter kit components and upstream lighting measures. Surveys were administered online.
- Determined unit energy savings (UES) which incorporate verified variables when possible.
- Achieved a minimum precision of better than ±10 percent with 90 percent statistical confidence ("90/10 precision") for realized savings estimates by measure category.
- Provided comprehensive documentation and transparency for all evaluation tasks.
- Estimated leakage rates for lighting measures using geospatial analysis.
- Provided inputs for cost benefit analyses.
- Provided ongoing technical reviews and guidance throughout the evaluation cycle.
- ADM did not conduct on-site verification or equipment monitoring as part of this evaluation.

2.3 Process Evaluation Objectives

The purpose of the process evaluation is to gain an in-depth understanding of program operations and the challenges and evaluation needs. The evaluation was completed through key staff interviews with Pacific Power and implementation contractor complemented with program documentation review and program participant surveys.

The process evaluation was designed to answer the following research questions.

- What are key barriers and drivers to program success in Pacific Power's Washington service territory?
- How can those be addressed to improve program operations in the future?
- How well did Pacific Power staff, implementation staff, participants, and trade allies work together?

- How do participants learn about the program?
- What percentage of Pacific Power customers are contacted directly by Pacific Power or implementation staff?
- What percentage hears about the program through another avenue and then contacts Pacific Power?
- Were program participants satisfied with their experiences?

3 Impact Evaluation

The Home Energy Savings Program resulted in 8,958,511 kWh savings during the evaluation period. Evaluated savings (kWh) are presented in Table 3-1 through Table 3-3. Detailed impact evaluation results and analysis methodology for each measure category are included in subsequent sections.

Table 3-1: Total Program Savings 2019-2020

Measure Category	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate	% Program Savings
HVAC	4,408,882	4,151,506	94%	45%
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Total	**4,720,378**	**4,093,345**	**87%**	**100%**

3.1 Impact Evaluation Approach

ADM's evaluation of unit energy savings (UES) for each measure takes into consideration savings values presented in TRL reference files. TRL reference files rely heavily on the Regional Technical Forum (RTF) library of measure maintained by Northwest Power and Conservation Council to verify and evaluate energy efficiency savings.

When applicable, ADM incorporated verified variables such as in service rates (ISRs) and hours of use (HOUs) in place of ex ante variables used in the calculation of RTF values.

In addition to completing an impact evaluation using UES from applicable TRL source documentation for a census of measures included in the program, ADM also completed a supplemental billing analysis of homes that received incentives for the purchase and installation of heat pump and duct sealing measures.

3.2 Data Collection and Measure Verification

ADM reviewed and reconciled program tracking data to the participation counts and ex-ante savings indicated in the 2019 and 2020 annual reports. ADM reviewed a census of program tracking data, associated savings values, input assumptions and calculations contained in the Technical Resource Library (TRL) files provided by Pacific Power. ADM issued data requests as needed to ensure that all data was collected that could be reasonably expected or required for this evaluation.

ADM surveyed a representative sample of known participants and employed a general population survey for unknown participants (those who purchased upstream measures) to collect installation data.

ADM completed the following activities as part of the evaluation, measurement and verification process.

- Review of the program tracking database is an essential step for verifying data integrity. ADM reviewed a census of program tracking dataset for completeness, consistency, and compliance with the provided TRL files.
- Review of measure savings assumptions and calculations maintained in the Technical Reference Library (TRL). The TRL files include measure savings assumptions, calculations, source papers or files (e.g. Regional Technical Forum versions), and additional documentation that together comprise the generally accepted rules and guidance for evaluating the program. ADM reviewed all TRL documentation and included in this report any errors, missing data, and inconsistencies identified during ADM's review. Appendix A: Ex Ante Review of TRL includes a complete list of the TRL reference files that ADM used in this evaluation.

- ADM requested program tracking data, TRL reports and reference files, in addition to other program data and verification, as necessary.
- ADM collected primary data from Pacific Power customers through two online surveys; one to customers who received energy kits (starter kits), and the other to the general customer population to collect data about upstream measures.

3.3 Sample Design

ADM achieved a sampling precision of ±10 percent or better with 90 percent statistical confidence – or "90/10 precision" – for gross realized savings estimates at the measure category level.

For upstream lighting measures, for which participants are not known, ADM employed a general population survey where the sampling frame is the population of Pacific Power residential customers in Washington with valid email addresses excluding known participants in any other energy efficiency programs that Pacific Power implemented in 2019 or 2020. Four hundred customers responded to the survey. These responses were used to collect data used in the impact analysis for lighting measures.

For starter kits, the sampling frame is the population of customers who received starter kits for whom the tracking dataset included valid email addresses. Sixty-eight starter kit program participants completed the online survey.

ADM included the following datasets in its evaluation:

- Census review of all measures in the program tracking dataset to determine if appropriate UES values were sourced from TRL files for claimed savings.
- A sample of 564 heat pump manufacturer model numbers and specifications to determine if heat pumps for which incentives were paid met efficiency criteria established in the TRL reference files.
- Census review of lighting measures by manufacturer and product model number to determine if lighting products for which incentives were paid met the efficiency criteria established in the TRL reference files.
- Census review of manufacturer model numbers and specifications for heat pump water heaters and other appliances to determine if measures for which incentives were paid met efficiency criteria established in the TRL reference files.
- A sample of 68 program participants who received energy kits (starter kits) was surveyed for measure installation rates, installation location and process evaluation responses.

- A sample of Pacific Power residential customers who were not known to have participated in any downstream or request-by-mail Home Energy Savings Program offering was surveyed using a general customer population survey to determine measure installation rates, installation locations, and process evaluation responses for upstream lighting measures. See Table 3-4 for survey participation.

Table 3-4: Survey Sample Response Size

Survey	Number of Survey Invites Sent	Number of Completed Surveys	Response Rate
General Population Survey	7,995	400	5%
Energy Kits Survey	580	68	12%

3.4 Determination of Impact Methodology

Table 3-5 shows the methodology used to calculate evaluated savings for each measure category. ADM reviewed TRL UES values, their assumptions and calculations, modeling files, and additional information contained in the TRL and underlying Regional Technical Forum (RTF) files.

Table 3-5: Impact Evaluation Methodology Approach by Measure

Measure Category	Impact Evaluation Methodologies	Inputs to Evaluated Savings
HVAC	Unit Energy Savings Review Supplemental Billing Analysis	• Savings values from TRL reference files • Model specifications • Billing data
Energy Kits	Unit Energy Savings Review	• Savings values from TRL reference files • Energy Kits survey results
Whole Homes	Unit Energy Savings Review	• Project files
Lighting	Unit Energy Savings Review	• Savings values from TRL reference files • General population survey results
Water Heating	Unit Energy Savings Review	• Savings values from TRL reference files • Model specifications
Appliances	Unit Energy Savings Review	• Savings values from TRL reference files • Model specifications
Building Shell	Unit Energy Savings Review	• Savings values from TRL reference files

3.5 Net-to-Gross Ratio

Washington uses a prescribed net-to-gross ratio of 1.0. Therefore, an NTG ratio is not included in impact analyses. ADM competed free ridership and spillover analyses to provide comparison values from previous years for starter kits (see process analysis section 0).

3.6 Note on Measure Versions

Measures are included in the program with up to three different version numbers. Each version is treated as a separate measure for evaluation purposes. Measure and version number are concatenated in the following tables, for example, *Smart Thermostat - eFAF - WA – 1*, *Smart Thermostat - eFAF - WA – 2*, *Smart Thermostat - eFAF - WA – 3* indicate the three versions of the measure Smart Thermostat – eFAF – WA.

3.7 Heating, Ventilation and Air Conditioning (HVAC)

Pacific Power offered customers financial incentives to install energy efficient HVAC measures in their homes during the evaluation period. HVAC measures resulted in 4,151,506 kWh of savings, accounting for 45 percent of total program savings during the evaluation period. HVAC measures included heat pumps, duct sealing, smart thermostats, and central air conditioners. Sixty-eight percent of HVAC savings resulted from air source heat pumps. HVAC program savings are reported in Table 3-6 through Table 3-8.

Table 3-6: HVAC Program Savings 2019-2020

Measure Category	Quantity	Claimed UES (kWh)	Evaluated Gross UES (kWh)	Realization Rate
Central Air Conditioner	95	30,980	30,687	99%
Duct Sealing and/or Insulation	533	463,952	463,952	100%
Heat Pump - Air Source	707	3,009,380	2,806,521	93%
Heat Pump - Ductless	338	796,598	742,927	93%
Heat Pump Commissioning	13	8,190	7,638	93%
Smart Thermostat	186	99,782	99,782	100%
Total	**1,872**	**4,408,882**	**4,151,506**	**94%**

Table 3-7: HVAC Program Savings 2019

Measure Category	Quantity	Claimed UES (kWh)	Evaluated Gross UES (kWh)	Realization Rate
Central Air Conditioner	39	15,366	15,222	99%
Duct Sealing and/or Insulation	500	430,145	430,145	100%
Heat Pump - Air Source	299	1,305,211	1,217,683	93%
Heat Pump - Ductless	206	493,668	460,407	93%
Heat Pump Commissioning	7	4,410	4,155	94%
Smart Thermostat	56	30,706	30,706	100%
Total	**1,107**	**2,279,506**	**2,158,318**	**95%**

Table 3-8: HVAC Program Savings 2020

Measure Category	Quantity	Claimed UES (kWh)	Evaluated Gross UES (kWh)	Realization Rate
Central Air Conditioner	56	15,614	15,464	99%
Duct Sealing and/or Insulation	33	33,807	33,807	100%
Heat Pump - Air Source	408	1,704,169	1,588,838	93%
Heat Pump - Ductless	132	302,930	282,520	93%
Heat Pump Commissioning	6	3,780	3,483	92%
Smart Thermostat	130	69,076	69,076	100%
Total	**765**	**2,129,376**	**1,993,188**	**94%**

3.7.1 Tracking Data Verification

ADM reviewed program tracking data to evaluate if:

- The tracking dataset included duplicate or erroneous data entries.
- Data entries in the program tracking dataset included all necessary fields for savings calculations.
- Claimed energy savings matched the applicable TRL source documents and calculations;
- Installed measures met incentive efficiency requirements for a sample of HVAC measure items (e.g., model numbers or HSPF reported in implementer's tracking data and/or application data.)

Through this review process, ADM found the following in the dataset:

- One of 56 central air conditioners did not meet the TRL guidelines for SEER rating and the model numbers and SEER ratings were missing for 4 other air conditioners.
- 84 smart thermostat records were missing model and/or application data. Because ADM was able to verify 100 percent of the remaining smart thermostats in the program, this finding did not impact measure savings.
- The HSPF ratings for 38 (7 percent) of heat pump records out of a sample of 564 did not meet TRL efficiency guidelines.

3.7.2 Ex Ante Review

ADM evaluated the UES values claimed by Pacific Power to verify that they were supported by the applicable TRL documents. Savings values reported in the tracking data matched the values reported in reference files included in the TRL. ADM accepted the claimed savings for all HVAC measures.

3.7.3 Evaluated Savings

Evaluated savings were calculated using UES values included in the TRL reference files for all HVAC measures for which ADM could verify savings through a review of the program data. For two measure types, ADM was unable to fully verify savings: central air conditioners and heat pumps.

ADM was able to verify that the SEER ratings for 106 of the 107 central air conditioners reviewed met TRL guidelines; therefore, the realization rate for central air conditioners was 99 percent. This realization rate was applied to all central air conditioners in the program.

ADM verified HSPF ratings for a sample of 564 records of heat pumps. From that sample, ADM could not verify savings for 38 heat pumps because the HSPF ratings of the heat pump models tracked in the program application data did not meet TRL guidelines. From this verification exercise, ADM calculated a 93.26 percent realization rate, which was applied to the claimed savings for all heat pumps. Average UES are reported in Table 3-9. Total savings are reported in Table 3-10 Table 3-12.

Table 3-9: HVAC Unit Energy Savings (UES) by Measure

Measure - Version	Average Claimed UES	Average Evaluated UES	Realization Rate
Central Air Conditioner			
Central Air Conditioner with Best Practice Install and Sizing - WA - 2	394	390	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 3	265	263	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 4	265	263	99%
Manufactured Home - Central Air Conditioner with Best Practice Install and Sizing - WA - 1	394	390	99%
Duct Sealing and/or Insulation			
Duct Sealing - Electric Forced Air Furnace - WA - 2	1,049	1,049	100%
Duct Sealing - Electric Forced Air Furnace - WA - 3	1,254	1,254	100%
Duct Sealing - Electric Forced Air Furnace - WA - 4	1,254	1,254	100%
Duct Sealing - Heat Pump - WA - 2	752	752	100%
Duct Sealing - Heat Pump - WA - 4	848	848	100%

Measure - Version	Average Claimed UES	Average Evaluated UES	Realization Rate
Duct Sealing and Insulation - Electric Forced Air Heating System - WA - 3	1,657	1,657	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA - 2	1,163	1,163	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA (New) - 1	1,067	1,067	100%
Manufactured Home - Direct Install - eFAF - Test and Seal - WA - 1	973	973	100%
Manufactured Home - Direct Install - eFAF - Test Only - WA - 1	-	-	NA
Manufactured Home - Direct Install - eFAF - Test, Seal, & Crossover - WA - 1	973	973	100%
Manufactured Home - Direct Install - Heat Pump - Test and Seal - WA - 1	615	615	100%
Manufactured Home - Direct Install - Heat Pump - Test Only - WA - 1	-	-	NA
Manufactured Home - Direct Install - Heat Pump - Test, Seal, & Crossover - WA - 1	615	615	100%
Manufactured Home - Duct Sealing - Contractor Install - eFAF - WA - 1	973	973	100%
Manufactured Home - Duct Sealing - Contractor Install - Heat Pump - WA - 1	615	615	100%
Manufactured Home - Duct Sealing - Not Direct Install - eFAF - WA - 2	973	973	100%
Heat Pump - Air Source			
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF with CAC - WA - 3	7,066	6,590	93%
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF without CAC - WA - 3	6,847	6,386	93%
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	6,957	6,488	93%
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	6,738	6,284	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF with CAC - WA - 2	7,066	6,590	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF without CAC - WA - 2	6,847	6,386	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/CAC - WA - 1	6,957	6,488	93%

Measure - Version	Average Claimed UES	Average Evaluated UES	Realization Rate
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	6,738	6,284	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	739	689	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	739	689	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	5,463	5,095	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	5,159	4,811	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 1	5,463	5,095	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 1	5,159	4,811	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	5,069	4,727	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	720	671	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	720	671	93%
Heat Pump – Ductless			
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	3,521	3,284	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 2	2,341	2,183	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 3	2,341	2,183	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	3,836	3,578	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	2,550	2,378	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 3	2,550	2,378	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	2,239	2,088	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2,239	2,088	93%

Measure - Version	Average Claimed UES	Average Evaluated UES	Realization Rate
Ductless Heat Pump - Zonal to DHP 12.6 and above - WA - 1	2,341	2,183	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	2,146	2,001	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 2	2,146	2,001	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	5,265	4,910	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	5,736	5,350	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	5,736	5,350	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	2,239	2,088	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2,239	2,088	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	2,146	2,001	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	1,224	1,142	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	1,224	1,142	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	1,173	1,094	93%
Heat Pump Commissioning			
Heat Pump - Commissioning, Controls, and Sizing - WA - 1	630	588	93%
Heat Pump - Commissioning, Controls, and Sizing - WA - 2	630	588	93%
Manufactured Home - Heat Pump - Commissioning, Controls, and Sizing - WA - 1	630	588	93%
Smart Thermostat			
Manufactured Home - Smart Thermostat - eFAF - WA - 1	434	434	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 2	434	434	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 4	434	434	100%

Measure - Version	Average Claimed UES	Average Evaluated UES	Realization Rate
Manufactured Home - Smart Thermostat - Heat Pump - WA - 1	628	628	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 2	628	628	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 4	628	628	100%
Smart Thermostat - eFAF - WA - 1	434	434	100%
Smart Thermostat - eFAF - WA - 2	434	434	100%
Smart Thermostat - eFAF - WA - 3	434	434	100%
Smart Thermostat - eFAF - WA - 4	434	434	100%
Smart Thermostat - Heat Pump - WA - 1	628	628	100%
Smart Thermostat - Heat Pump - WA - 2	638	638	100%
Smart Thermostat - Heat Pump - WA - 3	628	628	100%
Smart Thermostat - Heat Pump - WA - 4	628	628	100%

See Appendix A for sources.

Table 3-10: HVAC Program Savings by Measure 2019-2020

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Central Air Conditioner with Best Practice Install and Sizing - WA - 2	44	17,336	17,170	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 3	26	6,890	6,826	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 4	24	6,360	6,301	99%
Duct Sealing - Electric Forced Air Furnace - WA - 2	2	2,098	2,098	100%
Duct Sealing - Electric Forced Air Furnace - WA - 3	1	1,254	1,254	100%
Duct Sealing - Electric Forced Air Furnace - WA - 4	2	2,508	2,508	100%
Duct Sealing - Heat Pump - WA - 2	8	6,016	6,016	100%
Duct Sealing - Heat Pump - WA - 4	2	1,696	1,696	100%
Duct Sealing and Insulation - Electric Forced Air Heating System - WA - 3	4	6,628	6,628	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA - 2	2	2,326	2,326	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA (New) - 1	3	3,201	3,201	100%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	4	14,084	13,135	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 2	3	7,023	6,550	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 3	4	9,364	8,733	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	25	95,900	89,439	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	6	15,300	14,269	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 3	12	30,600	28,538	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	99	221,661	206,726	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	13	29,107	27,146	93%
Ductless Heat Pump - Zonal to DHP 12.6 and above - WA - 1	2	4,682	4,367	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	90	193,140	180,127	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 2	21	45,066	42,030	93%
Heat Pump - Commissioning, Controls, and Sizing - WA - 1	2	1,260	1,175	93%
Heat Pump - Commissioning, Controls, and Sizing - WA - 2	2	1,260	1,175	93%
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF with CAC - WA - 3	41	289,706	270,187	93%
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF without CAC - WA - 3	19	130,093	121,328	93%
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	3	20,871	19,465	93%

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	1	6,738	6,284	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF with CAC - WA - 2	61	431,026	401,985	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF without CAC - WA - 2	177	1,211,919	1,130,265	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/CAC - WA - 1	4	27,828	25,953	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	15	101,070	94,260	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	190	140,410	130,850	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	40	29,560	27,568	93%
Manufactured Home - Central Air Conditioner with Best Practice Install and Sizing - WA - 1	1	394	390	99%
Manufactured Home - Direct Install - eFAF - Test and Seal - WA - 1	335	325,955	325,955	100%
Manufactured Home - Direct Install - eFAF - Test Only - WA - 1	4	-	-	NA
Manufactured Home - Direct Install - eFAF - Test, Seal, & Crossover - WA - 1	18	17,514	17,514	100%
Manufactured Home - Direct Install - Heat Pump - Test and Seal - WA - 1	129	79,335	79,335	100%
Manufactured Home - Direct Install - Heat Pump - Test Only - WA - 1	2	-	-	NA
Manufactured Home - Direct Install - Heat Pump - Test, Seal, & Crossover - WA - 1	10	6,150	6,150	100%
Manufactured Home - Duct Sealing - Contractor Install - eFAF - WA - 1	5	4,865	4,865	100%
Manufactured Home - Duct Sealing - Contractor Install - Heat Pump - WA - 1	4	2,460	2,460	100%
Manufactured Home - Duct Sealing - Not Direct Install - eFAF - WA - 2	2	1,946	1,946	100%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	1	5,265	4,910	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	10	57,360	53,495	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	1	5,736	5,350	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	2	4,478	4,176	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2	4,478	4,176	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	2	4,292	4,003	93%
Manufactured Home - Heat Pump - Commissioning, Controls, and Sizing - WA - 1	9	5,670	5,288	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	18	98,334	91,709	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	9	46,431	43,303	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 1	32	174,816	163,038	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 1	51	263,109	245,382	93%

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	1	5,069	4,727	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	41	29,520	27,531	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	4	2,880	2,686	93%
Manufactured Home - Smart Thermostat - eFAF - WA - 1	1	434	434	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 2	14	6,076	6,076	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 4	3	1,302	1,302	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 1	2	1,256	1,256	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 2	6	3,768	3,768	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 4	2	1,256	1,256	100%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	15	18,360	17,123	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	4	4,896	4,566	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	22	25,806	24,067	93%
Smart Thermostat - eFAF - WA - 1	5	2,170	2,170	100%
Smart Thermostat - eFAF - WA - 2	50	21,700	21,700	100%
Smart Thermostat - eFAF - WA - 3	5	2,170	2,170	100%
Smart Thermostat - eFAF - WA - 4	13	5,642	5,642	100%
Smart Thermostat - Heat Pump - WA - 1	12	7,536	7,536	100%
Smart Thermostat - Heat Pump - WA - 2	64	40,820	40,820	100%
Smart Thermostat - Heat Pump - WA - 3	5	3,140	3,140	100%
Smart Thermostat - Heat Pump - WA - 4	4	2,512	2,512	100%
Total	**1,872**	**4,408,882**	**4,151,506**	**94%**

Table 3-11: HVAC Program Savings by Measure 2019

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Central Air Conditioner with Best Practice Install and Sizing - WA - 2	38	14,972	14,832	99%
Duct Sealing - Electric Forced Air Furnace - WA - 2	2	2,098	2,098	100%
Duct Sealing - Heat Pump - WA - 2	7	5,264	5,264	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA (New) - 1	3	3,201	3,201	100%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	3	10,563	9,851	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	22	84,392	78,706	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	80	179,120	167,052	93%
Ductless Heat Pump - Zonal to DHP 12.6 and above - WA - 1	1	2,341	2,183	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	53	113,738	106,075	93%
Heat Pump - Commissioning, Controls, and Sizing - WA - 1	2	1,260	1,218	97%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF with CAC - WA - 2	17	120,122	112,029	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF without CAC - WA - 2	107	732,629	683,729	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/CAC - WA - 1	2	13,914	12,977	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	12	80,856	75,408	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	91	67,249	62,668	93%
Manufactured Home - Central Air Conditioner with Best Practice Install and Sizing - WA - 1	1	394	390	99%
Manufactured Home - Direct Install - eFAF - Test and Seal - WA - 1	325	316,225	316,225	100%
Manufactured Home - Direct Install - eFAF - Test Only - WA - 1	4	-	-	NA
Manufactured Home - Direct Install - eFAF - Test, Seal, & Crossover - WA - 1	18	17,514	17,514	100%
Manufactured Home - Direct Install - Heat Pump - Test and Seal - WA - 1	127	78,105	78,105	100%
Manufactured Home - Direct Install - Heat Pump - Test Only - WA - 1	2	-	-	NA
Manufactured Home - Direct Install - Heat Pump - Test, Seal, & Crossover - WA - 1	10	6,150	6,150	100%
Manufactured Home - Duct Sealing - Contractor Install - eFAF - WA - 1	1	973	973	100%
Manufactured Home - Duct Sealing - Contractor Install - Heat Pump - WA - 1	1	615	615	100%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	10	57,360	53,495	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	1	2,239	2,088	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	1	2,146	2,001	93%
Manufactured Home - Heat Pump - Commissioning, Controls, and Sizing - WA - 1	5	3,150	2,938	93%

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 1	16	87,408	81,519	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 1	36	185,724	173,211	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	1	5,069	4,727	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	17	12,240	11,415	93%
Manufactured Home - Smart Thermostat - eFAF - WA - 1	1	434	434	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 2	5	2,170	2,170	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 1	2	1,256	1,256	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 2	1	628	628	100%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	14	17,136	15,981	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	21	24,633	22,973	93%
Smart Thermostat - eFAF - WA - 1	5	2,170	2,170	100%
Smart Thermostat - eFAF - WA - 2	12	5,208	5,208	100%
Smart Thermostat - Heat Pump - WA - 1	12	7,536	7,536	100%
Smart Thermostat - Heat Pump - WA - 2	18	11,304	11,304	100%
Total	**1,107**	**2,279,506**	**2,158,318**	**95%**

Table 3-12: HVAC Program Savings by Measure 2020

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Central Air Conditioner with Best Practice Install and Sizing - WA - 2	6	2,364	2,338	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 3	26	6,890	6,826	99%
Central Air Conditioner with Best Practice Install and Sizing - WA - 4	24	6,360	6,301	99%
Duct Sealing - Electric Forced Air Furnace - WA - 3	1	1,254	1,254	100%
Duct Sealing - Electric Forced Air Furnace - WA - 4	2	2,508	2,508	100%
Duct Sealing - Heat Pump - WA - 2	1	752	752	100%
Duct Sealing - Heat Pump - WA - 4	2	1,696	1,696	100%
Duct Sealing and Insulation - Electric Forced Air Heating System - WA - 3	4	6,628	6,628	100%
Duct Sealing and Insulation - Heat Pump Heating System - WA - 2	2	2,326	2,326	100%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	1	3,521	3,284	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 2	3	7,023	6,550	93%
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 3	4	9,364	8,733	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	3	11,508	10,733	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	6	15,300	14,269	93%
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 3	12	30,600	28,538	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	19	42,541	39,675	93%
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	13	29,107	27,146	93%
Ductless Heat Pump - Zonal to DHP 12.6 and above - WA - 1	1	2,341	2,183	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	37	79,402	74,052	93%
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 2	21	45,066	42,030	93%
Heat Pump - Commissioning, Controls, and Sizing - WA - 1	0	0	-42	NA
Heat Pump - Commissioning, Controls, and Sizing - WA - 2	2	1,260	1,175	93%
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF with CAC - WA - 3	41	289,706	270,187	93%
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF without CAC - WA - 3	19	130,093	121,328	93%
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	3	20,871	19,465	93%
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	1	6,738	6,284	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF with CAC - WA - 2	44	310,904	289,957	93%

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF without CAC - WA - 2	70	479,290	446,536	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/CAC - WA - 1	2	13,914	12,977	93%
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	3	20,214	18,852	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	99	73,161	68,182	93%
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	40	29,560	27,568	93%
Manufactured Home - Direct Install - eFAF - Test and Seal - WA - 1	10	9,730	9,730	100%
Manufactured Home - Direct Install - Heat Pump - Test and Seal - WA - 1	2	1,230	1,230	100%
Manufactured Home - Duct Sealing - Contractor Install - eFAF - WA - 1	4	3,892	3,892	100%
Manufactured Home - Duct Sealing - Contractor Install - Heat Pump - WA - 1	3	1,845	1,845	100%
Manufactured Home - Duct Sealing - Not Direct Install - eFAF - WA - 2	2	1,946	1,946	100%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	1	5,265	4,910	93%
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	1	5,736	5,350	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	1	2,239	2,088	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2	4,478	4,176	93%
Manufactured Home - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	1	2,146	2,001	93%
Manufactured Home - Heat Pump - Commissioning, Controls, and Sizing - WA - 1	4	2,520	2,350	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	18	98,334	91,709	93%
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	9	46,431	43,303	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 1	16	87,408	81,519	93%
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 1	15	77,385	72,171	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	24	17,280	16,116	93%
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	4	2,880	2,686	93%
Manufactured Home - Smart Thermostat - eFAF - WA - 2	9	3,906	3,906	100%
Manufactured Home - Smart Thermostat - eFAF - WA - 4	3	1,302	1,302	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 2	5	3,140	3,140	100%
Manufactured Home - Smart Thermostat - Heat Pump - WA - 4	2	1,256	1,256	100%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	1	1,224	1,142	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	4	4,896	4,566	93%
Multifamily - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	1	1,173	1,094	93%

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Saving (kWh)	Realization Rate
Smart Thermostat - eFAF - WA - 2	38	16,492	16,492	100%
Smart Thermostat - eFAF - WA - 3	5	2,170	2,170	100%
Smart Thermostat - eFAF - WA - 4	13	5,642	5,642	100%
Smart Thermostat - Heat Pump - WA - 2	46	29,516	29,516	100%
Smart Thermostat - Heat Pump - WA - 3	5	3,140	3,140	100%
Smart Thermostat - Heat Pump - WA - 4	4	2,512	2,512	100%
Total	**765**	**2,129,376**	**1,993,188**	**94%**

3.7.4 Discussion of Realization Rates

Evaluated savings for the HVAC measure category resulted in 94 percent realization rate.

Realization rates other than 100 percent resulted from the following factors:

Efficiency rating threshold documented in TRL reference files was not met for 39 records in the tracking data (1 central air conditioner and 38 heat pumps). The verification rates for these measures resulted in decreased realization rates.

3.7.5 Additional Analysis of Heat Pumps and Duct Sealing

To fulfill the M&V commitments outlined in the work plan, ADM completed a billing analysis using consumption data from homes that installed ductless heat pumps, air source heat pumps, and duct sealing/insulation during the evaluation period. The following sections outline the methodology and results of this analysis.

3.7.5.1 Data Collection and Review

ADM reviewed all program tracking data available for customers that received heat pumps through the program. The program data included the *Project Creation Date* (presumed to be the date on which the new heat pump was installed), the *Measure Subcategory* indicating if either a “Air Source” or “Ductless” heat pump was installed.

ADM received billing data from early 2017 through early 2021 for 306 unique residential premises that installed ductless heat pumps discounted through the program, 702 premises that installed air source heat pumps discounted through the program, and 531 premises that installed duct sealing and/or insulation through the program. ADM removed premises from the analysis using the following criteria:

- 6 or more months of billing data both prior to installation of the heat pump as well as following installation required for inclusion in the model.
- No periods of zero energy consumption that might indicate the premise was not occupied.

After completing these data review checks, ADM found that there were 181 premises with ductless heat pumps, 448 with air source heat pumps, and 466 with new duct sealing/insulation available for use in ADM’s regression models.

In addition to customer-specific data, ADM also acquired weather data from the National Oceanic and Atmospheric Administration database. Because the evaluation service territory spans a large area, premises are paired with their closest weather station by zip code.

3.7.5.2 **Analysis Methodology**

ADM performed a regression analysis which involves the use of a linear regression model on premise energy consumption data with a dummy term (that is either 1 or 0) labeled as 'post' included to designate whether a data point occurs before or after installation. This has the effect of allowing the term to drop out of the regression for pre-period data points and assigns a coefficient value for post-period data points that describes how the energy consumption changes solely due to the intervention effect while controlling for other regression variables. The model is shown in Equation 3-1.

Equation 3-1: Ductless Heat Pump Linear Regression Model

$$AEC_{i,t} = \alpha_j + \beta_1 \times Post + \beta_2 \times Month + \beta_3 \times DD + \epsilon$$

Where:

$AEC_{i,t}$	is the average daily consumption of electricity for period, *t,* for a given customer (*i*).
$\alpha_{j[i]}$	is an intercept term unique to each account number where $j = 1, \dots, J$ and J is the number of premises.
$Post$	is a dummy variable that can be either 0 or 1 depending on whether or not a data point is before or after measure installation.
$Month$	is a set of categorical dummy variables controlling for changes in base consumption for each month of the year.
DD	represents the degree day variable for each data point, used as a proxy for either heating or cooling usage, depending on the seasonal model[1].
ϵ	The error term.

For both the ductless and air source heat pumps, ADM ran two seasonal regression models, one using summer-month data (billing records from June through September) and the other using winter-month data (billing records from October through May). For premises that installed duct sealing / insulation through the program, ADM used a single regression analysis that accounts for both the heating and cooling seasons by adding an additional *DD* term into the regression model.

[1] ADM determined optimal cooling and heating degree day base temperatures to use in the regression by creating a list of possible degree day base temperatures (both cooling and heating) at whole number intervals and then iterating through the 2-dimensional set. Each iteration fit a linear regression model to energy consumption and a degree day set; the set which minimized the root mean squared error of the model was then used as the optimal degree day base temperatures. Based on the results of this analysis, ADM used a base temperature of 70°F for cooling and 55°F for heating.

3.7.5.3 **Ductless Heat Pump Regression Analysis Results**

The results of the regression analysis are shown below in Table 3-13. ADM found that consumption decreased by 0.88 kWh/day during summer months and by 1.94 kWh/day during the winter months. Overall, these results indicate a net annual decrease in energy consumption following the installation of a heat pump of 577 kWh per premise.

Table 3-13: Ductless Heat Pump Regression Analysis Results

Season	Daily Savings	Daily Error	Seasonal Savings†	Annual Savings	Premise Count	Data Points
Summer	0.88	0.40	106	577	181	2,539
Winter	1.94	0.39	471		181	5,426

†ADM defined the "Summer Season" as June-September (122 days) and the "Winter Season" as October-May (243 days).

Regression statistics are provided in Table 3-14 for each coefficient listed in Table 3-13. as well as the standard error on those estimates and associated t-value and R-Squared values for each. T-value can be interpreted as the relative importance of the term in estimating the premise consumption. For example, the magnitude of the CDD and HDD terms (β_3) relative to the t-values of the other terms indicate their significant influence in determining the predicted consumption. Moreover, ADM considers all results to be statistically significant because the absolute value of the t-value for β_1, the coefficient used to determine savings, is less than -1.645, the z-score which corresponds to the 90 percent confidence level. The R-Squared value can be interpreted as the linear regression fit, where a value of 1 indicates a perfect fit.

Table 3-14: Ductless Heat Pump Regression Analysis Statistics

Season	Term	Estimate	Standard Error	t-value	R-Squared (fixed effects)
Summer	$\alpha_{j[i]}$	28.88	1.27	22.79	0.80
	β_1	-0.88	0.40	-2.23	
	β_2	*	*	*	
	β_3	12.50	1.45	8.60	
Winter	$\alpha_{j[i]}$	33.37	1.90	17.51	0.75
	β_1	-1.93	0.39	-4.99	
	β_2	*	*	*	
	β_3	25.31	1.01	25.19	

**Values for every month not shown*

3.7.5.4 **Air Source Heat Pump Regression Analysis Results**

The results of the regression analysis are shown in Table 3-15. ADM found that consumption decreased by 2.71 kWh/day during summer months and by 8.23 kWh/day during the winter months. Overall, these results indicate a net annual decrease in energy consumption following the installation of a heat pump of 2,328 kWh per premise.

Table 3-15: Air Source Heat Pump Regression Analysis Results

Season	Daily Savings	Daily Error	Seasonal Savings†	Annual Savings	Premise Count	Data Points
Summer	2.71	0.29	328	2,328	448	6,441
Winter	8.23	0.25	2,000		449	13,705

†ADM defined the "Summer Season" as June-September (122 days) and the "Winter Season" as October-May (243 days).

Regression statistics are provided in Table 3-16 for each coefficient listed in Table 3-15 as well as the standard error on those estimates and associated t-value and R-Squared values for each. T-value can be interpreted as the relative importance of the term in estimating the premise consumption. For example, the magnitude of the CDD and HDD terms (β_3) relative to the t-values of the other terms indicate their significant influence in determining the predicted consumption. Moreover, ADM considers the results to be statistically significant for the winter season because the absolute value of the t-value for β_1, the coefficient used to determine savings, is less than -1.645, the z-score which corresponds to the 90 percent confidence level. The R-Squared value can be interpreted as the linear regression fit, where a value of 1 indicates a perfect fit.

Table 3-16: Air Source Heat Pump Regression Analysis Statistics

Season	Term	Estimate	Standard Error	t-value	R-Squared (fixed effects)
Summer	$\alpha_{j[i]}$	37.50	0.99	38.026	0.85
	β_1	-2.71	0.29	-9.37	
	β_2	*	*	*	
	β_3	25.53	0.99	25.56	
Winter	$\alpha_{j[i]}$	40.63	1.21	33.51	0.79
	β_1	-8.23	0.25	-33.41	
	β_2	*	*	*	
	β_3	33.38	0.65	50.95	

**Values for every month not shown*

3.7.5.5 **Duct Sealing / Insulation Regression Analysis Results**

The results of the regression analysis are shown in Table 3-17. ADM found that consumption decreased by 1.73 kWh/day during. Overall, these results indicate a net annual decrease in energy consumption following the installation of a heat pump of 631 kWh per premise.

Table 3-17: Duct Sealing / Insulation *Regression Analysis Results*

Daily Savings	Daily Error	Annual Savings	Premise Count	Data Points
1.73	0.16	631	446	21,346

Regression statistics are provided in Table 3-18 for the coefficient in Table 3-17 as well as the standard error on those estimates and associated t-value and R-Squared values for each. T-value can be interpreted as the relative importance of the term in estimating the premise consumption. For example, the magnitude of the CDD and HDD terms (β_3 and $\beta 4$) relative to the t-values of the other terms indicate their significant influence in determining the predicted consumption. Moreover, ADM considers the results to be statistically significant for the winter season because the absolute value of the t-value for β_1, the coefficient used to determine savings, is less than -1.645, the z-score which corresponds to the 90 percent confidence level. The R-Squared value can be interpreted as the linear regression fit, where a value of 1 indicates a perfect fit.

Table 3-18: Duct Sealing / Insulation Regression Analysis Statistics

Term	Estimate	Standard Error	t-value	R-Squared (fixed effects)
$\alpha_{j[i]}$	29.14	0.95	30.56	0.81
β_1	-1.73	0.16	-10.60	
β_2	*	*	*	
β_3 †	19.28	1.24	15.55	
β_4 §	34.86	0.54	64.44	

**Values for every month not shown*
†Heating Degree Day term. §Cooling Degree Day term.

3.7.5.6 **Discussion of Regression Analyses**

Both summer season and winter season regression analyses indicate a net decrease in consumption following the installation of air source and ductless heat pumps. However, the results of the regression analysis presented in this report indicate that the energy savings indicated in TRL reference files may be higher than what is achieved through the program.

The savings indicated from ADM's analysis of consumption data from customers who participated in the duct sealing offering also suggest that the savings assumptions used in the TRL documents may not accurately reflect the range of baseline conditions present in the customer population.

In future program years, supplementary data, such as results from Blower Door Tests done before and after the installation of all duct sealing measures, could be gathered from a sample of homes to support the development of more applicable TRL savings values. Such testing of a home's duct leakage rate before and after duct sealing is installed is a common approach within the industry.

3.8 Lighting

A total of 362,229 discounted LED lighting measures were sold through 42 retail locations in Pacific Power's Washington service area through the upstream lighting program during the evaluation period. Lighting measures resulted in 3,391,331 kWh of savings during the evaluation period with a realization rate of 79 percent, representing 40 percent of program savings.

Eleven percent of the lighting units were sold through the Simple Steps program, an upstream lighting program partnership with an adjacent electricity utility that included retail stores on the border between utility companies' service areas. Pacific Power ended participation in Simple Steps effective March 30, 2020.

ADM reviewed claimed savings included in tracking data and ex ante savings values reported in TRL reference files. It also calculated in-service rates (ISRs) and hours of use (HOUs) for lighting measures using responses from a general population survey emailed to Pacific Power customers. Additionally, ADM calculated and applied a leakage rate to gross evaluated savings to calculate net evaluated savings. Total program savings from lighting measures are reported in Table 3-19.

Table 3-19: Lighting Program Savings

Year	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Total Lighting Program Savings						
2019	207,227	2,662,337	2,106,029	79%	5.7%	1,984,976
2020	155,002	1,912,120	1,492,121	78%	5.7%	1,406,354
Total	**362,229**	**4,574,455**	**3,598,151**	79%	5.7%	3,391,331
Lighting Program Savings Excluding Simple Steps						
2019	185,034	2,365,157	1,878,742	79%	5.7%	1,770,754
2020	136,954	1,679,901	1,314,665	78%	5.7%	1,239,099
Total	321,988	4,045,058	3,193,406	79%	5.7%	3,009,852
Lighting Program Savings Simple Steps Only						
2019	22,193	297,179	227,287	76%	5.7%	214,223
2020	18,048	232,218	177,455	76%	5.7%	167,255
Total	40,241	529,397	404,742	76%	5.7%	381,478

3.8.1 Tracking Data Verification

ADM evaluated program tracking data, as well as datasets from three program implementers: CLEAResult, Nexant and the Simple Steps program.

ADM reviewed program tracking data and lighting memorandums of agreement (MOUs) with lighting measure manufacturers to evaluate if:

- the tracking dataset included duplicate or erroneous data entries,
- data entries in the program tracking dataset included all necessary fields for savings calculations,
- claimed energy savings match the applicable TRL source documents and calculations,
- specific product model numbers sold through the program met the requirements of the measure definition as documented in the TRL reference files,
- upstream lighting measures were sold through retail stores in the service area.

ADM verified that 89 percent of bulbs sold through the upstream program were sold from retail stores in the service area. Eleven percent of the lighting units were sold through the Simple Steps program, an upstream lighting program partnership with an adjacent electricity utility that included retail stores on the border between utility companies' service areas.

ADM found the following in the dataset:

- Ten records, totaling 2,882 lighting units with a total claimed savings of 38,134 kWh reported incorrect UES. All of these errors occurred in upstream sales reported through the Simple Steps program.
- Eighteen of 119 light fixture model numbers included in the MOUs with lighting manufacturers did not meet the requirements included in the TRL reference documents (17 models were because they had replaceable rather than integrated bulbs). No adjustments were made to evaluated savings because of these findings. Quantities of specific model numbers (as opposed to specific measures) were not able to be extracted from the data provided.

3.8.2 Ex Ante Review

ADM compared ex ante values in TRL reference documents with claimed savings included in program tracking data. Up to three different versions of each measure were included in the tracking data. ADM reviewed each version independently. Discrepancies between ex ante savings documented in the TRL and claimed savings occurred in records of lighting units sold through the Simple Steps program.

The ex-ante savings values included in the Service Agreement for the Simple Steps program were drawn from an RTF reference file (ResLighting_v6_1.xlsm). The Simple Steps ex ante values were designated as "Annual Savings @ Generator Busbar (kwh/yr) - Period 1". Pacific Power's TRL's ex ante values are drawn from "Annual Savings @ Site (kWh/yr) - Period 1" from the same RTF reference file (ResLighting_v6_1.xlsm). The TRL and Simple Steps ex ante values did not match. Additionally, the Generator Busbar values were not uniformly applied as claimed savings for measures sold through Simple Steps; a portion of Simple Steps records use claimed savings values that match the "TRL Annual Savings @ Site value".

3.8.3 Evaluated Unit Energy Savings

Unit energy savings (UES) were evaluated for each lighting measure sold through the upstream program using ex ante savings (kWH) values from the indicated reference file for each version of each measure. ADM calculated evaluated UES using ISRs and HOUs collected from general population survey responses to modify ex ante savings values. The total gross evaluated savings by measure is the product of the evaluated UES and the quantity of the measure sold through the program as documented in the program tracking data. Total net savings for lighting measures applies an evaluated leakage rate that reflects an estimate of the percentage of bulbs sold through the program that are not installed in the service area.

ADM calculated IRS and HOU from customer survey responses for each of three categories of lighting measures: standard bulbs, specialty bulbs, and fixtures.

In Service Rates (ISR)

ISR were calculated using Equation 3-2.

Equation 3-2: In-Service Rate – Lighting Measures

$$ISR = (Qty\ currently\ installed + (Qty\ stored/3))/Qty\ Purchased$$

Hours of Use (HOU)

ADM used a weighted average HOU calculated for each lighting measure type (standard bulbs, specialty bulbs and fixtures), using locations identified in the general population survey. Hours per room were drawn from *Lighting HOU Residential Building Stock Assessment: Metering Study: Report #E14-283*, prepared by Northwest Energy Efficiency Alliance, (April 28, 2014) as indicated in the TRL.

ADM made an exception for bathroom vanity fixtures and exterior porch and exterior security fixtures. For these lighting measures, ADM used ex ante HOUs rather than a weighted average because of the dedicated functionality of these fixtures.

UES (kWh)

UES are reported for each version of each measure in Table 3-20. When claimed savings included in the program tracking data for a measure included records that did not equal TRL ex ante savings, average claimed UES does not equal the ex-ante UES indicated in TRL reference documents.

Table 3-20: Lighting Unit Energy Savings (UES) by Measure

Measure - Version	UES in TRL (kWh)	Average Claimed UES (kWh)	Ex Ante ISR	Ex Ante HOU	Ex Ante Source	Evaluated ISR	Evaluated HOU	Evaluated UES (kWh)
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 1	15.18	15.18	1.00	1.20	1	0.89	1.20	13.57
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 2	23.74	23.74	1.00	1.20	2	0.89	1.20	21.22
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 3	19.00	19.00	1.00	1.20	3	0.89	1.20	16.98
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 1	29.48	0.00	1.00	1.20	1	0.89	1.20	26.35
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 2	46.10	46.10	1.00	1.20	2	0.89	1.20	41.20
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 3	38.00	38.00	1.00	1.20	3	0.89	1.20	33.96
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	13.36	1496.22	1.00	1.20	2	0.89	1.20	11.94
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 1	18.52	18.52	1.00	1.90	1	0.89	2.15	18.73
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	23.45	23.44	1.00	1.90	2	0.89	2.15	23.71
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 3	23.00	22.99	1.00	2.10	3	0.89	2.15	21.04
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 1	35.96	35.96	1.00	1.90	1	0.89	2.15	36.36
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	45.51	46.02	1.00	1.90	2	0.89	2.15	46.02
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 3	44.00	44.00	1.00	2.10	3	0.89	2.15	40.25
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 1	67.28	67.28	1.00	1.90	1	0.89	2.15	68.03
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 2	85.16	85.16	1.00	1.90	2	0.89	2.15	86.11
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 3	82.00	82.00	1.00	2.10	3	0.89	2.15	75.01
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 1	10.42	10.42	1.00	1.90	1	0.89	2.15	10.54
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	13.19	13.40	1.00	1.90	2	0.89	2.15	13.34
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 3	13.00	13.00	1.00	2.10	3	0.89	2.15	11.89
Fixture - Downlight - 2000 to 3999 Lumens - WA - 3	44.00	44.00	1.00	2.50	3	0.89	2.15	33.81
Fixture - Exterior Porch - 1000 to 1999 Lumens - WA - 2	55.80	835.80	1.00	3.70	2	0.89	3.70	49.87
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 1	136.00	136.00	1.00	3.70	1	0.89	3.70	121.56
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 2	203.00	203.00	1.00	3.70	2	0.89	3.70	181.44
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 1	21.00	21.00	1.00	3.70	1	0.89	3.70	18.77
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 2	31.40	31.40	1.00	3.70	2	0.89	3.70	28.07

Measure - Version	UES in TRL (kWh)	Average Claimed UES (kWh)	Ex Ante ISR	Ex Ante HOU	Ex Ante Source	Evaluated ISR	Evaluated HOU	Evaluated UES (kWh)
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 3	32.00	32.00	1.00	3.70	3	0.89	3.70	28.60
Fixture - Exterior Security - 1000 to 1999 Lumens - WA - 3	35.00	35.00	1.00	3.70	3	0.89	3.70	31.28
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 2	58.97	58.97	1.00	3.70	2	0.89	3.70	52.71
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 3	68.00	68.00	1.00	3.70	3	0.89	3.70	60.78
Fixture - Exterior Security - 250 to 499 Lumens - WA - 3	10.00	10.00	1.00	3.70	3	0.89	3.70	8.94
Fixture - Exterior Security - 500 to 999 Lumens - WA - 2	17.09	17.09	1.00	3.70	2	0.89	3.70	15.28
Fixture - Exterior Security - 500 to 999 Lumens - WA - 3	19.00	19.00	1.00	3.70	3	0.89	3.70	16.98
Fixture - Track - 2000 to 3999 Lumens - WA - 1	71.92	71.92	1.00	2.30	1	0.89	2.15	60.07
Fixture - Track - 2000 to 3999 Lumens - WA - 2	51.28	51.28	1.00	2.30	2	0.89	2.15	42.83
Fixture - Track - 2000 to 3999 Lumens - WA - 3	47.00	47.00	1.00	2.40	3	0.89	2.15	37.62
Fixture - Track - 250 to 499 Lumens - WA - 1	11.27	11.27	1.00	2.30	1	0.89	2.15	9.41
Fixture - Track - 250 to 499 Lumens - WA - 2	8.03	8.03	1.00	2.30	2	0.89	2.15	6.71
Fixture - Track - 500 to 999 Lumens - WA - 1	20.84	20.84	1.00	2.30	1	0.89	2.15	17.41
Fixture - Track - 500 to 999 Lumens - WA - 2	14.86	14.86	1.00	2.30	2	0.89	2.15	12.41
LED Recessed Downlight Kit - Post Purchase - WA - 1	23.00	23.00	1.00	2.50	3	0.89	2.15	17.67
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 1	13.12	13.12	0.83	2.50	1	0.74	2.13	9.96
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	13.62	13.79	0.83	2.40	2	0.74	2.13	10.83
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 3	18.00	18.00	0.83	2.60	3	0.74	2.13	13.22
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 1	18.08	18.08	0.84	2.60	1	0.74	2.13	13.04
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	26.84	26.27	0.83	2.50	2	0.74	2.13	20.49
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 3	26.00	26.00	0.83	2.50	3	0.74	2.13	19.85
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 1	10.50	10.50	0.84	2.50	1	0.74	2.13	7.93
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	8.99	9.24	0.83	2.50	2	0.74	2.13	6.86
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 3	13.00	13.00	0.83	2.50	3	0.74	2.13	9.93
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 1	10.26	10.26	0.85	2.40	1	0.74	2.13	7.99
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	11.64	11.49	0.83	2.30	2	0.74	2.13	9.66

Measure - Version	UES in TRL (kWh)	Average Claimed UES (kWh)	Ex Ante ISR	Ex Ante HOU	Ex Ante Source	Evaluated ISR	Evaluated HOU	Evaluated UES (kWh)
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 3	9.00	9.00	0.83	2.40	3	0.74	2.13	7.16
LEDs - Globe - 250 to 1049 Lumens - WA - 1	12.14	12.14	0.83	1.90	1	0.74	2.13	12.13
LEDs - Globe - 250 to 1049 Lumens - WA - 2	14.00	13.66	0.83	1.80	2	0.74	2.13	14.85
LEDs - Globe - 250 to 1049 Lumens - WA - 3	13.00	13.00	0.83	1.90	3	0.74	2.13	13.06
LEDs - MR 250 to 499 Lumens (Pin Base) - WA - 2	10.27	10.27	0.98	2.80	2	0.74	2.13	5.93
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 1	32.48	32.48	0.98	2.90	1	0.74	2.13	18.11
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 2	13.99	13.99	0.98	2.80	2	0.74	2.13	8.08
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 1	28.75	28.75	0.98	2.70	1	0.74	2.13	17.22
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 2	21.69	21.69	0.98	2.60	2	0.74	2.13	13.49
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 1	21.13	21.13	0.84	3.30	1	0.74	2.13	12.01
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	9.64	17.55	0.83	3.20	2	0.74	2.13	5.75
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 3	11.00	11.00	0.83	3.10	3	0.74	2.13	6.77
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 1	72.12	72.12	0.82	3.60	1	0.74	2.13	38.48
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	55.53	66.14	0.83	3.50	2	0.74	2.13	30.29
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 3	45.00	45.00	0.83	3.20	3	0.74	2.13	26.84
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 1	23.52	23.52	0.84	3.00	1	0.74	2.13	14.73
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	8.00	8.20	0.83	3.50	2	0.74	2.13	4.36
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 3	11.00	11.00	0.83	3.00	3	0.74	2.13	7.00

Sources: (1) RTF-ResLighting_v5.2_forPCORP_v02_8_8_17.xlsm, (2) RTF-ResLighting_v6.1_4_4_18.xlsm, (3) RTF-ResLighting_v7_1.xlsm, Evaluated ISRs and HOUs calculated from 2020 general population survey sent to Pacific Power customers (see Appendix B) and *in Lighting HOU Residential Building Stock Assessment: Metering Study: Report #E14-283*, prepared by Northwest Energy Efficiency Alliance (April 28, 2014).

3.8.4 Total Evaluated Savings

Total lighting savings are reported in Table 3-21 through Table 3-23. Gross evaluated savings is the product of the evaluated UES and the total quantity of that measure sold through the program (see Table 3-20). Net evaluated savings reflects gross evaluated savings with leakage applied.

Table 3-21: Lighting Program Savings by Measure 2019-2020

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 1	10	152	136	89%	5.7%	128
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 2	24	570	509	89%	5.7%	480
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 3	12	228	204	89%	5.7%	192
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 1	0	0	0	N/A	5.7%	0
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 2	18	830	742	89%	5.7%	699
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 3	7	266	238	89%	5.7%	224
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	3	4,489	36	01%	5.7%	34
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 1	947	17,538	17,733	101%	5.7%	16,714
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	2,014	47,208	47,753	101%	5.7%	45,008
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 3	880	20,230	18,516	92%	5.7%	17,452
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 1	157	5,646	5,708	101%	5.7%	5,380
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	755	34,747	34,741	100%	5.7%	32,744
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 3	301	13,244	12,116	91%	5.7%	11,420
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 1	22	1,480	1,497	101%	5.7%	1,411
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 2	119	10,134	10,247	101%	5.7%	9,658
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 3	18	1,476	1,350	91%	5.7%	1,272
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 1	122	1,271	1,285	101%	5.7%	1,211
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	925	12,398	12,336	99%	5.7%	11,627
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 3	483	6,279	5,744	91%	5.7%	5,414
Fixture - Downlight - 2000 to 3999 Lumens - WA - 3	125	5,500	4,226	77%	5.7%	3,983
Fixture - Exterior Porch - 1000 to 1999 Lumens - WA - 2	1	836	50	6%	5.7%	47
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 1	2	272	243	89%	5.7%	229
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 2	8	1,624	1,452	89%	5.7%	1,369
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 1	45	945	845	89%	5.7%	796

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 2	360	11,304	10,104	89%	5.7%	9,523
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 3	399	12,768	11,412	89%	5.7%	10,756
Fixture - Exterior Security - 1000 to 1999 Lumens - WA - 3	38	1,330	1,189	89%	5.7%	1,121
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 2	23	1,356	1,212	89%	5.7%	1,142
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 3	128	8,704	7,780	89%	5.7%	7,333
Fixture - Exterior Security - 250 to 499 Lumens - WA - 3	48	480	429	89%	5.7%	404
Fixture - Exterior Security - 500 to 999 Lumens - WA - 2	8	137	122	89%	5.7%	115
Fixture - Exterior Security - 500 to 999 Lumens - WA - 3	12	228	204	89%	5.7%	192
Fixture - Track - 2000 to 3999 Lumens - WA - 1	6	432	360	83%	5.7%	339
Fixture - Track - 2000 to 3999 Lumens - WA - 2	15	769	642	83%	5.7%	605
Fixture - Track - 2000 to 3999 Lumens - WA - 3	16	752	602	80%	5.7%	567
Fixture - Track - 250 to 499 Lumens - WA - 1	15	169	141	83%	5.7%	133
Fixture - Track - 250 to 499 Lumens - WA - 2	(1)	(8)	(7)	88%	5.7%	(7)
Fixture - Track - 500 to 999 Lumens - WA - 1	14	292	244	84%	5.7%	230
Fixture - Track - 500 to 999 Lumens - WA - 2	21	312	261	84%	5.7%	246
LED Recessed Downlight Kit - Post Purchase - WA - 1	372	8,556	6,575	77%	5.7%	6,197
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 1	4,202	55,130	41,864	76%	5.7%	39,458
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	11,912	164,279	129,043	79%	5.7%	121,626
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 3	13,685	246,330	180,854	73%	5.7%	170,459
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 1	1,597	28,874	20,829	72%	5.7%	19,632
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	8,466	222,422	173,502	78%	5.7%	163,529
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 3	11,620	302,120	230,687	76%	5.7%	217,427
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 1	5,624	59,052	44,617	76%	5.7%	42,052
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	22,503	207,960	154,470	74%	5.7%	145,591
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 3	12,609	163,917	125,161	76%	5.7%	117,967
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 1	28,840	295,898	230,293	78%	5.7%	217,056
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	90,581	1,040,779	875,078	84%	5.7%	824,779
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 3	85,101	765,909	609,186	80%	5.7%	574,171
LEDs - Globe - 250 to 1049 Lumens - WA - 1	1,788	21,706	21,681	100%	5.7%	20,435
LEDs - Globe - 250 to 1049 Lumens - WA - 2	7,501	102,488	111,368	109%	5.7%	104,967
LEDs - Globe - 250 to 1049 Lumens - WA - 3	8,142	105,846	106,342	100%	5.7%	100,230

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
LEDs - MR 250 to 499 Lumens (Pin Base) - WA - 2	9	92	53	58%	5.7%	50
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 1	6	195	109	56%	5.7%	103
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 2	7	98	57	58%	5.7%	54
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 1	37	1,064	637	60%	5.7%	600
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 2	61	1,323	823	62%	5.7%	776
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 1	697	14,728	8,374	57%	5.7%	7,893
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	2,266	39,760	13,031	33%	5.7%	12,282
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 3	1,842	20,262	12,477	62%	5.7%	11,760
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 1	84	6,058	3,232	53%	5.7%	3,046
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	287	18,981	8,692	46%	5.7%	8,192
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 3	149	6,705	4,000	60%	5.7%	3,770
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 1	8,379	197,074	123,422	63%	5.7%	116,328
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	11,769	96,538	51,351	53%	5.7%	48,399
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 3	13,993	153,923	97,941	64%	5.7%	92,311
Total	**362,229**	**4,574,455**	**3,598,151**	**79%**	**5.7%**	**3,391,331**

Table 3-22: Lighting Program Savings by Measure 2019

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 1	10	152	136	89%	5.7%	128
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 2	24	570	509	89%	5.7%	480
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 1	0	0	0	N/A	5.7%	0
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 2	18	830	742	89%	5.7%	699
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	3	4,489	36	1%	5.7%	34
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 1	947	17,538	17,733	101%	5.7%	16,714
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	1,930	45,239	45,761	101%	5.7%	43,131
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 1	157	5,646	5,708	101%	5.7%	5,380
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	736	33,882	33,867	100%	5.7%	31,920
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 1	22	1,480	1,497	101%	5.7%	1,411
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 2	119	10,134	10,247	101%	5.7%	9,658
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 1	122	1,271	1,285	101%	5.7%	1,211
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	919	12,319	12,256	99%	5.7%	11,552
Fixture - Exterior Porch - 1000 to 1999 Lumens - WA - 2	1	836	50	6%	5.7%	47
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 1	2	272	243	89%	5.7%	229
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 2	8	1,624	1,452	89%	5.7%	1,369
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 1	45	945	845	89%	5.7%	796
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 2	360	11,304	10,104	89%	5.7%	9,523
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 2	13	767	685	89%	5.7%	646
Fixture - Exterior Security - 500 to 999 Lumens - WA - 2	7	120	107	89%	5.7%	101
Fixture - Track - 2000 to 3999 Lumens - WA - 1	6	432	360	83%	5.7%	339
Fixture - Track - 2000 to 3999 Lumens - WA - 2	15	769	642	83%	5.7%	605
Fixture - Track - 250 to 499 Lumens - WA - 1	15	169	141	83%	5.7%	133
Fixture - Track - 250 to 499 Lumens - WA - 2	(1)	(8)	(7)	88%	5.7%	(7)
Fixture - Track - 500 to 999 Lumens - WA - 1	14	292	244	84%	5.7%	230
Fixture - Track - 500 to 999 Lumens - WA - 2	21	312	261	84%	5.7%	246
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 1	4,202	55,130	41,864	76%	5.7%	39,458
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	11,398	157,278	123,475	79%	5.7%	116,378
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 1	1,597	28,874	20,829	72%	5.7%	19,632

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 1	10	152	136	89%	5.7%	128
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 2	24	570	509	89%	5.7%	480
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 1	0	0	0	N/A	5.7%	0
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 2	18	830	742	89%	5.7%	699
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	3	4,489	36	1%	5.7%	34
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 1	947	17,538	17,733	101%	5.7%	16,714
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	1,930	45,239	45,761	101%	5.7%	43,131
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	8,029	210,693	164,546	78%	5.7%	155,088
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 1	5,624	59,052	44,617	76%	5.7%	42,052
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	22,168	204,949	152,170	74%	5.7%	143,423
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 1	28,840	295,898	230,293	78%	5.7%	217,056
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	87,886	1,009,409	849,042	84%	5.7%	800,240
LEDs - Globe - 250 to 1049 Lumens - WA - 1	1,788	21,706	21,681	100%	5.7%	20,435
LEDs - Globe - 250 to 1049 Lumens - WA - 2	7,113	97,056	105,607	109%	5.7%	99,537
LEDs - MR 250 to 499 Lumens (Pin Base) - WA - 2	9	92	53	58%	5.7%	50
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 1	6	195	109	56%	5.7%	103
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 2	7	98	57	58%	5.7%	54
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 1	37	1,064	637	60%	5.7%	600
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 2	61	1,323	823	62%	5.7%	776
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 1	697	14,728	8,374	57%	5.7%	7,893
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	2,163	38,767	12,438	32%	5.7%	11,723
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 1	84	6,058	3,232	53%	5.7%	3,046
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	275	18,315	8,329	45%	5.7%	7,850
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 1	8,379	197,074	123,422	63%	5.7%	116,328
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	11,351	93,194	49,527	53%	5.7%	46,680
Total	**207,227**	**2,662,337**	**2,106,029**	**79%**	**5.7%**	**1,984,977**

Table 3-23: Lighting Program Savings by Measure 2020

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 3	12	228	204	89%	5.7%	192
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 3	7	266	238	89%	5.7%	224
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	84	1,969	1,992	101%	5.7%	1,878
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 3	880	20,230	18,516	92%	5.7%	17,452
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	19	865	874	101%	5.7%	824
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 3	301	13,244	12,116	91%	5.7%	11,420
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 3	18	1,476	1,350	91%	5.7%	1,272
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	6	79	80	101%	5.7%	75
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 3	483	6,279	5,744	91%	5.7%	5,414
Fixture - Downlight - 2000 to 3999 Lumens - WA - 3	125	5,500	4,226	77%	5.7%	3,983
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 3	399	12,768	11,412	89%	5.7%	10,756
Fixture - Exterior Security - 1000 to 1999 Lumens - WA - 3	38	1,330	1,189	89%	5.7%	1,121
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 2	10	590	527	89%	5.7%	497
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 3	128	8,704	7,780	89%	5.7%	7,333
Fixture - Exterior Security - 250 to 499 Lumens - WA - 3	48	480	429	89%	5.7%	404
Fixture - Exterior Security - 500 to 999 Lumens - WA - 2	1	17	15	88%	5.7%	14
Fixture - Exterior Security - 500 to 999 Lumens - WA - 3	12	228	204	89%	5.7%	192
Fixture - Track - 2000 to 3999 Lumens - WA - 3	16	752	602	80%	5.7%	567
LED Recessed Downlight Kit - Post Purchase - WA - 1	372	8,556	6,575	77%	5.7%	6,197
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	514	7,001	5,568	80%	5.7%	5,248
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 3	13,685	246,330	180,854	73%	5.7%	170,459
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	437	11,729	8,956	76%	5.7%	8,441
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 3	11,620	302,120	230,687	76%	5.7%	217,427
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	335	3,012	2,300	76%	5.7%	2,168
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 3	12,609	163,917	125,161	76%	5.7%	117,967
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	2,695	31,370	26,036	83%	5.7%	24,539
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 3	85,101	765,909	609,186	80%	5.7%	574,171
LEDs - Globe - 250 to 1049 Lumens - WA - 2	388	5,432	5,761	106%	5.7%	5,430
LEDs - Globe - 250 to 1049 Lumens - WA - 3	8,142	105,846	106,342	100%	5.7%	100,230

Measure - Version	Quantity	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Realization Rate	Leakage	Net Evaluated Savings (kWh)
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	103	993	592	60%	5.7%	558
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 3	1,842	20,262	12,477	62%	5.7%	11,760
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	12	666	363	55%	5.7%	342
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 3	149	6,705	4,000	60%	5.7%	3,770
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	418	3,344	1,824	55%	5.7%	1,719
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 3	13,993	153,923	97,941	64%	5.7%	92,311
Total	**155,002**	**1,912,120**	**1,492,121**	**78%**	**5.7%**	**1,406,355**

3.8.5 Discussion of Realization Rates

Realization rates were impacted by the following factors:

- *In-service Rates (ISRs).* Ex ante ISRs were higher than verified installation rates for all measures, reducing realization rates.
- *Hours of Use (HOUs)*. For bathroom vanity fixtures and exterior porch and exterior security fixtures, ADM calculated evaluated savings using ex ante HOU because of the specific location functionality of these fixtures. For remaining lighting measures, ADM used a weighted average HOU by measure type (standard, specialty, or fixture), using the NEEA hours per room as used in the TRL. Realization rates were impacted both positively and negatively.
- *Data errors.* Realization rates were impacted both positively and negatively by these errors.

  Ten records, totaling 2,882 lighting units with a total claimed savings of 38,134 kWh reported incorrect UES. Realization rates were impacted both positively and negatively

  Of the 40,241 lighting units sold through the Simple Steps program, 17,351 had claimed savings other than documented TRL ex ante savings. Two types of errors appear in the tracking data.

  First, a portion of measures sold through the Simple Steps program include “Annual Savings @ Generator Busbar (kwh/yr) - Period 1” values from the RTF reference file ResLighting_v6_1.xlsm rather than the “Annual Savings @ Site (kWh/yr) - Period 1” values used in the TRL. The Generator Busbar values were not uniformly applied as claimed savings; a portion of Simple Steps records include claimed savings values that match the TRL “Annual Savings @ Site (kWh)” value.

  Second, the tracking data includes data entry errors. The implementer provided documentation indicating that total lighting claimed savings and incentive payouts for measures distributed through Simple Steps were corrected at the program level; the errors occur at the measure level. Table 3-24 reports savings and realization rates for lighting measures sold through the Simple Steps program.

Table 3-24: Simple Steps Program Savings

Measure - Version	Quantity	Qty with incorrect claimed savings	Claimed Savings (kWh)	Gross Evaluated Savings (kWh)	Simple Steps Realization Rate
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	3	2	4,489	36	1%
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	216	197	10,217	9,939	97%
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 3	77	-	3,388	3,099	91%
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	531	485	7,202	7,082	98%
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 3	269	-	3,497	3,199	91%
Fixture - Exterior Porch - 1000 to 1999 Lumens - WA - 2	1	1	836	50	6%
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	1,330	909	20,152	14,408	71%
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 3	1,550	-	27,900	20,484	73%
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	1,554	998	36,904	31,848	86%
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 3	1,967	-	51,142	39,050	76%
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	1,732	1,346	21,229	11,889	56%
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 3	1,280	-	16,640	12,706	76%
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	11,226	8,873	117,087	108,451	93%
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 3	8,110	-	72,990	58,055	80%
LEDs - Globe - 250 to 1049 Lumens - WA - 2	1,607	1,398	19,972	23,859	119%
LEDs - Globe - 250 to 1049 Lumens - WA - 3	1,040	-	13,520	13,583	100%
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	464	360	22,389	2,668	12%
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 3	331	-	3,641	2,242	62%
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	64	55	6,598	1,938	29%
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 3	54	-	2,430	1,450	60%
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	3,465	2,727	30,106	15,119	50%
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 3	3,370	-	37,070	23,588	64%
Total	**40,241**	**17,351**	**529,397**	**404,742**	**76%**

3.8.6 Leakage

Leakage is an estimate of the percentage of measures sold through the program that were installed outside Pacific Power's service area. ADM assessed leakage using geo-mapping data of participating and non-participating retailers combined with general population survey responses.

First, ADM mapped 60-minute drive-time areas surrounding both participating and non-participating (competing) retailers[2] (see Table 3-25). If retailers had overlapping areas,

[2] 2020 data. Safe Graph Data: https://marketplace.arcgis.com/listing.html?id=3425348e4bee4059af2b353e52df43c2

ADM assumed that customers purchased measures from the closest store and modified retailers' drive-time areas.

Second, ADM determined the total population in each retailer's drive time area and the percentage of the population in each area that are Pacific Power customers[3].

Thus, for each drive time circle for each retail location, ADM determined the proportion of the population that falls inside and outside of Pacific Power's service area.

In accordance with guidance from the Department of Energy (DOE) National Renewable Energy Laboratory (NREL) in the *Uniform Methods Project (UMP): Methods for Determining Energy Savings for Specific Measures Chapter 6: Residential Lighting Evaluation Protocol*, ADM determined that bulbs purchased or installed in the territory of another utility through the Simple Steps program are not considered leakage if that utility is also running an upstream lighting program. The Simple Steps program was a collaborative upstream lighting program run in conjunction with Benton PUD, and therefore bulbs sold through that program are not included in the leakage rate calculation.

Third, ADM modified drive-time areas established in step one using general population survey[4] responses to define drive-time range categories to assess how many consumers were willing to drive and shop at each participating retail store. Drive-time behavior survey results are included in Table 3-25. Within each drive-time category, ADM calculated the percentage of the population that lives in Pacific Power's service area.

Table 3-25: RDD Drive Time Estimates

Retailer Type	0-5	5-10	10-15	15-20	20-25	25-30	30-40	40-50	50-60	60+
DIY	4%	14%	21%	22%	14%	5%	12%	6%	0%	2%
Big Box	7%	14%	26%	22%	12%	2%	9%	3%	0%	3%
Member	8%	7%	14%	16%	15%	4%	11%	8%	3%	13%
Discount	10%	27%	23%	20%	8%	1%	8%	2%	0%	1%

Fourth, for each drive-time category indicated in Table 3-25 for each retailer, ADM calculated the predicted population that was willing to drive to and shop at the retailer, and what percentage of that population lives in Pacific Power's service area.

The resulting leakage percentage is the share of residents who are willing to drive to participating retailers who are not Pacific Power customers. ADM calculated lighting program leakage by weighting each store's leakage by its evaluated savings (kWh).

ADM estimated that 5.04 percent of the upstream lighting measures sold at participating retailers were purchased by residents living outside of Pacific Power's service area.

[3] 2010 Census block data from Environmental System Research Institute (ESRI).

[4] ADM conducted the general population survey in 2020.

3.9 Starter Kits

Pacific Power supplied 6,625 energy saving kits, referred to as *Starter Kits* on the Pacific Power web site, at no charge to eligible customers who requested them. The kits resulted in 724,816 kWh of savings, accounting for 8 percent of total program savings during the evaluation period. Pacific Power discontinued Starter Kits measures on January 4, 2021.

All kits contained four standard LED bulbs; customers who indicated that they had an electric water heater also received water saving aerators and low-flow showerheads for up to two bathrooms. Pacific Power customer eligibility was determined through a web-based portal where customers ordered kits.

An additional 4,000 LED-only kits were distributed through food banks in the service area.

Tracking data included three versions of the kits (3, 4 and 5).

On May 15, 2020, the DSM Advisory Group approved increasing the per-customer limit from one to two kits every ten years with the following parameters:

- Second kits would be lighting-only kits if a water savings kit was previously provided.
- If a customer requested two kits, only one could be a bathroom kit.
- No two-bathroom kits should be given out for customers who receive a second kit that is a water savings kit.

Total starter kit savings are presented in Table 3-26 through Table 3-28.

Table 3-26: Starter Kit Program Savings 2019-2020

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Version 3				
Energy Savings Kit - LED - WA - 3	19	622	727	117%
Energy Savings Kit - Best - 1 Bathroom - WA - 3	36	14,164	11,331	80%
Energy Savings Kit - Best - 2 Bathrooms - WA - 3	65	39,287	30,162	77%
Version 4				
Energy Savings Kit - Best - 1 Bathroom - WA - 4	281	112,805	94,109	83%
Energy Savings Kit - Best - 2 Bathrooms - WA - 4	495	302,702	239,805	79%
Energy Savings Kit - LED - WA - 4	263	9,089	10,218	112%
Version 5				
Energy Savings Kit - LED - WA - 5	4,831	132,884	139,192	105%
Energy Savings Kit - Best - 2 Bathrooms - WA - 5	29	16,398	12,792	78%
Energy Savings Kit - Best - 1 Bathroom - WA - 5	606	225,705	186,478	83%
Total	**6,625**	**853,656**	**724,816**	**85%**

Table 3-27: Starter Kit Program Savings 2019

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Version 3				
Energy Savings Kit - LED - WA - 3	19	622	727	117%
Energy Savings Kit - Best - 1 Bathroom - WA - 3	36	14,164	11,331	80%
Energy Savings Kit - Best - 2 Bathrooms - WA - 3	65	39,287	30,162	77%
Version 4				
Energy Savings Kit - Best - 1 Bathroom - WA - 4	211	84,704	70,665	83%
Energy Savings Kit - Best - 2 Bathrooms - WA - 4	335	204,859	163,948	80%
Energy Savings Kit - LED - WA - 4	164	5,668	6,503	115%
Total	**830**	**349,304**	**283,337**	**81%**

Table 3-28: Starter Kit Program Savings 2020

Measure - Version	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Version 4				
Energy Savings Kit - Best - 1 Bathroom - WA - 4	70	28,101	23,444	83%
Energy Savings Kit - Best - 2 Bathrooms - WA - 4	160	97,843	75,857	78%
Energy Savings Kit - LED - WA - 4	99	3,421	3,716	109%
Version 5				
Energy Savings Kit - LED - WA - 5	4,831	132,884	139,192	105%
Energy Savings Kit - Best - 2 Bathrooms - WA - 5	29	16,398	12,792	78%
Energy Savings Kit - Best - 1 Bathroom - WA - 5	606	225,705	186,478	83%
Total	**5,795**	**504,352**	**441,479**	**88%**

3.9.1 Tracking Data Verification

ADM reviewed program tracking data to determine if:

- tracking dataset included duplicate or erroneous data entries,
- data entries in the program tracking dataset included all necessary fields for savings calculations,
- claimed energy savings match the applicable TRL source documents and calculations.

ADM found the following in the dataset:

- Eleven customers received two starter kits before the 10-year per-customer limit was raised from one to two kits.
- Five customers received two starter kits with water saving measures.
- Four records in the tracking data included claimed savings lower than TRL ex ante values. These records documented 550 LED-only kits (version 5) that were distributed through food banks.

3.9.2 Ex Ante Review

ADM completed an ex-ante review of each kit version to verify that claimed savings in the tracking data reflected the ex-ante values in the TRL reference documents. Reference files included additional embedded reference files for each kit component. These documents were used to identify ex ante assumptions for in-service rates and the percentage of recipients with electric water heaters.

3.9.3 Evaluated Savings

To calculate evaluated savings, ADM replaced ex ante ISR and percentage of recipients with electric water heaters with values calculated from participant survey responses. Respondents reported installation information for each component, allowing ADM to calculate ISRs for each kit component separately. Only customers who received water savings measures were consider when calculating percentage of participants with electric water heaters. Savings for each configuration of each version of starter kits are included in Table 3-29 through Table 3-31.

Table 3-29: Starter Kit Version 3 Unit Energy Savings (UES)

Kit Component	Claimed UES (kWh)	Ex Ante ISR	Ex Ante % Electric DHW	Evaluated ISR	Evaluated % Electric DHW	Evaluated UES (kWh)	Realization Rate
Energy Savings Kit - Best - 1 Bathroom							
LED 1 (9.5 Watt)	8.19	74%		97%		10.72	131%
LED 2 (9.5 Watt)	8.19	74%		93%		10.32	126%
LED 3 (9.5 Watt)	8.19	74%		82%		9.09	111%
LED 4 (9.5 Watt)	8.19	74%		74%		8.16	100%
Aerator Kitchen (1.5 gph)	149.70	63%	98%	48%	89%	102.34	68%
Aerator Bath 1 (0.5 gpm)	49.30	61%	98%	47%	89%	34.11	69%
Showerhead 1 (1.5 gpm)	161.68	60%	98%	57%	89%	140.02	87%
TOTAL	**393.44**					**314.76**	**80%**
Energy Savings Kit - Best - 2 Bathrooms							
LED 1 (9.5 Watt)	8.19	74%		97%		10.72	131%
LED 2 (9.5 Watt)	8.19	74%		93%		10.32	126%
LED 3 (9.5 Watt)	8.19	74%		82%		9.09	111%
LED 4 (9.5 Watt)	8.19	74%		74%		8.16	100%
Aerator Kitchen (1.5 gph)	149.70	63%	98%	48%	89%	102.34	68%
Aerator Bath 1 (0.5 gpm)	49.30	61%	98%	47%	89%	34.11	69%
Aerator Bath 2 (0.5 gpm)	49.30	61%	98%	38%	89%	27.41	56%
Showerhead 1 (1.5 gpm)	161.68	60%	98%	57%	89%	140.02	87%
Showerhead 2 (1.5 gpm)	161.68	60%	98%	50%	89%	121.86	75%
TOTAL	**604.42**					**464.04**	**77%**
Energy Savings Kit - LED							
LED 1 (9.5 Watt)	8.19	74%		97%		10.72	131%
LED 2 (9.5 Watt)	8.19	74%		93%		10.32	126%
LED 3 (9.5 Watt)	8.19	74%		82%		9.09	111%
LED 4 (9.5 Watt)	8.19	74%		74%		8.16	100%
TOTAL	**32.76**					**38.29**	**117%**

Version 3 sources: (LEDs) RTF-ResLighting_v6_1_4_4_18.xlsm; (kitchen aerators) 2015-2016 Pacific Power Washington HES Evaluation Report.pdf, (bathroom aerators) 2015-2016 Pacific Power Washington HES Evaluation Report.pdf, (showerheads) 2017.09.12_WA_HES_Kits_Brief.xlsx, (evaluated ISRs and % DHW) ADM participant survey.

Table 3-30: Starter Kit Version 4 Unit Energy Savings (UES)

Kit Component	Claimed UES	Ex Ante ISR	Ex Ante % Electric DHW	Evaluated ISR	Evaluated % Electric DHW	Evaluated UES (kWh)	Realization Rate
Energy Savings Kit - Best - 1 Bathroom							
LED 1 (9.5 Watt)	8.64	74%		97%		11.31	131%
LED 2 (9.5 Watt)	8.64	74%		93%		10.88	126%
LED 3 (9.5 Watt)	8.64	74%		82%		9.59	111%
LED 4 (9.5 Watt)	8.64	74%		74%		8.60	100%
Aerator Kitchen (1.5 gph)	156.80	62%	93%	48%	89%	114.48	73%
Aerator Bath 1 (0.5 gpm)	48.40	65%	93%	47%	89%	33.13	68%
Showerhead 1 (1.5 gpm)	161.68	60%	93%	57%	89%	146.91	91%
TOTAL	**401.44**					**334.91**	**83%**
Energy Savings Kit - Best - 2 Bathrooms							
LED 1 (9.5 Watt)	8.64	74%		97%		11.31	131%
LED 2 (9.5 Watt)	8.64	74%		93%		10.88	126%
LED 3 (9.5 Watt)	8.64	74%		82%		9.59	111%
LED 4 (9.5 Watt)	8.64	74%		74%		8.60	100%
Aerator Kitchen (1.5 gph)	156.80	62%	93%	48%	89%	114.48	73%
Aerator Bath 1 (0.5 gpm)	48.40	65%	93%	47%	89%	33.13	68%
Aerator Bath 2 (0.5 gpm)	48.40	65%	93%	38%	89%	26.62	55%
Showerhead 1 (1.5 gpm)	161.68	60%	93%	57%	89%	146.91	91%
Showerhead 2 (1.5 gpm)	161.68	60%	93%	50%	89%	127.87	79%
TOTAL	**611.52**					**489.40**	**80%**
Energy Savings Kit - LED							
LED 1 (9.5 Watt)	8.64	74%		97%		11.31	131%
LED 2 (9.5 Watt)	8.64	74%		93%		10.88	126%
LED 3 (9.5 Watt)	8.64	74%		82%		9.59	111%
LED 4 (9.5 Watt)	8.64	74%		74%		8.60	100%
TOTAL	**34.56**					**40.39**	**117%**

Version 4 sources: (LEDs) RTF-ResLighting_v7_1.xlsm; (kitchen aerators) 2015-2016 Pacific Power Washington HES Evaluation Report.pdf; (bathroom aerators) 2015-2016 Pacific Power Washington HES Evaluation Report.pdf; (showerheads) 2018.11.28_WA_HES_Kits_Brief.xlsx; (evaluated ISRs and % DHW) ADM participant survey.

Table 3-31: Starter Kit Version 5 Unit Energy Savings (UES)

Kit Component	Claimed UES	Ex Ante ISR	Ex Ante % Electric DHW	Evaluated ISR	Evaluated % Electric DHW	Evaluated UES (kWh)	Realization Rate
Energy Savings Kit - Best - 1 Bathroom							
LED 1 (9.5 Watt)	7.00	74%		97%		9.16	131%
LED 2 (9.5 Watt)	7.00	74%		93%		8.82	126%
LED 3 (9.5 Watt)	7.00	74%		82%		7.77	111%
LED 4 (9.5 Watt)	7.00	74%		74%		6.97	100%
Aerator Kitchen (1.5 gph)	151.41	63%	100%	48%	89%	101.45	67%
Aerator Bath 1 (0.5 gpm)*	41.99	61%	100%	47%	89%	28.47	68%
Showerhead 1 (1.5 gpm)	151.00	53%	100%	57%	89%	145.08	96%
TOTAL	**372.40**					**307.72**	**83%**
Energy Savings Kit - Best - 2 Bathrooms							
LED 1 (9.5 Watt)	7.00	74%		97%		9.16	131%
LED 2 (9.5 Watt)	7.00	74%		93%		8.82	126%
LED 3 (9.5 Watt)	7.00	74%		82%		7.77	111%
LED 4 (9.5 Watt)	7.00	74%		74%		6.97	100%
Aerator Kitchen (1.5 gph)	151.41	63%	100%	48%	89%	101.45	67%
Aerator Bath 1 (0.5 gpm)*	41.99	61%	100%	47%	89%	28.47	68%
Aerator Bath 2 (0.5 gpm)*	41.99	61%	100%	38%	89%	22.88	54%
Showerhead 1 (1.5 gpm)	151.00	53%	100%	57%	89%	145.08	96%
Showerhead 2 (1.5 gpm)	151.00	53%	100%	50%	89%	126.27	84%
TOTAL	**565.39**					**456.87**	**81%**
Energy Savings Kit - LED							
LED 1 (9.5 Watt)	7.00	74%		97%		9.16	131%
LED 2 (9.5 Watt)	7.00	74%		93%		8.82	126%
LED 3 (9.5 Watt)	7.00	74%		82%		7.77	111%
LED 4 (9.5 Watt)	7.00	74%		74%		6.97	100%
TOTAL	**28.00**					**32.72**	**117%**
Energy Savings Kit - LED Distributed through Food Banks							
LED 1 (9.5 Watt)	7.00	74%		74%		7.00	100%
LED 2 (9.5 Watt)	7.00	74%		74%		7.00	100%
LED 3 (9.5 Watt)	7.00	74%		74%		7.00	100%
LED 4 (9.5 Watt)	7.00	74%		74%		7.00	100%
TOTAL	**28.00**					**28.00**	**100%**

Version 5 sources: (LEDs) RTF-ResLighting_v7_1; (kitchen aerators) 2017-2018 Final Evaluation Report for PacifiCorp Residential Home Energy Savings Program in Washington; (bathroom aerators) 2017-2018 Final Evaluation Report for PacifiCorp Residential Home Energy Savings Program in Washington; (showerheads) RTF Showerheads_v4_2.xlsm; (evaluated ISRs and % DHW) ADM participant survey.

3.9.4 Discussion of Realization Rates

Realization rates were impacted by the following factors:

LEDs. TRL reference documents for lighting components include an ex-ante ISR of 74 percent. ADM used survey data to calculate ISRs for each light bulb in the kit. Realization rates reflect evaluated ISRs.

For version 5 kits distributed through food banks, no evaluated ISR data was collected; therefore, the ex-ante ISR was not adjusted. Claimed savings for these 4,000 kits was lower than TRL documented ex ante savings for LEDs resulting in a realization rate over 100 percent.

Aerators and Showerheads. Ex ante values for the percentage of homes with electric water heaters (where water saving measures were installed) was 98, 93, and 100 percent for the three kit versions respectively. Survey responses from customers who received water savings measures indicate that 89 percent had electric water heaters, resulting in a reduced realization rate.

Duplication of kits sent to customers. No savings were assigned to 16 kits that were distributed outside the lifetime per-customer limit guidelines.

3.10 Whole Homes

Pacific Power offered financial incentives to build new homes that exceeded Washington State Building Code and manufactured homes that met ENERGY STAR® and Ecorated™ guidelines. Program tracking data listed 69 new homes and 34 manufactured homes, totaling 278,854 kWh of savings, accounting for 3 percent of total program savings as reported in Table 3-32.

Table 3-32: Whole Homes Program Savings 2019-2020

Year	Quantity[5]	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate (%)
2019	79	244,739	199,907	82%
2020	24	79,029	78,947	100%
Total	**103**	**323,768**	**278,854**	**86%**

3.10.1 Tracking Data Verification

ADM reviewed program tracking data to evaluate if:

- tracking dataset included duplicate or erroneous data entries,
- data entries in the program tracking dataset included all necessary fields to calculate savings,
- claimed energy savings matched savings as indicated in the applicable TRL source documents and calculations.

ADM found the following in the dataset:

- ADM identified 12 premises that were duplicated in the program tracking data.

3.10.2 Ex Ante Review

For new homes, claimed savings were developed using REM/RateTM models to compare expected annual consumption for as-built new homes with expected annual consumption for a similar home built to the Washington State Building Code standards. ADM reviewed both code-built and efficient-model REM/RateTM files.

For manufactured homes, ADM verified that claimed savings matched savings as indicated in the TRL reference file (2017.09.12_WA New MH ENERGY STAR_Brief.xlsx).

[5] Quantity listed in Table 3-32 represents claimed quantity in program tracking data. Twelve new homes records were found to be duplicates and were assigned 0 kWh in verified savings.

3.10.3 Evaluated Savings

New homes accounted for 75 percent of claimed savings, and manufactured homes accounted for 25 percent of savings in the category. ADM applied a 100 percent ISR for the whole homes measure category.

3.10.4 New Homes – Whole Home Performance Path

Unit energy savings were calculated using REM/Rate™ models to compare expected annual consumption for the new as-built homes with expected annual consumption for a similar home built to the Washington State Building Code standard.

ADM completed the following steps to calculate evaluated savings:

1. Reviewed REM/Rate™ model files for each home in a sample to determine if the reported consumption in the efficient home models matched energy consumption reported in the program documentation. Most models were found to match reported savings; however, for 14 of the homes ADM found that modeled energy consumption varied from reported consumption by between 1 and 2 percent.

2. Reviewed REM/Rate™ User Defined Reference Home (UDRH) files used to calculate baseline energy consumption of comparable code-built homes. ADM verified that baseline models were appropriately defined and adhered to established guidelines.

3. ADM verified that any adjustments made to modeled energy savings were appropriate and in accordance with RTF guidance. The *RTF Standard Savings Estimation Protocol: New Homes*[6], recommends adjustments to modeled energy savings from appliances, lighting, low-flow showerheads, and water heating.

4. ADM reviewed available project documentation, including specific measures installed, project inspection reports, invoices, and other documentation, as available. Specific adjustments were made on a project-by-project basis. Adjustments included updating appliance savings based on the actual model installed and adjustments made to lighting counts or other specifications based on project inspection reports.

5. ADM completed steps 1-4 for a sample of 33 of 69 homes in the New Homes – Whole Home Performance Path. ADM calculated realization rates by specific measure from the sample and applied realization rates across all records.

ADM assigned 0 kWh savings to 12 records of duplicated homes.

[6] https://nwcouncil.app.box.com/v/NewHomesSP-v2-1, accessed July 7th, 2021.

3.10.5 Manufactured Homes

Unit energy savings for new manufactured homes is based on the home's heating and cooling zone as indicated in the TRL reference file (2017.09.12_WA New MH ENERGY STAR_Brief.xlsx). Seven homes in the program tracking data identified the incorrect cooling zone. Evaluated savings for those premises reflect the correct savings for cooling zone.

Savings for all Whole Homes measures are reported in Table 3-33 through Table 3-35.

Table 3-33: Whole Home Program Savings by Measure 2019-2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
New Homes - Whole Home Performance Path - Electrically Heated - 20% and higher - Tier 2 - WA	28	107,509	108,106	101%
New Homes - Whole Home Performance Path - Electrically Heated 10-19.99% - Tier 1 - WA	37	127,022	82,369	65%
New Homes Whole Home Performance Path - Electrically Heated - WA	4	8,128	7,256	89%
New Manufactured Home - Ecorated - Any Electric - WA	12	30,444	30,446	100%
New Manufactured Home - ENERGY STAR - Any Electric - WA	22	50,666	50,678	100%
Total	**103**	**323,769**	**278,854**	**86%**

Table 3-34: Whole Home Program Savings by Measure 2019

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
New Homes - Whole Home Performance Path - Electrically Heated - 20% and higher - Tier 2 - WA	16	57,195	57,879	101%
New Homes - Whole Home Performance Path - Electrically Heated 10-19.99% - Tier 1 - WA	37	127,022	82,369	65%
New Homes Whole Home Performance Path - Electrically Heated - WA	4	8,128	7,256	89%
New Manufactured Home - Ecorated - Any Electric - WA	8	20,152	20,154	100%
New Manufactured Home - ENERGY STAR - Any Electric - WA	14	32,242	32,250	100%
Total	**79**	**244,739**	**199,907**	**82%**

Table 3-35: Whole Home Program Savings by Measure 2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
New Homes - Whole Home Performance Path - Electrically Heated - 20% and higher - Tier 2 - WA	12	50,313	50,228	100%
New Manufactured Home - Ecorated - Any Electric - WA	4	10,292	10,292	100%
New Manufactured Home - ENERGY STAR - Any Electric - WA	8	18,424	18,428	100%
Total	**24**	**79,029**	**78,948**	**100%**

3.10.6 Discussion of Realization Rates

Realization rates were impacted by the following factors:

- No savings were assigned for duplicate records of the same premise (12 homes), reducing the realization rate.
- Adjustments made to new homes consumption models based on RTF guidance and project documentation in the home resulted in minor impacts to realization rates.
- Evaluated savings reflect correction to designated cooling zone for seven manufactured homes resulting in less than 1 percent change in the realization rate.

3.11 Building Shell

Pacific Power offered rebates to verified customers who installed insulation or energy efficient windows in their homes during the evaluation period. Pacific Power provided incentives for 430,053 square feet of wall, attic and floor insulation installed in single family and multifamily homes during the evaluation period, and 3,985 square feet of upgraded windows. These measures resulted in savings of 197,149 kWh, accounting for 2 percent of total program savings as reported in Table 3-36.

Table 3-36: Building Shell Program Savings

Year	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
2019	301,316	178,025	147,408	83%
2020	132,722	58,607	49,740	85%
Total	**434,038**	**236,632**	**197,149**	**83%**

Program insulation measures are defined by home heating type and the change in baseline-to-efficient R values. Tracking data included cooling source but not heating source. Baseline and replacement R values were also not included in the tacking data.

3.11.1 Tracking Data Verification

ADM reviewed the program tracking data to:

- verify that the program tracking dataset did not include duplicate or erroneous data,
- verify that all energy savings are claimed in accordance with the applicable TRL source documents and calculations.

ADM found the following in the dataset.

- Seventy-six records for measures with eFAF or Zonal heating indicate that the cooling source is a heat pump. ADM assumed that homes that use a heat pump for cooling also use the heat pump for heating.
- Baseline and replacement R values were not indicated in the program tracking dataset.
- 89 records did not have a heating source indicated in the tracking data.

3.11.2 Ex Ante Review

ADM verified that the UES values claimed by Pacific Power were supported by the applicable TRL documents. Further, ADM verified that the total claimed savings for each measure accurately reflected the quantity of that measure installed in 2019 and 2020.

3.11.3 Evaluated savings

ADM used an ISR of 1.0 for building shell measures. ADM used TRL reference documents to determine evaluated savings. When tracking data indicated that the cooling source was a heat pump, ADM assumed that a heat pump was also used as the heating source and used the correlated UES. Building Shell savings are reported in Table 3-37 through Table 3-39.

Table 3-37: Building Shell Program Savings by Measure 2019-2020

Measure	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Attic Insulation	**258,961**	**65,604**	**57,097**	**87%**
Insulation - Attic - eFAF - R11 to R49 - WA - 1	48,796	30,242	20,986	69%
Insulation - Attic - eFAF - R11 to R49 - WA - 2	12,158	7,538	4,404	58%
Insulation - Attic - eFAF - R19 to R49 - WA - 1	34,400	9,632	6,872	71%
Insulation - Attic - eFAF - R19 to R49 - WA - 2	1,225	343	172	50%
Insulation - Attic - Gas Heated - R11 to R49 - WA - 1[7]	22,781	(6,130)	683	-11%
Insulation - Attic - Gas Heated - R11 to R49 - WA - 2	1,355	41	41	100%
Insulation - Attic - Gas Heated - R19 to R49 - WA - 1	46,498	930	930	100%
Insulation - Attic - Heat Pump - R11 to R49 - WA - 1	22,101	5,746	5,746	100%
Insulation - Attic - Heat Pump - R11 to R49 - WA - 2	600	156	156	100%
Insulation - Attic - Heat Pump - R19 to R49 - WA - 1	27,647	3,871	3,871	100%
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 1	12,397	5,455	5,455	100%
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 2	528	232	232	100%
Insulation - Attic - Zonal or DHP - R19 to R49 - WA - 1	27,342	6,836	6,836	100%
Manufactured Home - Insulation - Attic - Electric Resistance - R0 to R22 - WA - 1	1,133	714	714	100%
Floor Insulation	**110,142**	**107,522**	**84,648**	**79%**
Insulation - Floor - eFAF - R0 to R19 - WA - 1	2,708	2,410	2,410	100%
Insulation - Floor - eFAF - R0 to R19 - WA - 2	4,130	3,676	661	18%
Insulation - Floor - eFAF - R0 to R30 - WA - 1	11,476	11,476	7,191	63%
Insulation - Floor - eFAF - R0 to R30 - WA - 2	2,301	2,301	1,554	68%
Insulation - Floor - Heat Pump - R0 to R19 - WA - 1	3,984	637	637	100%
Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	13,567	2,442	2,442	100%

[7] Negative claimed savings result from adjusting transactions.

Measure	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 1	1,753	1,630	1,630	100%
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 2	1,225	1,139	1,139	100%
Insulation - Floor - Zonal or DHP - R0 to R30 - WA - 1	33,677	34,687	34,687	100%
Multifamily - Insulation - Floor - eFAF - R0 to R30 - WA - 1	15,824	24,844	10,018	40%
Multifamily - Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	7,977	4,308	4,308	100%
Multifamily - Insulation - Floor - Zonal - R0 to R30 - WA - 1	11,520	17,971	17,971	100%
Roof/Attic Insulation	**24,071**	**3,257**	**3,749**	**115%**
Multifamily - Insulation - Attic - Ductless Heat Pump - R19 to R49 - WA - 1	11,520	1,843	1,843	100%
Multifamily - Insulation - Attic - eFAF - R19 to R49 - WA - 1	960	307	307	100%
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 1	10,368	752	1,244	166%
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 2	1,223	355	355	100%
Wall Insulation	**36,880**	**56,664**	**48,118**	**85%**
Insulation - Wall - eFAF - R0 to R11 - WA - 1	6,611	14,742	12,524	85%
Insulation - Wall - eFAF - R0 to R13 - WA - 2	420	937	937	100%
Insulation - Wall - eFAF - R0 to R13 - WA - 3	1,828	4,076	1,755	43%
Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	13,001	12,481	12,481	100%
Insulation - Wall - Heat Pump - R0 to R13 - WA - 2	2,034	1,953	1,953	100%
Insulation - Wall - Heat Pump - R0 to R13 - WA - 3	896	860	860	100%
Insulation - Wall - Zonal or DHP - R0 to R11 - WA - 1	3,894	5,958	5,958	100%
Insulation - Wall - Zonal or DHP - R0 to R13 - WA - 2	2,006	3,069	3,069	100%
Multifamily - Insulation - Wall - eFAF - R0 to R11 - WA - 1	3,424	8,560	4,554	53%
Multifamily - Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	1,650	1,551	1,551	100%
Multifamily - Insulation - Wall - Zonal - R0 to R11 - WA - 1	1,116	2,478	2,478	100%
Window Upgrade	**3,985**	**3,585**	**3,536**	**99%**
Manufactured Home - Windows - Ufactor 30 to Ufactor 25 - Electric Resistance - WA - 1	65	39	39	100%
Multifamily - Windows - Ufactor 30 to Ufactor 25 - Zonal - WA - 1	1,593	2,357	2,357	100%
Windows - Ufactor > 0.30 to Ufactor <= 0.25 - eFAF - WA - 2	128	96	46	48%
Windows - Ufactor 30 to Ufactor 25 - eFAF - WA - 1	700	525	525	100%
Windows - Ufactor 30 to Ufactor 25 - Heat Pump - WA - 1	1,385	499	499	100%
Windows - Ufactor 30 to Ufactor 25 - Zonal or DHP - WA - 1	115	70	70	100%
Total	**434,038**	**236,632**	**197,149**	**83%**

Table 3-38: Building Shell Program Savings by Measure 2019

Measure	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Attic Insulation	**170,331**	**40,001**	**31,410**	**79%**
Insulation - Attic - eFAF - R11 to R49 - WA - 1	27,310	16,932	10,248	61%
Insulation - Attic - eFAF - R19 to R49 - WA - 1	25,019	7,005	5,099	73%
Insulation - Attic - Gas Heated - R11 to R49 - WA - 1	4,964	149	149	100%
Insulation - Attic - Gas Heated - R19 to R49 - WA - 1	46,498	930	930	100%
Insulation - Attic - Heat Pump - R11 to R49 - WA - 1	4,468	1,162	1,162	100%
Insulation - Attic - Heat Pump - R19 to R49 - WA - 1	27,647	3,871	3,871	100%
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 1	7,083	3,117	3,117	100%
Insulation - Attic - Zonal or DHP - R19 to R49 - WA - 1	27,342	6,836	6,836	100%
Floor Insulation	**89,505**	**91,634**	**75,832**	**83%**
Insulation - Floor - eFAF - R0 to R19 - WA - 1	2,708	2,410	2,410	100%
Insulation - Floor - eFAF - R0 to R30 - WA - 1	7,440	7,440	6,464	87%
Insulation - Floor - Heat Pump - R0 to R19 - WA - 1	3,984	637	637	100%
Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	8,299	1,494	1,494	100%
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 1	1,753	1,630	1,630	100%
Insulation - Floor - Zonal or DHP - R0 to R30 - WA - 1	30,000	30,900	30,900	100%
Multifamily - Insulation - Floor - eFAF - R0 to R30 - WA - 1	15,824	24,844	10,018	40%
Multifamily - Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	7,977	4,308	4,308	100%
Multifamily - Insulation - Floor - Zonal - R0 to R30 - WA - 1	11,520	17,971	17,971	100%
Roof/Attic Insulation	**12,480**	**2,150**	**2,150**	**100%**
Multifamily - Insulation - Attic - Ductless Heat Pump - R19 to R49 - WA - 1	11,520	1,843	1,843	100%
Multifamily - Insulation - Attic - eFAF - R19 to R49 - WA - 1	960	307	307	100%
Wall Insulation	**26,880**	**41,664**	**35,440**	**85%**
Insulation - Wall - eFAF - R0 to R11 - WA - 1	6,611	14,742	12,524	85%
Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	13,001	12,481	12,481	100%
Insulation - Wall - Zonal or DHP - R0 to R11 - WA - 1	3,844	5,881	5,881	100%
Multifamily - Insulation - Wall - eFAF - R0 to R11 - WA - 1	3,424	8,560	4,554	53%
Window Upgrade	**2,120**	**2,576**	**2,576**	**100%**
Multifamily - Windows - Ufactor 30 to Ufactor 25 - Zonal - WA - 1	1,593	2,357	2,357	100%
Windows - Ufactor 30 to Ufactor 25 - Heat Pump - WA - 1	413	149	149	100%
Windows - Ufactor 30 to Ufactor 25 - Zonal or DHP - WA - 1	115	70	70	100%
Total	**301,316**	**178,025**	**147,408**	**83%**

Table 3-39: Building Shell Program Savings by Measure 2020

Measure	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Attic Insulation	**258,961**	**65,604**	**57,097**	**87%**
Insulation - Attic - eFAF - R11 to R49 - WA - 1	48,796	30,242	20,986	69%
Insulation - Attic - eFAF - R11 to R49 - WA - 2	12,158	7,538	4,404	58%
Insulation - Attic - eFAF - R19 to R49 - WA - 1	34,400	9,632	6,872	71%
Insulation - Attic - eFAF - R19 to R49 - WA - 2	1,225	343	172	50%
Insulation - Attic - Gas Heated - R11 to R49 - WA - 1	22,781	(6,130)	683	-11%
Insulation - Attic - Gas Heated - R11 to R49 - WA - 2	1,355	41	41	100%
Insulation - Attic - Gas Heated - R19 to R49 - WA - 1	46,498	930	930	100%
Insulation - Attic - Heat Pump - R11 to R49 - WA - 1	22,101	5,746	5,746	100%
Insulation - Attic - Heat Pump - R11 to R49 - WA - 2	600	156	156	100%
Insulation - Attic - Heat Pump - R19 to R49 - WA - 1	27,647	3,871	3,871	100%
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 1	12,397	5,455	5,455	100%
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 2	528	232	232	100%
Insulation - Attic - Zonal or DHP - R19 to R49 - WA - 1	27,342	6,836	6,836	100%
Manufactured Home - Insulation - Attic - Electric Resistance - R0 to R22 - WA - 1	1,133	714	714	100%
Floor Insulation	**110,142**	**107,522**	**84,648**	**79%**
Insulation - Floor - eFAF - R0 to R19 - WA - 1	2,708	2,410	2,410	100%
Insulation - Floor - eFAF - R0 to R19 - WA - 2	4,130	3,676	661	18%
Insulation - Floor - eFAF - R0 to R30 - WA - 1	11,476	11,476	7,191	63%
Insulation - Floor - eFAF - R0 to R30 - WA - 2	2,301	2,301	1,554	68%
Insulation - Floor - Heat Pump - R0 to R19 - WA - 1	3,984	637	637	100%
Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	13,567	2,442	2,442	100%
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 1	1,753	1,630	1,630	100%
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 2	1,225	1,139	1,139	100%
Insulation - Floor - Zonal or DHP - R0 to R30 - WA - 1	33,677	34,687	34,687	100%
Multifamily - Insulation - Floor - eFAF - R0 to R30 - WA - 1	15,824	24,844	10,018	40%
Multifamily - Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	7,977	4,308	4,308	100%
Multifamily - Insulation - Floor - Zonal - R0 to R30 - WA - 1	11,520	17,971	17,971	100%
Roof/Attic Insulation	**24,071**	**3,257**	**3,749**	**115%**
Multifamily - Insulation - Attic - Ductless Heat Pump - R19 to R49 - WA - 1	11,520	1,843	1,843	100%
Multifamily - Insulation - Attic - eFAF - R19 to R49 - WA - 1	960	307	307	100%
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 1	10,368	752	1,244	166%
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 2	1,223	355	355	100%
Wall Insulation	**36,880**	**56,664**	**48,118**	**85%**
Insulation - Wall - eFAF - R0 to R11 - WA - 1	6,611	14,742	12,524	85%
Insulation - Wall - eFAF - R0 to R13 - WA - 2	420	937	937	100%
Insulation - Wall - eFAF - R0 to R13 - WA - 3	1,828	4,076	1,755	43%

Measure	Quantity (sq ft)	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	13,001	12,481	12,481	100%
Insulation - Wall - Heat Pump - R0 to R13 - WA - 2	2,034	1,953	1,953	100%
Insulation - Wall - Heat Pump - R0 to R13 - WA - 3	896	860	860	100%
Insulation - Wall - Zonal or DHP - R0 to R11 - WA - 1	3,894	5,958	5,958	100%
Insulation - Wall - Zonal or DHP - R0 to R13 - WA - 2	2,006	3,069	3,069	100%
Multifamily - Insulation - Wall - eFAF - R0 to R11 - WA - 1	3,424	8,560	4,554	53%
Multifamily - Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	1,650	1,551	1,551	100%
Multifamily - Insulation - Wall - Zonal - R0 to R11 - WA - 1	1,116	2,478	2,478	100%
Window Upgrade	**3,985**	**3,585**	**3,536**	**99%**
Manufactured Home - Windows - Ufactor 30 to Ufactor 25 - Electric Resistance - WA - 1	65	39	39	100%
Multifamily - Windows - Ufactor 30 to Ufactor 25 - Zonal - WA - 1	1,593	2,357	2,357	100%
Windows - Ufactor > 0.30 to Ufactor <= 0.25 - eFAF - WA - 2	128	96	46	48%
Windows - Ufactor 30 to Ufactor 25 - eFAF - WA - 1	700	525	525	100%
Windows - Ufactor 30 to Ufactor 25 - Heat Pump - WA - 1	1,385	499	499	100%
Windows - Ufactor 30 to Ufactor 25 - Zonal or DHP - WA - 1	115	70	70	100%
Total	**434,038**	**236,632**	**197,149**	**83%**

3.11.4 Discussion of Realization Rates

Realization rates were impacted by the following factors:

- Six correcting entries with negative claimed savings negatively impacted the realization rate.
- Seventy-six records identify either eFAF or Zonal heating while data collected from the rebate application indicates that the cooling source is a heat pump. Evaluated savings for those records reflect a UES for measures with a heat pump heat source, resulting in a lower realization rate.

3.12 Water Heating

Pacific Power offered rebates to verified customers on qualified energy efficient heat pump water heaters during the evaluation period. Rebates were issued on 33 water heaters resulting in savings of 45,481 kWh, accounting for 1 percent of program savings as reported in Table 3-40.

Table 3-40: Water Heater Program Savings

Year	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
2019	20	27,775	27,775	100%
2020	13	17,706	17,706	100%
Total	**33**	**45,481**	**45,481**	**100%**

3.12.1 Tracking Data Verification

ADM reviewed the program tracking data to:

- Evaluate if installed measures met efficiency requirements indicated in TRL files.
- Verify that the program tracking dataset did not include duplicate or erroneous data entries.

ADM found the following information was missing from the dataset:

- Tracking data did not include baseline conditions.
- Tracking data did not include installation location or conditions as indicated by measure names.

3.12.2 Ex Ante Review

ADM verified that the UES values claimed by Pacific Power were supported by the applicable TRL documents.

3.12.3 Evaluated savings

ADM reviewed the manufacture model specifications for each heat pump water heater reported in the program tracking data to verify each model's capacity and ENERGY STAR certification.

ADM assumed an ISR of 1.0 for water heating measures.

Total evaluated program savings for water heating, by measure, are reported in Table 3-41 through Table 3-43.

Table 3-41: Water Heater Program Savings by Measure 2019-2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 3	4	5,276	5,276	100%
HPWH Tier 3 Basement 0-55 Gallons - Self Install - WA - 3	4	5,756	5,756	100%
HPWH Tier 3 Garage 0-55 Gallons - Self Install - WA - 3	5	7,120	7,120	100%
HPWH Tier 3 Garage 0-55 Gallons - WA - 3	4	5,696	5,696	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - WA - 2	1	1,557	1,557	100%
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 4	3	3,864	3,864	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 4	2	2,638	2,638	100%
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 3	1	1,288	1,288	100%
HPWH Tier 3 Garage 0-55 Gallons - WA - 2	1	1,678	1,678	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 2	1	1,286	1,286	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	2	1,894	1,894	100%
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 3	2	3,184	3,184	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 2	1	1,557	1,557	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - WA - 3	0	0	0	N/A
HPWH Tier 3 Ducted Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	1	1,095	1,095	100%
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 4	1	1,592	1,592	100%
Total	**33**	**45,481**	**45,481**	**100%**

Table 3-42: Water Heater Program Savings by Measure 2019

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 3	2	2,638	2,638	100%
HPWH Tier 3 Basement 0-55 Gallons - Self Install - WA - 3	3	4,317	4,317	100%
HPWH Tier 3 Garage 0-55 Gallons - Self Install - WA - 3	4	5,696	5,696	100%
HPWH Tier 3 Garage 0-55 Gallons - WA - 3	3	4,272	4,272	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - WA - 2	1	1,557	1,557	100%
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 3	1	1,288	1,288	100%
HPWH Tier 3 Garage 0-55 Gallons - WA - 2	1	1,678	1,678	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 2	1	1,286	1,286	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	2	1,894	1,894	100%
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 3	1	1,592	1,592	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 2	1	1,557	1,557	100%
Total	20	27,775	27,775	100%

Table 3-43: Water Heater Program Savings by Measure 2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 3	2	2,638	2,638	100%
HPWH Tier 3 Basement 0-55 Gallons - Self Install - WA - 3	1	1,439	1,439	100%
HPWH Tier 3 Garage 0-55 Gallons - Self Install - WA - 3	1	1,424	1,424	100%
HPWH Tier 3 Garage 0-55 Gallons - WA - 3	1	1,424	1,424	100%
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 4	3	3,864	3,864	100%
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 4	2	2,638	2,638	100%
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 3	1	1,592	1,592	100%
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - WA - 3	0	0	0	N/A
HPWH Tier 3 Ducted Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	1	1,095	1,095	100%
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 4	1	1,592	1,592	100%
Total	**13**	**17,706**	**17,706**	**100%**

3.13 Appliances

Pacific Power offered rebates to verified customers on qualified energy efficient clothes washers and dryers during the evaluation period. Rebates were issued on 217 appliances resulting in savings of 37,976 kWh, accounting for 0.4 percent of program savings as reported in Table 3-44.

Table 3-44: Appliances Program Savings by Year

Program Year	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
2019	111	17,208	17,812	104%
2020	106	19,188	20,165	105%
Total	**217**	**36,396**	**37,976**	**104%**

3.13.1 Tracking Data Verification

ADM reviewed the program tracking data to:

- Determine if energy efficiency requirements were met for all appliances, as documented in the TRL reference files,
- Verify that the program tracking dataset did not include duplicate or erroneous data entries.

ADM found the following in the dataset:

- Three records were missing model numbers.
- Seventy-six records included appliance model numbers with specifications that exceeded efficiency qualifications for which higher claimed savings were available.
- Twenty-one records did not qualify for the efficiency tier of the indicated measure.

3.13.2 Ex Ante Review

ADM verified that the UES values in the TRL were supported by appropriate reference files.

3.13.3 Evaluated savings

ADM reviewed manufacture model specifications to determine appropriate savings tier savings as indicated by TRL reference documents. ADM assumed an ISR of 1.0 for appliances. Savings by measure are reported in Table 3-45 through Table 3-47.

Table 3-45: Appliances Program Savings by Measure 2019-2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Clothes Washer - Electric DHW & Electric Dryer	**158**	**27,398**	**28,587**	**104%**
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	26	3,978	4,086	103%
Clothes Washers - CEE Tier 3 - Electric DHW & Electric Dryer - WA - 1	42	7,625	8,099	106%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	41	6,273	6,921	110%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 3	24	4,752	4,639	98%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 2	15	2,970	2,934	99%
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 2	3	540	558	103%
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 3	7	1,260	1,350	107%
Clothes Washer - Electric DHW & Gas Dryer	**9**	**844**	**766**	**91%**
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 2	6	552	457	83%
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	0	0	0	N/A
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	1	84	102	121%
Clothes Washers - CEE Tier 3 - Electric DHW & Gas Dryer - WA - 1	1	116	116	100%
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 3	1	92	91	99%
Heat Pump Clothes Dryer	**12**	**5,307**	**5,920**	**112%**
Clothes Dryer - Ventless_UCEF 4.20 to 4.69 - WA - 1	1	435	624	143%
Clothes Dryer - Ventless_UCEF 7.20 to 8.00 - WA - 1	3	1,872	1,782	95%
Clothes Dryer - Vented_UCEF 3.20 to 3.39 - WA - 2	1	234	599	256%
Clothes Dryer - Vented_UCEF 3.80 to 4.19 - WA - 1	1	346	346	100%
Clothes Dryer - Vented_UCEF 3.60 to 3.79 - WA - 1	2	608	757	125%
Clothes Dryer - Ventless_UCEF 4.70 to 5.29 - WA - 1	1	485	344	71%
Clothes Dryer - Ventless_UCEF 3.60 to 3.79 - WA - 1	1	344	485	141%
Clothes Dryer - Ventless_UCEF 3.80 to 4.19 - WA - 1	1	384	384	100%
Clothes Dryer - Vented_UCEF 7.20 to 8.00 - WA - 1	1	599	599	100%
Clothes Washer - Gas DHW & Electric Dryer	**38**	**2,847**	**2,704**	**95%**
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	12	804	864	107%
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 3	5	470	453	96%
Clothes Washers - CEE Tier 3 - Gas DHW & Electric Dryer - WA - 1	21	1,573	1,387	88%
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	0	0	0	N/A
Total	**217**	**36,396**	**37,976**	**104%**

Table 3-46: Appliances Program Savings by Measure 2019

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Clothes Washer - Electric DHW & Electric Dryer	**76**	**12,573**	**13,516**	**108%**
Clothes Washers - CEE Tier 3 - Electric DHW & Electric Dryer - WA - 1	35	6,300	6,595	105%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	41	6,273	6,921	110%
Clothes Washer - Electric DHW & Gas Dryer	**1**	**84**	**102**	**121%**
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	1	84	102	121%
Heat Pump Clothes Dryer	**5**	**2,438**	**2,207**	**91%**
Clothes Dryer - Ventless_UCEF 7.20 to 8.00 - WA - 1	1	624	534	86%
Clothes Dryer - Vented_UCEF 3.80 to 4.19 - WA - 1	1	346	346	100%
Clothes Dryer - Ventless_UCEF 4.70 to 5.29 - WA - 1	1	485	344	071%
Clothes Dryer - Ventless_UCEF 3.80 to 4.19 - WA - 1	1	384	384	100%
Clothes Dryer - Vented_UCEF 7.20 to 8.00 - WA - 1	1	599	599	100%
Clothes Washer - Gas DHW & Electric Dryer	**29**	**2,113**	**1,987**	**94%**
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	12	804	864	107%
Clothes Washers - CEE Tier 3 - Gas DHW & Electric Dryer - WA - 1	17	1,309	1,123	86%
Total	**111**	**17,208**	**17,812**	**104%**

Table 3-47: Appliance Program Savings by Measure 2020

Measure	Quantity	Claimed Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Clothes Washer - Electric DHW & Electric Dryer	**82**	**14,825**	**15,071**	**102%**
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	26	3,978	4,086	103%
Clothes Washers - CEE Tier 3 - Electric DHW & Electric Dryer - WA - 1	7	1,325	1,504	114%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 3	24	4,752	4,639	98%
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 2	15	2,970	2,934	99%
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 2	3	540	558	103%
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 3	7	1,260	1,350	107%
Clothes Washer - Electric DHW & Gas Dryer	**8**	**760**	**664**	**87%**
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 2	6	552	457	83%
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	0	0	0	N/A
Clothes Washers - CEE Tier 3 - Electric DHW & Gas Dryer - WA - 1	1	116	116	100%
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 3	1	92	91	99%
Heat Pump Clothes Dryer	**7**	**2,869**	**3,713**	**129%**
Clothes Dryer - Ventless_UCEF 4.20 to 4.69 - WA - 1	1	435	624	143%
Clothes Dryer - Ventless_UCEF 7.20 to 8.00 - WA - 1	2	1,248	1,248	100%
Clothes Dryer - Vented_UCEF 3.20 to 3.39 - WA - 2	1	234	599	256%
Clothes Dryer - Vented_UCEF 3.60 to 3.79 - WA - 1	2	608	757	125%
Clothes Dryer - Ventless_UCEF 3.60 to 3.79 - WA - 1	1	344	485	141%
Clothes Washer - Gas DHW & Electric Dryer	**9**	**734**	**717**	**98%**
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 3	5	470	453	96%
Clothes Washers - CEE Tier 3 - Gas DHW & Electric Dryer - WA - 1	4	264	264	100%
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	0	0	0	N/A
Total	**106**	**19,188**	**20,165**	**105%**

3.13.4 Discussion of Realization Rates

Realization rates were impacted by the following factors:

Ninety-seven records included model numbers with an efficiency rating different than indicated in the tracking data by the measure name (8 dryers and 90 washers). Evaluated savings reflect the efficiency rating model numbers provided in the tracking data. Realization rates reflect both increase and decreased savings by record.

4 Process Evaluation

4.1 Review of Program Materials and In-Depth Interviews

ADM completed a process analysis of the program which included in depth interviews and conversations with key staff at Pacific Power and Nexant, the program implementer. Additional information was gathered from a general customer survey, a starter kit participant survey, and a review of program materials.

4.1.1 Roles and Responsibilities

The Pacific Power program manager is responsible for the Wattsmart Home Energy Savings programs in California and Washington, including oversight of the regulatory process, assessment of program cost effectiveness, regulatory recovery, review and approval of marketing campaigns, program participation and procedures, and design and implementation of procedures.

Pacific Power transitioned from CLEAResult to Nexant as the delivery partner during the evaluation period. Delivery partner responsibilities included program implementation, contract management, client management, and overseeing day-to-day operations. In making the transition, Pacific Power sought to take advantage of synergies derived from Nexant's experience with their business customer program. Nexant provided an enhanced public user interface with online application processing with the capacity to tie into Pacific Power's program tracking system.

The transition included an overlap period when both implementation contractors were engaged to facilitate the handoff.

4.1.2 Program Design and Goals

The primary purpose of the program is to achieve conservation targets established through the integrated resource planning process as required by Energy Independence Act. An important secondary goal of the program is to deliver high quality customer service and customer satisfaction to insure continued customer engagement in the program.

Declining UESs was the primary challenge Pacific Power faced in achieving its program objectives. In addition, the COVID pandemic occurred during the last ten months of the evaluation period (March through December 2020).

4.1.3 Tracking and Reporting

Pacific Power savings documentation is comprised of the technical reference library (TRL) and its associated files and the program tracking dataset.

4.1.3.1 Technical Reference Library (TRL)

Ex ante program savings, as well as other measure specifications, are documented in Pacific Power's Technical Reference Library (TRL). The TRL is comprised of a listing of all program measures and all versions of each measure. Measure specifications are updated as required by changing regulatory and market conditions. The TRL file is maintained jointly by Pacific Power and its contracted program implementer. Each measure listed includes specifications for the measure and version number, including reference files that document UES values or savings calculation methodologies.

TRL reference files are frequently briefs that summarize relevant measures included in the Regional Technical Forum (RTF) library of measure maintained by Northwest Power and Conservation Council to verify and evaluate energy efficiency savings.

RTF reference files include the basis for unit energy savings values. RTF reference documents are frequently updated, and therefore keeping the TRL current is a challenge.

Because the TRL includes multiple versions of specific measures for which the savings values can vary, the accuracy of TRL necessitates that a specific reference file is indicated for each version of each measure. ADM found that the TRL often reported reference files used for groups of measures without explicitly indicating a reference file for each specific measure.

The new program implementor completed the transition to a new Measures Library with process improvements in June 2021.

4.1.3.2 Program Tracking Dataset

Pacific Power maintains a program tracking dataset that includes:

- Measure name and corresponding data that ties to the TRL
- Record or application status and relevant dates
- Customer and account information for downstream measures

The following data elements are not included in Pacific Power's dataset:

- Product manufacturer, model numbers, efficiency ratings
- Retail sales location for upstream measures
- Baseline and efficient conditions

ADM found that key program tracking data elements are retained with program implementer and are not integrated into Pacific Power's program tracking database. The transition to a new implementer mid-evaluation-cycle introduced additional data collection and retrieval challenges.

Program data provided by Pacific Power and the implementer did not included all information necessary to evaluate savings for all measures, as documented in Section 3 Impact Evaluation.

4.1.4 Communication

Pacific Power transitioned to a new implementation contractor in mid-2019. The two contractors overlapped to manage the transition. Pacific Power has weekly meetings with implementation staff. In addition, there are quarterly meetings and ad hoc communication. Weekly meeting topics include program status and performance, long-term strategy, day-to-day tactical decisions, and marketing activities.

4.2 General Population Survey Results

This section presents key findings from surveys administered online by ADM Associates and completed by 400 customers. Both program and non-program participants shared their experience with Pacific Power's programs during 2019 and 2020. ADM sent customers email invitations to complete the questionnaire through an online survey platform and offered monetary incentives for completion. The data collected in the survey was used for both the process evaluation and impact analyses.

4.2.1 LED Lighting Measures

Participants provided information on whether they participated in the Wattsmart Homes program by purchasing LED lighting products. Ninety-four percent of respondents bought LED light bulbs, 33 percent bought LED fixtures, and 2 percent could not recall.

Table 4-1: What type of ENERGY STAR® LED lighting products did you buy?

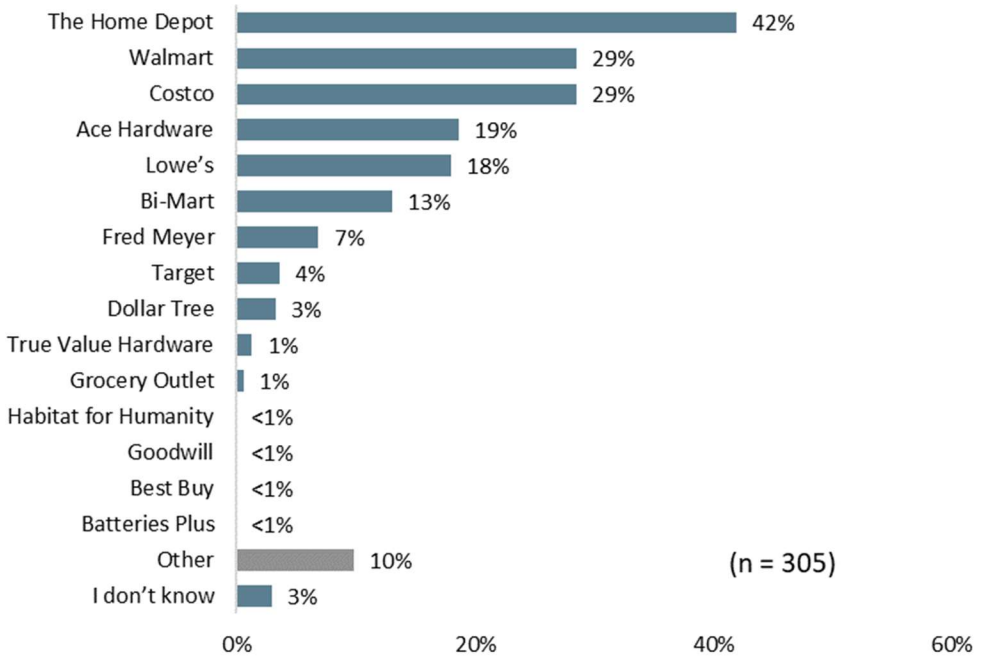
Type	Percentage (n = 272)
LED light bulb(s)	94%
LED fixture(s)	33%
I don't know	2%

*Multiple response questions- percentage exceeds 100%.

Customers who bought LED measures reported where they purchased their measures. The top retail stores among the survey respondents were The Home Depot (42 percent),

Walmart (29 percent), and Costco (29 percent). Other retailers include Ace Hardware (19 percent), Lowe's (18 percent), and Bi-Mart (13 percent). See Figure 4-1 for more details.

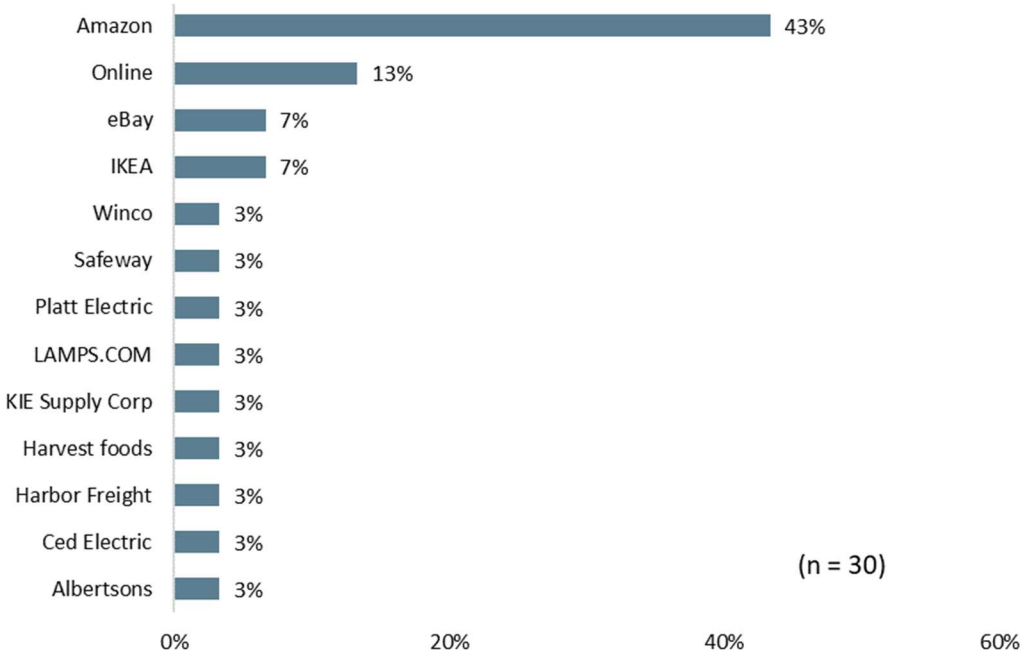
Figure 4-1: Which stores did you buy your ENERGY STAR® LED lighting from?



*Multiple response questions- percentage exceeds 100%.

As shown above, of the 305 respondents, 10 percent indicated they purchased their LEDs from other unlisted sources. Of the respondents who obtained their LEDs from another store, 43 percent indicated they bought their lights from Amazon.com, 13 percent indicated they shopped online without specifying the website, and 7 percent obtained their LEDs from eBay.com. See Figure 4-2 for more details.

Figure 4-2: Which other non-participating stores did you buy your ENERGY STAR® LED lighting from?



Furthermore, 86 percent of respondents purchased their standard LEDs during 2020 compared to 73 percent who purchased theirs in 2019. People who purchased LED fixtures also bought more in 2020 than in 2019 (see Table 4-2); many participants bought LEDs during both years.

Table 4-2: When did you buy the ENERGY STAR® LED bulbs?

LED Types	2019	2020
Standard LED bulb(s) (n = 258)	73%	86%
LED fixture(s) (n = 90)	53%	71%

*Multiple response questions - percentage exceeds 100%.

4.2.2 **Participant Motivations for Purchasing LEDs**

Survey participants stated the reasons why they decided to purchase the LEDs. The most common answer was they wanted to replace their burned-out bulbs (66 percent), followed by those who wanted to replace their working bulbs with ones that consumed less energy (49 percent). Another 25 percent indicated they had added a new light fixture in their home, and 8 percent wanted to take advantage of the discount pricing. Just 1 percent of the respondents could not recall. People who indicated "other" as their response stated they wanted a different color of the light (n = 5), different brightness (n = 2), or wanted a better fixture (n = 1).

Table 4-3: Why did you purchase the ENERGY STAR® LED lighting?

Response	Percentage (n = 272)
To replace burned out bulbs	66%
To replace working bulbs to lower energy use	49%
To add new light fixture(s) in my home	25%
To take advantage of discounted pricing	8%
Other	3%
I don't know	1%

*Multiple response questions- percentage exceeds 100%.

Regarding the discount pricing (n = 257), 16 percent of respondents indicated they recalled that the standard LEDs had been discounted, compared to 45 percent who stated the measures were not discounted, and 39 percent did not recall. Of the people who recalled the discount (n = 42), 21 percent remembered seeing a label or sign indicating Pacific Power provided the discount compared to the 43 percent who did not see a label and 36 percent who could not recall. For 67 percent of participants who recalled discount pricing, the discount was somewhat or very important when purchasing the standard LEDs.

Table 4-4: How important was the discount to your purchase of ENERGY STAR® LED standard light bulbs?

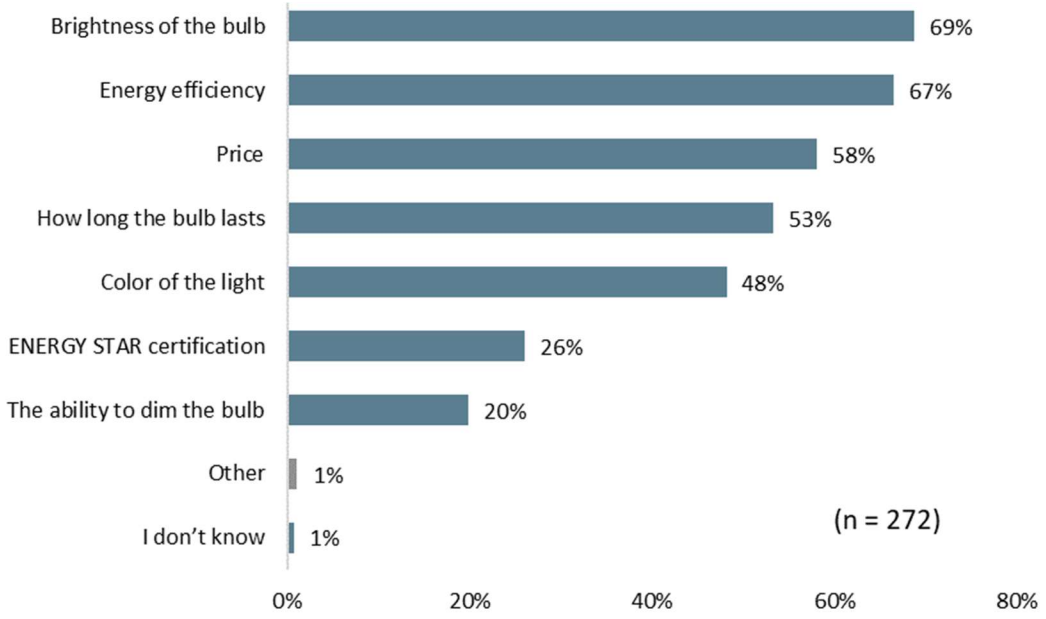
Rating	Percentage (n = 42)
0- Not important	0%
1	2%
2	2%
3	2%
4	5%
5	14%
6	7%
7	17%
8	12%
9	7%
10- Very important	31%

Of the 90 people who bought LED fixtures, 16 percent knew the measures were discounted, 47 percent did not, and 38 percent could not recall at the time of the survey. Of the 14 people who recalled the discount, only two people remember seeing a label indicating the discount was provided by Pacific Power compared to eight who did not see

the label and four who did not recall. The discount was important or very important to 50 percent of respondents.

Although pricing was a significant factor when considering the purchase, it was not the most important to many respondents. The figure below illustrates the top characteristics customers considered when purchasing LED lighting such as brightness of the bulb (69 percent) and energy efficiency (67 percent).

Figure 4-3: Which characteristic do you consider when purchasing light bulbs?



*Multiple response questions- percentage exceeds 100%.

4.2.3 Other Energy Savings Purchases by Participants and Other Behaviors

In addition to purchasing the LED products, respondents also stated they bought other energy efficient measures. As shown in the table below, most purchased ENERGY STAR® certified appliances (35 percent), low-flow showerheads (25 percent), or low-flow faucet aerators (22 percent).

Table 4-5: After buying the discounted ENERGY STAR® lighting product, have you taken any of the following additional steps to save energy in your home?

Response	Percentage (n = 51)
Installed ENERGY STAR® certified appliances such as a refrigerator, dishwasher, clothes washer, or clothes dryer	35%
Installed low flow showerheads	25%
Installed low flow faucet aerators	22%
Installed an ENERGY STAR® certified water heater	12%
Installed an ENERGY STAR® certified room air conditioner	10%
Installed a Smart Thermostat (e.g., EcoBee or Nest)	8%
Installed water heater jacket, blanket, or insulation	6%
Installed an ENERGY STAR® central air conditioner, heat pump, or evaporative cooler	2%
Other	6%
I don't know	8%
Did not install any of these energy saving items	29%

Multiple response questions- percentage exceeds 100%.

Of the people who purchased an ENERGY STAR® certified appliance (n = 12), 58 percent purchased a refrigerator, 50 percent bought a clothes washer, 25 percent bought a clothes dryer, and 17 percent a dishwasher. Most participants purchased more than one product.

Many participants who purchased non-LED measures did not receive any incentives or rebates for their products. See the table below for more details.

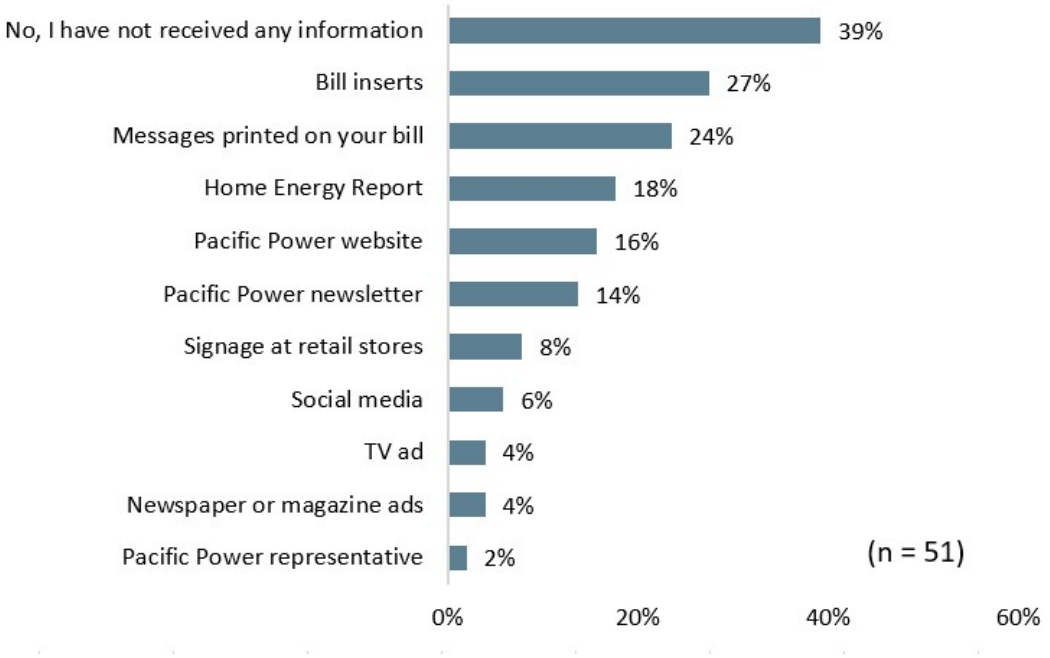
Table 4-6: Did you receive an incentive or discount to buy the measure?

Measure	Yes	No
ENERGY STAR® certified appliance (n = 18)	33%	67%
Low-flow faucet aerator (n = 11)	45%	55%
Low-flow showerhead (n = 13)	31%	69%
ENERGY STAR® certified water heater (n = 6)	33%	67%
Water heater jacket or blanket (n = 3)	0%	100%
Room air conditioner (n = 5)	0%	100%
ENERGY STAR® cooling system (n = 11)	73%	27%
Smart thermostat (n = 4)	0%	100%

People who bought a room air conditioner stated they either replaced their old equipment (n = 3), replaced a fan (n = 1), or added the measure to a room that previously had no cooling system (n = 2).

Lastly, program participants indicated whether they had received information from Pacific Power about how to save energy in their homes. Participants stated they received information from bill inserts (27 percent), messages printed on the bill (24 percent), or from their home energy report (18 percent). See additional details below.

Figure 4-4: Have you received information from Pacific Power about how to save energy in your home from any of these sources?



Multiple response questions- percentage exceeds 100%.

4.2.4 Non-Participants Summary

Respondents who stated they had not bought or could not recall having bought LED measures in 2019 or 2020 from participating retailers, indicated if they had participated in Pacific Power energy efficiency programs. Twenty percent received a Wattsmart Homes Starter kit, 5 percent received rebates or discounts, and 2 percent purchased LED lighting products discounted by Pacific Power at a retail store (see Table 4-7).

Table 4-7: Non-Participants: In 2019 or 2020, did you participate in any of the following Pacific Power programs that promoted energy saving?

Response	Percentage (n = 133)
No one in my home participated in any Pacific Power energy efficiency program	76%
Received a Pacific Power Wattsmart Homes Starter Kit that included LED light bulbs and may have included low flow faucet aerators and a showerhead	20%
Received a rebate or discount from Pacific Power energy efficient appliances, heating or cooling products, or home insulation or weatherization products and services	5%
Purchased LED lighting products discounted by Pacific Power from a retail store	2%

Multiple response questions- percentage exceeds 100%.

Respondents also bought other energy efficient measures; customers bought ENERGY STAR® certified appliances (16 percent), low-flow showerheads (11 percent), low-flow faucet aerators (8 percent), and ENERGY STAR® certified water heater (8 percent).

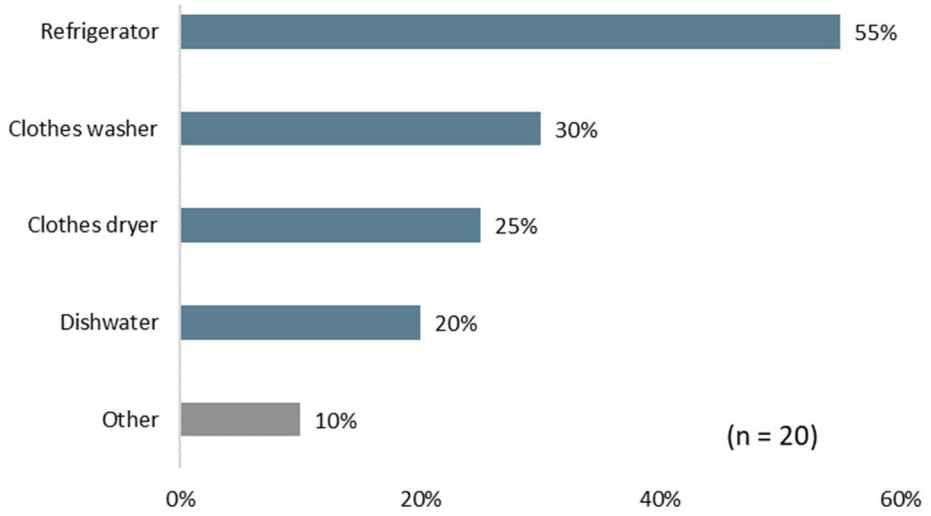
Table 4-8: Non-Participants: In 2019 and 2020, did you take any of the following steps to save energy in your home based on the information you received from Pacific Power?

Response	Percentage (n = 133)
I have not taken any of these energy saving actions	44%
Installed ENERGY STAR® certified appliances such as a refrigerator, dishwasher, clothes washer, or clothes dryer	16%
Installed low flow showerheads	11%
Installed low flow faucet aerators	8%
Installed an ENERGY STAR® certified water heater	8%
Installed an ENERGY STAR® central air conditioner, heat pump, or evaporative cooler	5%
Installed an ENERGY STAR® certified room air conditioner	2%
Installed a smart thermostat (e.g., EcoBee or Nest)	2%
Installed water heater jacket, blanket, or insulation	1%
Other	6%
I don’t know	18%

Multiple response questions- percentage exceeds 100%.

Non-program participants who purchased ENERGY STAR® certified appliances gave details on what specific measures they bought. According to the figure below, most participants bought more than one appliance. The top two purchased appliances were refrigerators and clothes washers. People who said "other" appliance stated they purchased a freezer or a range.

Figure 4-5: Non-Participants: What type of ENERGY STAR® certified appliance did you purchase?



According to the respondents, not many non-participants who purchased the above measures received or recalled receiving any incentives or rebates for their products. See Table 4-9 below for more details.

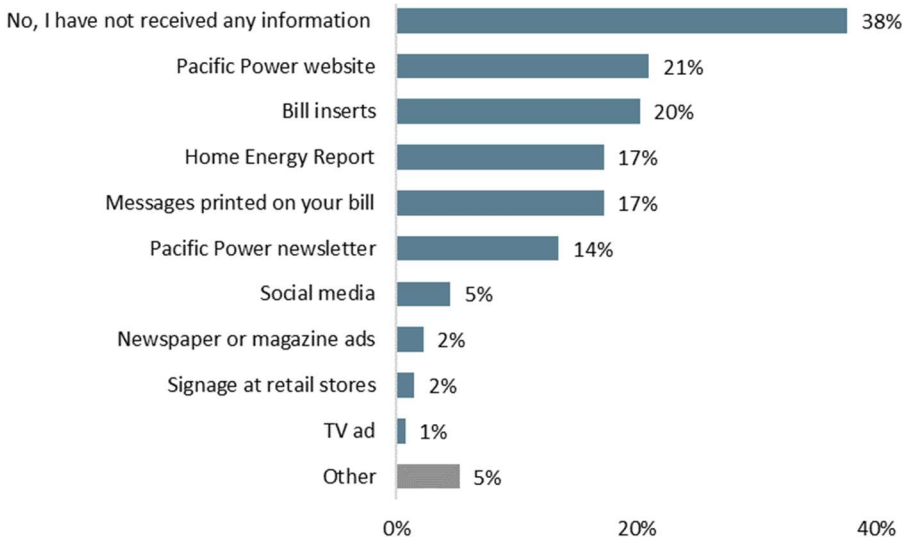
Table 4-9: Did you receive an incentive or discount to buy the measure?

Measure	Yes	No	Do not recall
ENERGY STAR® certified appliance (n = 21)	5%	81%	14%
Low-flow faucet aerator (n = 11)	0%	73%	27%
Low-flow showerhead (n = 15)	7%	80%	13%
ENERGY STAR® certified water heater (n = 1)	0%	0%	100%
Room air conditioner (n = 3)	0%	100%	0%
ENERGY STAR® cooling system (n = 7)	0%	43%	57%
Smart thermostat (n = 3)	0%	33%	67%

People who bought a room air conditioner stated they either replaced their old equipment (n = 1), replaced an evaporative cooler (n = 1), replaced a fan (n = 1), or added the measure to a room that previously had no cooling system (n = 1).

Non-program participants indicated whether they had received information from Pacific Power about how to save energy in their homes. Thirty-eight percent did not recall receiving any information about energy savings from Pacific Power. Customers who did recall receiving efficiency information stated they received information from the utility's website (21 percent), bill inserts (20 percent), or their home energy report (17 percent). See additional details in Figure 4-6.

Figure 4-6: Non-Participants: Have you received information from Pacific Power about how to save energy in your home from any of these sources?



4.2.5 Home Characteristics

Participants' home characteristics are summarized in Table 4-10. Respondents reported living in single-family homes (70 percent) and owning the property (71 percent). Most of the survey participants' homes were built before 2000 (72 percent).

Sixty percent of respondents reported that electricity was their primary home heating fuel. Sixty percent of home sizes are 2,000 square feet or smaller, and 61 percent of the respondents indicated that up to two people lived in their household. Respondents were asked if their household incomes, based on number of people living in the household, was over or under the federal poverty level (FPL). Twenty-five percent of respondents indicated a that their household income fell below FPL guidelines. Seventeen percent declined to respond.

Table 4-10: Home Characteristics

Home Characteristics	Percentage (n = 398)
Single-family home	70%
Manufactured or mobile home	12%
Apartment or condominium	10%
Duplex or townhouse	7%
Cooperative	<1%
Don't know	<1%
Year Built	**Percentage (n = 399)**
Before 1960	33%
1960 to 1979	21%
1980 to 1999	19%
2000 to 2009	10%
2010 or later	6%
Do not recall/Prefer not to answer	12%
Own or Rent	**Percentage (n = 398)**
Own	71%
Rent	28%
Do not recall/Prefer not to answer	1%
What is the main fuel used for heating your home?	**Percentage (n = 399)**
Electricity	60%
Natural Gas	27%
Heat Pump	6%
Wood	2%
Oil	2%
Wood pellets	2%
Propane	1%
Solar	1%
Gas boiler for all units	<1%
Radiant Heat in Ceiling	<1%
Do not recall/Prefer not to answer	<1%

How large is your home?	Percent (n = 399)
Less than 1,000 square feet	13%
1,000-2,000 square feet	47%
2,000-3,000 square feet	22%
3,000-4,000 square feet	5%
Greater than 4,000 square feet	1%
Do not recall/Prefer not to answer	13%
Is English the primary language spoken in your household?	**Percent (n = 397)**
Yes	94%
No	6%
Including yourself, how many people are living in your household?	**Percent (n = 392)**
1	23%
2	38%
3	14%
4	11%
5	8%
6	3%
7	1%
8	1%
9	0%
10	0%
Do not recall/Prefer not to answer	1%

4.3 Starter Kit Participant Survey Results

A total of 68 customers who received energy kits in 2019 or 2020 completed an online Starter Kit Participant Survey. The survey gathered data related to program awareness, measures installed, in-service rates, experience, and customers satisfaction. The survey collected data for both the process evaluation and impact analyses.

4.3.1 Program Awareness and Enrollment Experience

Participants provided information and feedback regarding how they learned about the Starter Kits program. Participants reported hearing about the program through the utility's website (37 percent), utility bill (31 percent), or through a utility bills insert (26 percent). A summary of survey responses appears in Table 4-11.

Table 4-11: How did respondents learn about the program?

How did you hear about these kits?	Percentage (n = 68)
Pacific Power website	37%
My bill	31%
Utility bill insert	26%
Pacific Power newsletter	13%
Social media such as Facebook or Twitter	3%
Home Energy Report	3%
Word of mouth (friend, relative, coworker, etc.)	1%
Other	1%
I don't know	3%

*Percentage exceeds 100%. Participants could choose more than one option.

4.3.2 Customer Experience and Installation of Measures

Survey respondents provided feedback about their experience installing the kit contents. Respondents were asked if their home had an electric water heater. Seventy-five percent of all the participants (n = 68) reported they used an electric water heater, and 89 percent of participants who received a kit with water saving measures (n = 52) stated they had an electric water heater. See the two tables below for more details.

Table 4-12: What fuel does your main water heater use?

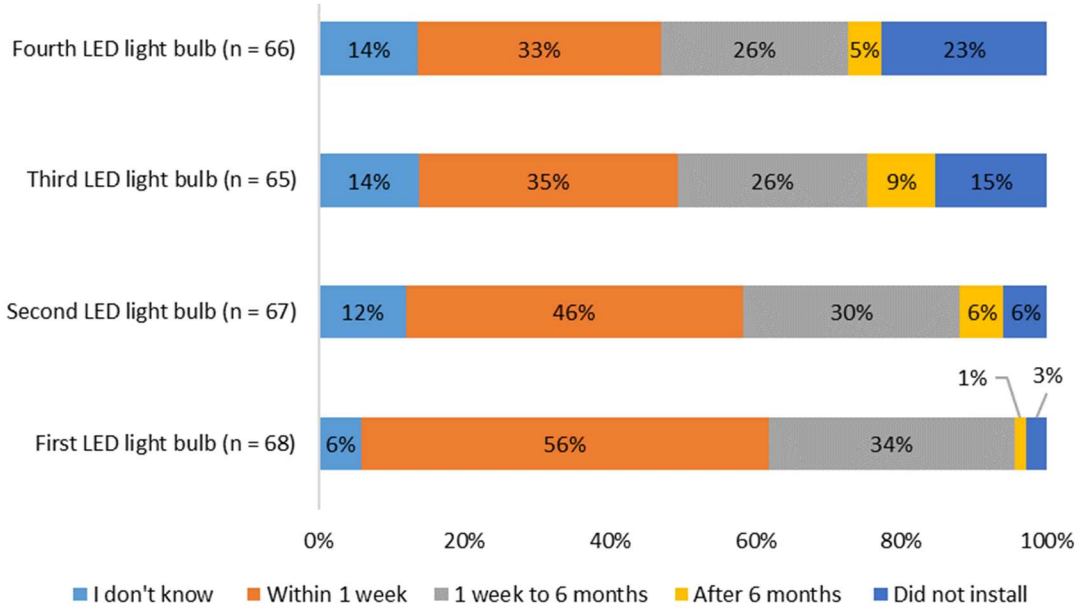
What fuel does your main water heater use?	Percent of All Kit Recipients (n = 68)
Electricity	75%
Natural gas	24%
I don't know	1%

Table 4-13: What fuel does your main water heater use?

What fuel does your main water heater use?	Percent of Bath-1 and Bath-2 Kit Recipients (n = 52)
Electricity	89%
Natural gas	10%
I don't know	1%

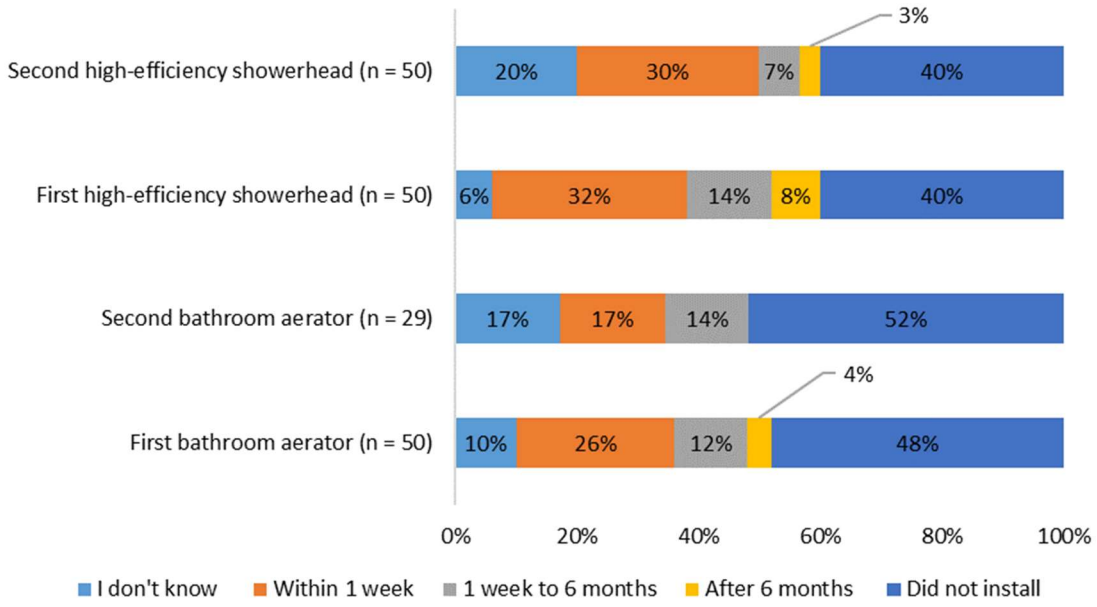
Respondents reported when they installed each of the their four LED lightbulbs. See Figure 4-7 for more details. Kit recipients who had not installed the LEDs at the time of the survey stated they were waiting for their bulbs to burn out (n = 12), two people stated the LEDs did not have the correct wattage, two disliked the color or tone, and two participants stated the bulb did not fit in their fixtures.

Figure 4-7: How long after receiving your kit did you install the LEDs?



For participants who received showerheads and bathroom aerators 40 to 52 percent did not install the water saving measures (see Figure 4-8). The same responses were true for people who installed kitchen aerators: 31 percent stated they installed within a week, compared to 46 percent who did not install them.

Figure 4-8: How long after receiving your kit did you install the bathroom measures?



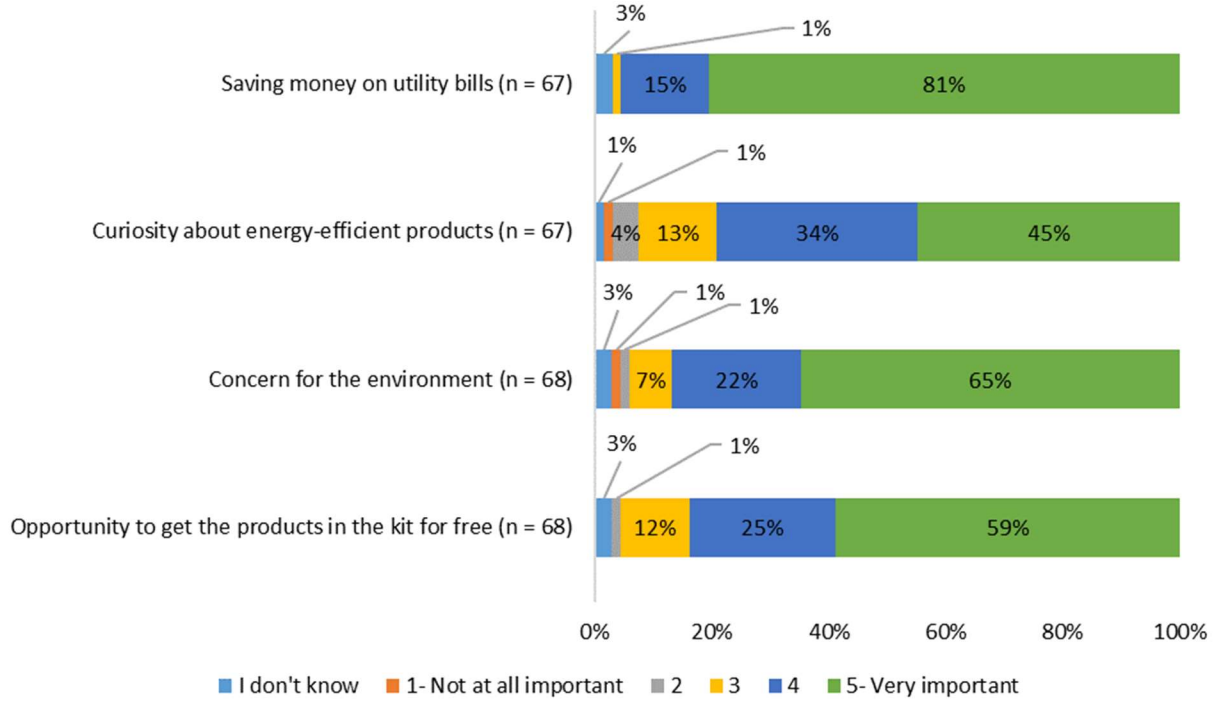
The survey asked respondents why they did not install showerheads. Some reported already having low-flow showerheads (n = 6), while five participants stated the measures did not integrate well with the current plumbing. Another five disliked the pressure-volume, and one stated they disliked the way the measure looked. Seven respondents offered other reasons that ranged from not being given showerheads to not having the time to install them.

People who decided not to install the aerators stated the measure did not integrate well with current plumbing (n = 9) or the customer already had a high-efficiency aerator (n = 8). Other reasons included the customer did not like the look of the measure (one person) or disliked the pressure-volume (n = 5). Six participants offered other reasons that were like those given regarding the showerheads.

4.3.3 Participant Motivations

Respondents provided feedback regarding what influenced them to request the Starter Kit. Ninety-six percent of respondents ranked “saving money on utility bills” as their strongest motivation to request a kit, followed by expressing curiosity for the energy-efficient products (79 percent).

Figure 4-9: Survey respondents' Ranking of Reasons for Requesting a Starter Kit



Before learning about the kits, 71 percent of respondents stated they had intentions of installing LED lights. Only 15 percent of customers had no LEDs in their homes prior to enrolling in the program. Moreover, 59 percent stated they would have bought and installed the LEDs even if they had not received the energy kits. Yet, the time the customers would have taken to install the bulbs extended beyond six months. Fifty-seven percent stated they would have waited up to six months or longer to install the bulbs, compared to 19 percent who would have bought them around the same time they received the energy kit.

Since receiving the kits, 40 customers reported installing additional LEDs. The number of bulbs purchased ranged from one to 100. Ten participants indicated their bulbs had been discounted from their regular pricing, but only two knew Pacific Power had sponsored the rebated measured.

Before receiving a kit, only 10 percent had any intentions of installing high-efficiency showerheads. However, 44 percent reported owning energy-efficient showerheads compared to 38 percent who stated they did not have any before receiving the kit. Only eight percent said they would have bought and installed the showerhead(s) about the same time as when they obtained the kit. Two people reported installing additional showerheads since participating in the program.

Of people who installed the aerators, 12 percent were likely to install the measures if they had not received the kit. Almost half of the people indicated they had no aerators installed

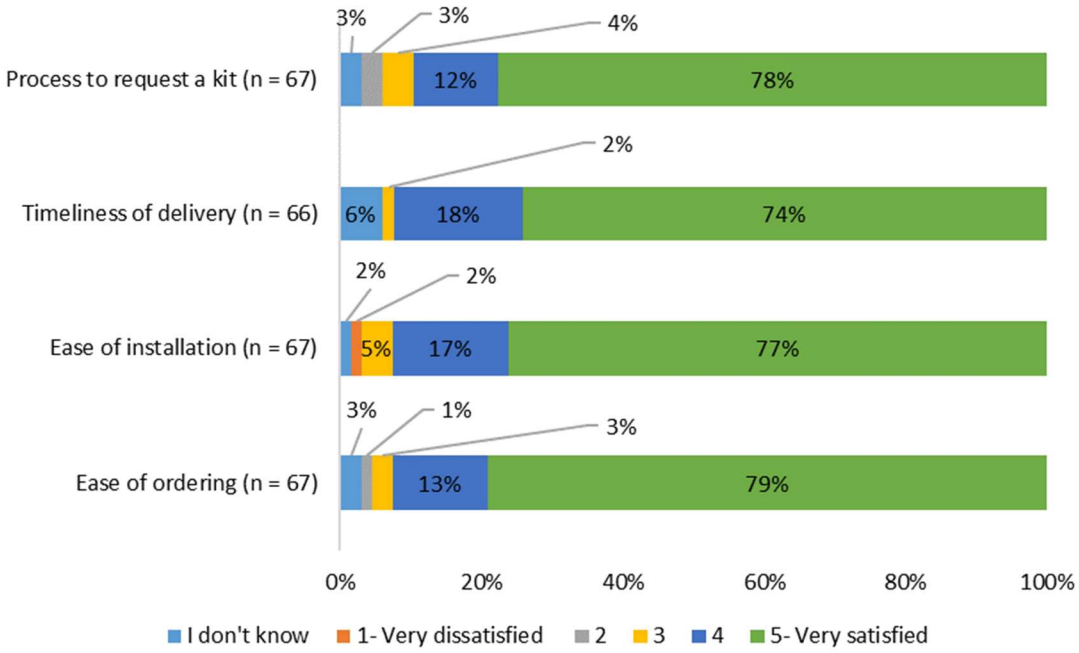
(42 percent) before receiving the kit. Ninety-two percent thought they would take longer than six months or were unsure if they would ever install aerators in their home. One person purchased additional aerators after participating in the program.

Customers also shared additional actions they took to save energy. For example, 26 people purchased ENERGY STAR appliances or equipment, seven installed a new smart thermostat, and nine installed a water heater or a water heater accessory. Additionally, five installed an energy efficient central air conditioner, heat pump, or evaporative cooler, and three people stated they took other actions.

4.3.4 Customer Satisfaction

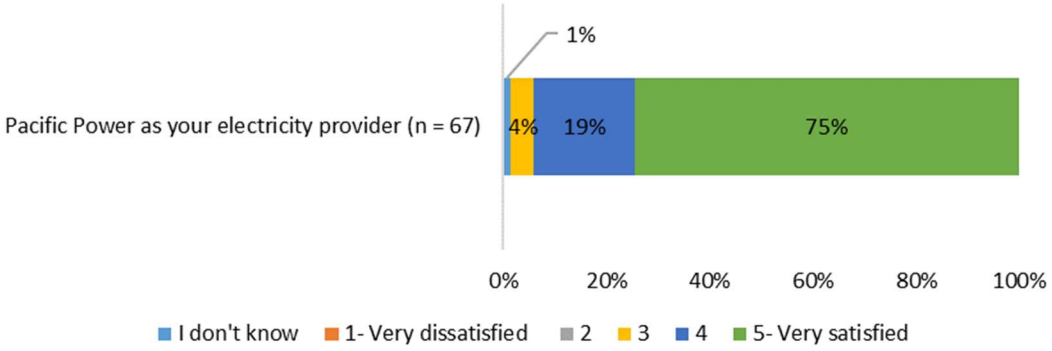
Participants provided feedback regarding their level of satisfaction with specific aspects of the program and their overall experience. Participants indicated they were satisfied with the process to request a kit (90 percent), the timeliness of delivery (92 percent), ease of ordering (92 percent), and ease of installation (94 percent). See Figure 4-10. Respondents also expressed satisfaction with content found in the kits (92 percent) and the measures' quality (91 percent).

Figure 4-10: Customer Satisfaction with Starter Kit Program



Sixty-seven percent of respondents indicated they were satisfied or very satisfied with the amount of energy savings they perceived from installing the measures. Overall satisfaction with the Pacific Power as their utility company was 94 percent (see Figure 4-11).

Figure 4-11: Customer Satisfaction with Pacific Power



4.3.5 Home Characteristics

Participants' home characteristics are summarized in Table 4-14: Home Characteristics. Seventy-two percent reported living in single-family homes and most owned their home (73 percent). Seventy-four percent of respondents' homes were built before 2000. Eighty-eight percent of respondents also stated they live in a household of up to four people. Sixty-eight percent of respondents reported that electricity was their main home heating fuel.

Table 4-14: Home Characteristics

Home Characteristics	Percent (n = 68)
Single-family home	72%
Apartment or condominium	10%
Manufactured or mobile home	9%
Duplex or townhouse	7%
I don't know	1%
Year Built	**Percent (n = 68)**
Before 1960	21%
1960-1979	29%
1980-1999	24%
2000-2009	10%
2010 or later	7%
I don't know	9%
Own or Rent	**Percent (n = 67)**
Own	73%
Rent	25%
Prefer not to answer	1%
What is the main fuel used for heating your home?	**Percent (n = 68)**
Electricity	68%
Natural Gas	25%
Oil	1%
Other	4%
I don't know	1%

4.4 Starter Kit Free Ridership and Spillover Analysis

ADM completed an analysis of free ridership and spillover rates for starter kits as part of its process analysis to inform program improvements. Note that this analysis was not used to calculate a net-to-gross ratio for the impact analysis.

4.4.1 Free Ridership

Free ridership estimates the percentage of participant who would have installed the same energy-saving measures if they had not received them through the program. To determine free ridership scores, ADM used participant survey responses about:

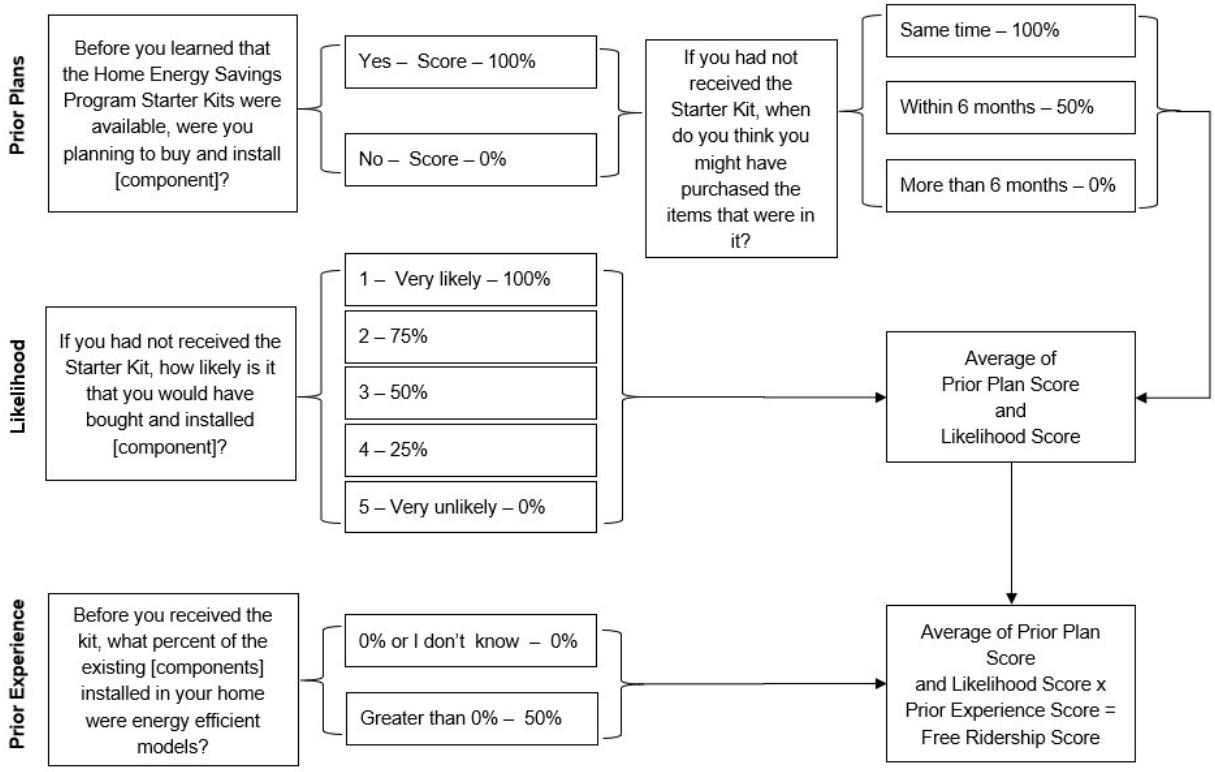
- Participant's prior plans to install kits components in their home
- Estimate of time when they would have installed the components
- Likelihood that the participant would have installed the components
- Prior installations of similar measures in the home

ADM calculated a free ridership score for each kit component using Equation 4-1 as illustrated in Figure 4-12. Each participant was assigned a free ridership score for each kit component. Participants' scores were averaged to calculate overall free ridership score for each component.

Equation 4-1:Kits Free Ridership

$$\begin{aligned} &Free\ Ridership \\ &= Average\ (Prior\ Plans\ Score, Likelihood\ Score) \\ &* Previous\ experience\ adjustment \end{aligned}$$

Figure 4-12: Kits Free Ridership Methodology



Free ridership scores by kit component are included in Table 4-15.

Table 4-15: Free Ridership Scores by Kit Component

Kit Component	Free Ridership Score
LEDs	23%
Aerators	5%
Low Flow Showerheads	5%

4.4.2 Spillover

Spillover represents energy savings that resulted indirectly from the program's influence on participants to implement additional energy saving measures without receiving a program incentive.

To assess participant spillover savings, survey respondents were asked whether they implemented any additional energy saving measures for which they did not receive a program incentive. Participants who report implementing one or more efficiency measures are then asked two questions used to develop a spillover score:

SO1: How important was your experience with the Home Energy Savings Program Starter Kits when you installed [spillover measure]?

SO2: How likely would you have been to take the additional steps to save energy if you had not received the Home Energy Savings Program Starter Kit?

Responses were collected using a 5-point Likert Scale, where 1 represented no program influence and 5 represented the largest influence on installing the additional energy saving measures. The spillover score is the average of the responses to the two questions (see Equation 4-2).

Equation 4-2: Spillover Score for Installed Measures

$$Spillover\ Score\ =\ Average(SO1, 5 - SO2)$$

Any energy saving measures with a spillover score of 4 or greater were included in spillover savings. Spillover is represented as the percentage of total spillover savings discovered through the survey divided by the total of kit savings generated by survey respondents. This ratio is applied as the spillover rate for kits (see Equation 4-2).

Equation 4-3: Spillover Ratio for Kits Program

$$Spillover\ Ratio\ =$$
$$Sum\ of\ savings\ from\ all\ measures\ with\ spillover\ scores\ greater\ than\ 3\ discovered\ in\ surve\ /\ (Average\ kit\ savings\ *\ Number\ of\ survey\ respondents)$$

The evaluated spillover for kits was 2.04 percent for the evaluation period. Factors contributing to spillover savings calculation are included in Table 4-16: Spillover Measures Identified and Table 4-17.

Table 4-16: Spillover Measures Identified

Measures with Spillover Scores >= 3	Quantity	UES (kWh)	Total Energy Savings (kWh)
Kitchen Aerators	1	103.52	103.52
Bathroom Aerators	1	29.05	29.05
Low Flow Showerheads	2	130.71	261.42
Total			**393.99**

Table 4-17: Total Savings from Survey Respondents

Kit Type Received by Survey Respondent	Avg UES for kit type	Qty	Total
Bath 1	301	20	6,012
Bath 2	398	32	13,903
LED	36	16	573
Total			**20,489**

The evaluated spillover for kits was 2.04 percent during the evaluation period. Free ridership and spillover results are presented in Table 4-18.

Table 4-18: Free ridership and Spillover Results - Kits

Kit component	Free ridership	Spillover	NTG
LEDs	23%	2%	79%
Kitchen Aerators	5%	2%	97%
Bathroom Aerators	5%	2%	97%
Low Flow Showerheads	5%	2%	97%

4.5 Process Evaluation Results

ADM made the following key findings during its process analysis.

- Pacific Power transitioned between implementation contractors during the evaluation period. Pacific Power engaged both contractors during an overlapping period to facilitate data and process transfer.
- The new implementation team provided synergies gained from previous work on the utility's commercial programs and provided enhanced web-based program interfaces for the Home Energy Savings program.
- The technical reference library (TRL) is a key program reference resource that documents ex ante savings values for all versions of all measures included in the program. Maintaining TRL version control, timeliness and completeness was a challenge complicated by the transition to a new implementation team. The new program implementer completed installation of a new Measure Library and process improvement in June 2021.
- Program tracking data documents the measures and quantities of each that were installed in the service area because of the program. Pacific Power receives and maintains the program tracking dataset. Additional information, such as upstream sales details, downstream product model specifications, and new home model details, are maintained by the implementer.
- The program tracking dataset was missing some data elements needed to evaluate measure savings. These errors are described in detail in *Section 3 Impact Analysis*.
- Verified installation rates of starter kit components are generally equal or greater than ex ante ISRs, except for second bathroom aerators and all showerheads. Kits were removed from the program on January 4, 2021.
- Twenty-five percent of respondents indicated that they were living below the federal poverty level.

5 Cost-Effectiveness

Guidehouse estimated program cost-effectiveness results based on 2019 and 2020 costs and savings estimates provided by Pacific Power. Cost-effectiveness was tested using the 2017 and 2019 IRP decrement. The program passed cost-effectiveness for the Participant Cost Test (PCT). Program inputs used in the cost effectiveness analysis are included in Table 5-1 through Table 5-3. Table 5-4 presents a summary of the results.

Table 5-1: Program Inputs

Parameter	2019	2020
Discount Rate	6.57%	6.92%
Residential Line Loss	9.67%	7.68%
Residential Energy Rate ($/kWh) [1]	$0.0869	$0.0828
Inflation Rate	2.20%	2.28%

[1] Future rates determined using a 2.20% and 2.28% annual escalator.

Table 5-2: Program Costs by Year

Program Year	Engineering Costs	Utility Admin	Program Delivery	Program Dev.	Incentives	Total Utility Costs	Gross Customer Costs
2019	$0	$37,101	$1,039,224	$25,556	$1,407,990	$2,509,871	$3,271,127
2020	$0	$66,550	$1,505,676	$16,111	$1,084,368	$2,672,705	$1,418,674
2019-2020	$0	$103,651	$2,544,900	$41,667	$2,492,358	$5,182,576	$4,689,801

Table 5-3: Program Savings by Year

Program Year	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
2019	5,758,893	86%	4,940,586	100%	4,940,586	11
2020	4,720,378	87%	4,093,345	100%	4,093,345	10
2019-2020	10,479,271	86%	9,033,931	100%	9,033,931	11

Table 5-4: Program Benefit/Cost Ratios by Year

Scenario	Year	PTRC	TRC	UCT	RIM	PCT
HES without NEBs	2019	0.48	0.43	0.75	0.30	1.56
	2020	1.07	0.97	1.09	0.55	2.66
	2019-2020	0.72	0.65	0.93	0.42	1.89
HES with NEBs	2019	0.68	0.64	0.75	0.30	1.84
	2020	1.18	1.08	1.09	0.55	2.88
	2019-2020	0.88	0.82	0.93	0.42	2.16

5.1 Cost-effectiveness Results without Non-energy Benefits (NEBs)

Table 5-5 through Table 5-7 provide cost-effectiveness results for inputs without non-energy benefits (NEBs).

Table 5-5: Program Cost-Effectiveness Results – 2019-2020
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1043	$7,380,018	$5,298,879	-$2,081,139	0.72
Total Resource Cost Test (TRC) No Adder	$0.1043	$7,380,018	$4,817,164	-$2,562,854	0.65
Utility Cost Test (UCT)	$0.0737	$5,182,575	$4,817,164	-$365,411	0.93
Rate Impact Test (RIM)		$11,571,144	$4,817,164	-$6,753,980	0.42
Participant Cost Test (PCT)		$4,689,801	$8,880,927	$4,191,126	1.89
Lifecycle Revenue Impacts ($/kWh)	$0.0000473161				

Table 5-6: Program Cost-Effectiveness Results – 2019
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1101	$4,373,008	$2,080,349	-$2,292,659	0.48
Total Resource Cost Test (TRC) No Adder	$0.1101	$4,373,008	$1,891,227	-$2,481,781	0.43
Utility Cost Test (UCT)	$0.0632	$2,509,871	$1,891,227	-$618,644	0.75
Rate Impact Test (RIM)		$6,211,886	$1,891,227	-$4,320,659	0.30
Participant Cost Test (PCT)		$3,271,127	$5,110,005	$1,838,878	1.56
Lifecycle Revenue Impacts ($/kWh)	$0.0000078213				

Table 5-7: Program Cost-Effectiveness Results – 2020
Without Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0973	$3,007,010	$3,218,530	$211,520	1.07
Total Resource Cost Test (TRC) No Adder	$0.0973	$3,007,010	$2,925,937	-$81,073	0.97
Utility Cost Test (UCT)	$0.0865	$2,672,704	$2,925,937	$253,233	1.09
Rate Impact Test (RIM)		$5,359,258	$2,925,937	-$2,433,321	0.55
Participant Cost Test (PCT)		$1,418,674	$3,770,922	$2,352,248	2.66
Lifecycle Revenue Impacts ($/kWh)	$0.0000955000				

5.2 Cost-effectiveness Results with Non-energy Benefits (NEBs)

Table 5-8 through Table 5-10 provide cost-effectiveness results by year for inputs with non-energy benefits.

Table 5-8: Program Cost-Effectiveness Results – 2019-2020
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1043	$7,380,018	$6,525,879	-$854,139	0.88
Total Resource Cost Test (TRC) No Adder	$0.1043	$7,380,018	$6,044,163	-$1,335,854	0.82
Utility Cost Test (UCT)	$0.0737	$5,182,575	$4,817,164	-$365,411	0.93
Rate Impact Test (RIM)		$11,571,144	$4,817,164	-$6,753,980	0.42
Participant Cost Test (PCT)		$4,689,801	$10,107,927	$5,418,126	2.16
Lifecycle Revenue Impacts ($/kWh)	$0.0000473161				

Table 5-9: Program Cost-Effectiveness Results – 2019
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.1101	$4,373,008	$2,992,488	-$1,380,520	0.68
Total Resource Cost Test (TRC) No Adder	$0.1101	$4,373,008	$2,803,365	-$1,569,642	0.64
Utility Cost Test (UCT)	$0.0632	$2,509,871	$1,891,227	-$618,644	0.75
Rate Impact Test (RIM)		$6,211,886	$1,891,227	-$4,320,659	0.30
Participant Cost Test (PCT)		$3,271,127	$6,022,144	$2,751,017	1.84
Lifecycle Revenue Impacts ($/kWh)	$0.0000078213				

Table 5-10: Program Cost-Effectiveness Results – 2020
With Non-energy Benefits (NEBs)

Cost-Effectiveness Test	Levelized $/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.0973	$3,007,010	$3,533,391	$526,381	1.18
Total Resource Cost Test (TRC) No Adder	$0.0973	$3,007,010	$3,240,798	$233,788	1.08
Utility Cost Test (UCT)	$0.0865	$2,672,704	$2,925,937	$253,233	1.09
Rate Impact Test (RIM)		$5,359,258	$2,925,937	-$2,433,321	0.55
Participant Cost Test (PCT)		$1,418,674	$4,085,783	$2,667,109	2.88
Lifecycle Revenue Impacts ($/kWh)	$0.0000955000				

6 Conclusions and Recommendations

Pacific Power's 2019-2020 Home Energy Savings program resulted in a savings of 9,033,931 kWh reflecting a realization rate of 86 percent as reported in Table 6-1.

Table 6-1: Total Program Savings by Year

Program Year	Claimed Saving (kWh)	Evaluated Savings (kWh)	Realization Rate
2019	5,758,893	4,940,586	86%
2020	4,720,378	4,093,345	87%
Total	**10,479,271**	**9,033,931**	**86%**

HVAC measures accounted for 45 percent of program savings, lighting measures accounted for 40 percent of savings, and energy kits represent 8 percent of program savings. The remaining measure categories account for 6 percent of program savings. This shift in distribution of program savings from the previous evaluation cycle is the result of declining savings available from lighting and water savings measures, and reflects a transformation of the lighting market (see Table 6-2).

Table 6-2: Total Program Savings by Measure Category

Measure Category	2019-2020				2017-2018	
	Claimed Saving	Evaluated Savings	Realization Rate	% Program Savings	% Program Savings	Realization Rate
HVAC	4,408,882	4,151,506	94%	45%	27%	80%
Lighting	4,574,455	3,598,149	79%	40%	53%	71%
Energy Kits	853,656	724,816	85%	8%	16%	106%
Whole Home	323,769	278,854	86%	3%	2%	100%
Building Shell	236,632	197,149	83%	2%	1%	100%
Appliances	45,481	45,481	100%	1%	1%	100%
Water Heating	36,396	37,976	104%	0.40%	0.3%	100%
Total	**10,479,271**	**9,033,931**	**86%**	**100%**	**100%**	**79%**

6.1 Conclusions and Recommendations

ADM makes the following conclusions and recommendations based on it's evaluation.

6.1.1 Conclusions

ADM draws the following conclusions from its evaluation:

- HVAC measures account for 45 percent of program savings, the highest savings category, with a 92 percent realization rate when evaluated using unit savings from TRL reference files. Additional analysis of billing data finds RTF unit savings values may exceed actual savings.
- Lighting accounts for 40 percent of program savings, down from 53 percent from the previous evaluation, reflecting lower lighting savings as the market transformation continues. At the same time, realization rates increased by 8 percent over the past evaluation. This was driven primarily by relatively strong ISRs for highest quantity lighting measures.
- The percentage of savings from Energy Kits fell from 16 percent to 8 percent; realization rates also declined. This decrease was the driven by water saving component ISRs and lower-than-expected percentage of bathroom kit recipients with electric water heaters. Energy saving kits were discontinued from the Home Energy Savings Program on January 4, 2021.
- The drop in the realization rate of whole homes measures was the result of data errors (12 duplicate records). Otherwise, whole homes would have resulted in a near 100 percent realization rate.
- Building shell measures continued to represent a small percentage of program savings (up to 2 percent from 1 percent of the previous evaluation).
- Water heating and appliances each continue to represent roughly 1 percent of program savings, maintaining roughly 100 percent realization rate. The small increase in realization rate for appliances is the result of the opportunity to claim slightly higher savings based on higher than reported appliance efficiency ratings.
- Several program data elements collected by the implementer are stored as separate application files rather than in a program database (for example .pdf rebate application files). The same data would be more valuable and useful if it were collected and stored in electronic datasets and transferred to Pacific Power's program tracking dataset.
- The new program contractor has implemented new system and process improvements to replace the Technical Reference Library (TRL) and the rebate

application process. The transition to the new Measure Library was completed in June 2021.

- Program data tracking and reporting challenges were exacerbated during the evaluation period by the transition to a new program implementer.
- General population survey results indicate that roughly 38 percent of Pacific Power customers indicated that they do not recall receiving any information about how to save energy from Pacific Power.
- Sixty-three percent of general population survey respondents who purchased LED lighting measures during the evaluation period from non-participating retailers indicated that they made their lighting purchases online.
- Twenty-five percent of Pacific Power customers who responded to the general population survey indicated they have a household income below the federal poverty level.
- Pacific Power ended its relationship with Simple Steps program on March 30, 2020.

6.1.2 Recommendations

ADM recommends that Pacific Power consider the following actions.

Add data elements to tracking and reporting

Pacific Power relies on implementation partners to collect and store critical data that is required to evaluate the program and verify the resulting energy savings. ADM recommends that Pacific Power adds the following additional data elements to its internal program tracking datasets:

- Product manufacturer and model numbers for installed measures
- Efficiency specifications for installed measures
- Sales or distribution location for all upstream measures
- Baseline conditions (specifics varies by measure)
- AHRI and ENERGY STAR identification numbers
- Additional data fields as required to define correct measure (e.g. installation location for water heaters).

Continue process improvement of program controls

ADM recommends Pacific Power work with implementer to ensure that all data elements required to verify measure savings are reported in the tracking data.

Evaluate program on an annual basis

Annual evaluations would allow Pacific Power to monitor program controls and data collection throughout the program year, allowing the utility to respond to program performance mid-cycle. ADM recommends that Pacific Power implement annual rather than biannual program evaluations.

Upgrade leakage modeling methodology

ADM recommends that Pacific Power employ a geospatial modeling method to replace the RSTAT model to estimate upstream program leakage. ADM recommends the methodology documented in the Arkansas TRM V8.1

Confirm matching ex ante savings on partnership programs

ADM recommends that Pacific Power verify coordinated ex ante savings values are used in any future partnership program like the Simple Steps program.

6.1.3 Process Changes in Process

The following process changes have been initiated by the implementor or Pacific Power that address a number of ADM's conclusions and recommendations:

- The Technical Reference Library (TRL) was replaced with a upgraded Measure Library (ML) with enhanced functionality that includes a quality control process to verify that all measure versions include reference documents.
- Pacific Power has revised its leakage estimate methodology to a geospatial modeling method.
- Pacific Power and the implementer have added or are in the process of adding the following data elements to the program dataset: baseline and efficient conditions, AHRI and ENERGY STAR identification numbers, sales and distribution location information for upstream measures.
- A quality control process has been added to ensure that data necessary to calculate or verify savings is collected and reported and that incentives are paid only for applications that meet measure eligibility requirements.
- Quality control processes are in development to improve the use of cooling zone data to use in estimating savings for applicable measures.

Appendix A – TRL Reference Documents

This appendix documents the TRL reference files used to complete this evaluation. ADM's review of these documents included verifying savings values accurately reflected the underlying technical files on which they are based, usually RFT files.

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Appliances		
Clothes Dryer - Vented_UCEF 3.20 to 3.39 - WA - 2	234.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Vented_UCEF 3.60 to 3.79 - WA - 1	304.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Vented_UCEF 3.80 to 4.19 - WA - 1	346.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Vented_UCEF 7.20 to 8.00 - WA - 1	599.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Ventless_UCEF 3.60 to 3.79 - WA - 1	344.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Ventless_UCEF 3.80 to 4.19 - WA - 1	384.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Ventless_UCEF 4.20 to 4.69 - WA - 1	435.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Ventless_UCEF 4.70 to 5.29 - WA - 1	485.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Dryer - Ventless_UCEF 7.20 to 8.00 - WA - 1	624.00	2018.10.05_WA_HES_Clothes_Dryers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	152.8	2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	67.0	2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	84.1	2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 2	180.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 1 - Electric DHW & Electric Dryer - WA - 3	180.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 1	153.00	2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 2	198.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Electric Dryer - WA - 3	198.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 1	84.00	2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 2	92.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Electric DHW & Gas Dryer - WA - 3	92.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 1	67.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 2 - Gas DHW & Electric Dryer - WA - 3	94.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Clothes Washers - CEE Tier 3 - Electric DHW & Electric Dryer - WA - 1	193.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx / 193 2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx / 180.28
Clothes Washers - CEE Tier 3 - Electric DHW & Gas Dryer - WA - 1	116.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx
Clothes Washers - CEE Tier 3 - Gas DHW & Electric Dryer - WA - 1	66.00	2019.09.12_WA_HES_Clothes_Washers_Brief.xlsx / 66 kWh 2017.09.12_WA_HES_Clothes_Washers_Brief.xlsx / 76.98 kWh
Building Shell		
Insulation - Attic - eFAF - R11 to R49 - WA - 1	0.62	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - eFAF - R11 to R49 - WA - 2	0.62	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - eFAF - R19 to R49 - WA - 1	0.28	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - eFAF - R19 to R49 - WA - 2	0.28	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Gas Heated - R11 to R49 - WA - 1	0.03	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Gas Heated - R11 to R49 - WA - 2	0.03	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Gas Heated - R19 to R49 - WA - 1	0.02	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Heat Pump - R11 to R49 - WA - 1	0.26	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Heat Pump - R11 to R49 - WA - 2	0.26	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Heat Pump - R19 to R49 - WA - 1	0.14	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 1	0.44	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Zonal or DHP - R11 to R49 - WA - 2	0.44	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Attic - Zonal or DHP - R19 to R49 - WA - 1	0.25	2017.09.12_WA_HES_SF_Attic_Insulation_Brief.xlsx
Insulation - Floor - eFAF - R0 to R19 - WA - 1	0.89	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - eFAF - R0 to R19 - WA - 2	0.89	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - eFAF - R0 to R30 - WA - 1	1.00	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - eFAF - R0 to R30 - WA - 2	1.00	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - Heat Pump - R0 to R19 - WA - 1	0.16	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	0.18	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 1	0.93	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - Zonal or DHP - R0 to R19 - WA - 2	0.93	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Floor - Zonal or DHP - R0 to R30 - WA - 1	1.03	2017.09.12_WA_HES_SF_Floor_Insulation_Brief.xlsx
Insulation - Wall - eFAF - R0 to R11 - WA - 1	2.2	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - eFAF - R0 to R13 - WA - 2	2.2	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - eFAF - R0 to R13 - WA - 3	2.2	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	0.96	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - Heat Pump - R0 to R13 - WA - 2	1.0	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - Heat Pump - R0 to R13 - WA - 3	1.0	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - Zonal or DHP - R0 to R11 - WA - 1	1.53	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Insulation - Wall - Zonal or DHP - R0 to R13 - WA - 2	1.5	2017.09.12_WA_HES_SF_Wall_Insulation_Brief.xlsx
Manufactured Home - Insulation - Attic - Electric Resistance - R0 to R22 - WA - 1	0.63	2017.09.12_WA_HES_MH_Attic_Insulation_Brief.xlsx
Manufactured Home - Windows - Ufactor 30 to 25 - Electric Resistance - WA - 1	0.600	2017.09.12_WA_HES_MH_Window_Brief.xlsx
Multifamily - Insulation - Attic - Ductless Heat Pump - R19 to R49 - WA - 1	0.16	2017.09.12_WA_HES_MF_Attic_Insulation_Brief.xlsx
Multifamily - Insulation - Attic - eFAF - R19 to R49 - WA - 1	0.32	2017.09.12_WA_HES_MF_Attic_Insulation_Brief.xlsx
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 1	0.29	2017.09.12_WA_HES_MF_Attic_Insulation_Brief.xlsx
Multifamily - Insulation - Attic - Zonal - R19 to R49 - WA - 2	0.29	2017.09.12_WA_HES_MF_Attic_Insulation_Brief.xlsx
Multifamily - Insulation - Floor - eFAF - R0 to R30 - WA - 1	1.57	ResMFWeatherization_v3_3.xlsm
Multifamily - Insulation - Floor - Heat Pump - R0 to R30 - WA - 1	0.54	ResMFWeatherization_v3_3.xlsm
Multifamily - Insulation - Floor - Zonal - R0 to R30 - WA - 1	1.56	ResMFWeatherization_v3_3.xlsm
Multifamily - Insulation - Wall - eFAF - R0 to R11 - WA - 1	2.50	2017.09.12_WA_HES_MF_Wall_Insulation_Brief.xlsx
Multifamily - Insulation - Wall - Heat Pump - R0 to R11 - WA - 1	0.94	2017.09.12_WA_HES_MF_Wall_Insulation_Brief.xlsx
Multifamily - Insulation - Wall - Zonal - R0 to R11 - WA - 1	2.22	2017.09.12_WA_HES_MF_Wall_Insulation_Brief.xlsx
Multifamily - Windows - Ufactor 30 to Ufactor 25 - Zonal - WA - 1	1.480	2017.09.12_WA_HES_MF_Window_Brief.xlsx
Windows - Ufactor > 0.30 to Ufactor <= 0.25 - eFAF - WA - 2	0.750	2017.09.12_WA_HES_SF_Window_Brief.xlsx
Windows - Ufactor 30 to Ufactor 25 - eFAF - WA - 1	0.750	2017.09.12_WA_HES_SF_Window_Brief.xlsx
Windows - Ufactor 30 to Ufactor 25 - Heat Pump - WA - 1	0.36	2017.09.12_WA_HES_SF_Window_Brief.xlsx
Windows - Ufactor 30 to Ufactor 25 - Zonal or DHP - WA - 1	0.610	2017.09.12_WA_HES_SF_Window_Brief.xlsx
Energy Kits		
Energy Savings Kit - LED - WA - 4	34.56	2018.11.28_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - LED - WA - 5	28.000	2020.02.28_WA_HES_Kits_Brief Nexant
Energy Savings Kit - LED - WA - 3	32.76	2017.09.12_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 1 Bathroom - WA - 3	393.44	2017.09.12_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 2 Bathrooms - WA - 5	565.44	2020.02.28_WA_HES_Kits_Brief Nexant
Energy Savings Kit - Best - 1 Bathroom - WA - 5	372.450	2020.02.28_WA_HES_Kits_Brief Nexant

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Energy Savings Kit - Best - 2 Bathrooms - WA - 3	604.420	2017.09.12_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 1 Bathroom - WA - 4	401.44	2018.11.28_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 1 Bathroom - WA - 4	401.440	2018.11.28_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 2 Bathrooms - WA - 4	611.52	2018.11.28_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - Best - 2 Bathrooms - WA - 4	611.520	2018.11.28_WA_HES_Kits_Brief.xlsx
Energy Savings Kit - LED - WA - 4	34.560	2018.11.28_WA_HES_Kits_Brief.xlsx
HVAC		
Central Air Conditioner with Best Practice Install and Sizing - WA - 2	394.00	2017.09.12_WA_HES_SF_CAC_Upgrade_with_BPIS_Brief.xlsx
Central Air Conditioner with Best Practice Install and Sizing - WA - 3	265.00	2019.09.12_WA_HES_SF_CAC_Upgrade_with_BPIS_Brief.xlsx
Central Air Conditioner with Best Practice Install and Sizing - WA - 4	265.00	2019.09.12_WA_HES_SF_CAC_Upgrade_with_BPIS_Brief.xlsx
Duct Sealing - Electric Forced Air Furnace - WA - 2	1,049.00	2017.09.12_WA_HES_SF_Duct_Sealing_Brief.xlsx
Duct Sealing - Electric Forced Air Furnace - WA - 3	1,254.00	2019.09.12_WA_HES_SF_Duct_sealing_Brief.xlsx
Duct Sealing - Electric Forced Air Furnace - WA - 4	1,254.00	2019.09.12_WA_HES_SF_Duct_sealing_Brief.xlsx
Duct Sealing - Heat Pump - WA - 2	752.00	2017.09.12_WA_HES_SF_Duct_Sealing_Brief.xlsx
Duct Sealing - Heat Pump - WA - 4	848.00	2019.09.12_WA_HES_SF_Duct_sealing_Brief.xlsx
Duct Sealing and Insulation - Electric Forced Air Heating System - WA - 3	1,657.00	2019.09.12_WA_HES_SF_Duct_Sealing_and_Insulation_Brief.xlsx
Duct Sealing and Insulation - Heat Pump Heating System - WA - 2	1,163.00	2019.09.12_WA_HES_SF_Duct_Sealing_and_Insulation_Brief.xlsx
Duct Sealing and Insulation - Electric Forced Air Heating System - WA (New) - 1	1,452.0	2017.09.12_WA_HES_SF_Duct_Sealing_and_Insulation_Brief.xlsx
Duct Sealing and Insulation - Heat Pump Heating System - WA (New) - 1	1,067.00	2017.09.12_WA_HES_SF_Duct_Sealing_and_Insulation_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	3,521.00	2017.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 2	2,341.0	2019.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 3	2,341.0	2019.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	3,836.00	2019.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	2,550.0	2019.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 3	2,550.0	2019.09.12_WA_HES_SF_EFAF_to_DHPv2_Brief.xlsx
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	2,239.00	2017.09.12_WA_HES_SF_Zonal_to_DHP_Brief.xlsx
Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2,240.0	2017.09.12_WA_HES_SF_Zonal_to_DHP_Brief.xlsx
Ductless Heat Pump - Zonal to DHP 12.6 and above - WA - 1	2,341.00	2017.09.12_WA_HES_SF_Zonal_to_DHP_Brief.xlsx
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	2,146.00	2017.09.12_WA_HES_SF_Zonal_to_DHP_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 2	2,146.00	2017.09.12_WA_HES_SF_Zonal_to_DHP_Brief.xlsx
Heat Pump - Commissioning, Controls, and Sizing - WA - 1	630.00	2017.09.12_WA_HES_SF_HP_CCandS_Brief.xlsx
Heat Pump - Commissioning, Controls, and Sizing - WA - 2	630.00	2017.09.12_WA_HES_SF_HP_CCandS_Brief.xlsx
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF with CAC - WA - 3	7,066.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF without CAC - WA - 3	6,847.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	6,957.0	2017.09.12_WA_HES_SF_HP_Conversion_with_BPIS_Brief.xlsx
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF with CAC - WA - 2	7,066.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF without CAC - WA - 2	6,847.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 2	5,463.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/CAC - WA - 1	6,957.0	2017.09.12_WA_HES_SF_HP_Conversion_with_BPIS_Brief.xlsx
Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	6,738.0	2017.09.12_WA_HES_SF_HP_Conversion_with_BPIS_Brief.xlsx
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	739.00	2017.09.12_WA_HES_SF_HP_Upgrade_with_BPIS_Brief.xlsx
Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	739.00	2017.09.12_WA_HES_SF_HP_Upgrade_with_BPIS_Brief.xlsx
Manufactured Home - Central Air Conditioner with Best Practice Install and Sizing - WA - 1	394.00	2017.09.12_WA_HES_MH_CAC_Upgrade_with_BPIS_Brief.xlsx
Manufactured Home - Direct Install - eFAF - Test and Seal - WA - 1	973.00	2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Direct Install - eFAF - Test Only - WA - 1		2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Direct Install - eFAF - Test, Seal, & Crossover - WA - 1	973.00	2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Direct Install - Heat Pump - Test and Seal - WA - 1	615.00	2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Direct Install - Heat Pump - Test Only - WA - 1		2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Direct Install - Heat Pump - Test, Seal, & Crossover - WA - 1	615.00	2017.09.12_WA_HES_MH_Duct_Sealing_Direct_Install_Brief.xlsx
Manufactured Home - Duct Sealing - Contractor Install - eFAF - WA - 1	973.00	2017.09.12_WA_HES_MH_Duct_Sealing_Contractor_Install_Brief.xlsx
Manufactured Home - Duct Sealing - Contractor Install - Heat Pump - WA - 1	615.00	2017.09.12_WA_HES_MH_Duct_Sealing_Contractor_Install_Brief.xlsx
Manufactured Home - Duct Sealing - Not Direct Install - eFAF - WA - 2	973.00	2017.09.12_WA_HES_MH_Duct_Sealing_Contractor_Install_Brief.xlsx
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.0 to 9.4 - WA - 1	5,265.00	2017.09.12_WA_HES_MH_EFAF_to_DHPv2_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 1	5,736.00	2017.09.12_WA_HES_MH_EFAF_to_DHPv2_Brief.xlsx
Manufactured Home - Ductless Heat Pump - eFAF to DHP 9.5 and above - WA - 2	5,736.00	2017.09.12_WA_HES_MH_EFAF_to_DHPv2_Brief.xlsx
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	2,239.00	2017.09.12_WA_HES_MH_Zonal_to_DHP_Brief.xlsx
Manufactured Home - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	2,239.00	2017.09.12_WA_HES_MH_Zonal_to_DHP_Brief.xlsx
Manufactured Home - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	2,146.00	2017.09.12_WA_HES_MH_Zonal_to_DHP_Brief.xlsx
Manufactured Home - Heat Pump - Commissioning, Controls, and Sizing - WA - 1	630.00	2017.09.12_WA_HES_MH_HP_CCandS_Brief.xlsx
Manufactured Home - Heat Pump - Conversion to 9.0+ HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	5,159.0	2017.09.12_WA_HES_SF_HP_Conversion_9HSPF_with_BPIS_Brief.xlsx
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 3	19.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/CAC - WA - 1	5,463.00	2017.09.12_WA_HES_MH_Heat_Pump_Conversion_9 HSPF_with_BPIS_Brief.xlsx
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 1	5,159.00	2017.09.12_WA_HES_MH_Heat_Pump_Conversion_9 HSPF_with_BPIS_Brief.xlsx
Manufactured Home - Heat Pump - Conversion with Best Practice Install & Sizing - Convert Federal FAF w/out CAC - WA - 1	5,069.00	2017.09.12_WA_HES_MH_Heat_Pump_Upgrade_with_BPIS_Brief.xlsx
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 1	720.00	2017.09.12_WA_HES_MH_HP_Upgrade_with_BPIS_Brief.xlsx
Manufactured Home - Heat Pump - Upgrade with Best Practice Install & Sizing - WA - 2	720.00	2017.09.12_WA_HES_MH_HP_Upgrade_with_BPIS_Brief.xlsx
Manufactured Home - Smart Thermostat - eFAF - WA - 1	434.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Manufactured Home - Smart Thermostat - eFAF - WA - 2	434.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Manufactured Home - Smart Thermostat - eFAF - WA - 4	434.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Manufactured Home - Smart Thermostat - Heat Pump - WA - 1	628.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Manufactured Home - Smart Thermostat - Heat Pump - WA - 2	628.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Manufactured Home - Smart Thermostat - Heat Pump - WA - 4	628.00	2018.10.05_WA_HES_MH_Smart_Thermostat_Brief.xlsx
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 1	1,224.00	2017.09.12_WA_HES_MF_Zonal_to_DHP_Brief.xlsx
Multifamily - Ductless Heat Pump - Zonal to DHP 11.1 to 12.5 - WA - 2	1,224.00	2017.09.12_WA_HES_MF_Zonal_to_DHP_Brief.xlsx
Multifamily - Ductless Heat Pump - Zonal to DHP 9.0 to 11.0 - WA - 1	1,173.0	2017.09.12_WA_HES_MF_Zonal_to_DHP_Brief.xlsx
Smart Thermostat - eFAF - WA - 1	434.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - eFAF - WA - 2	434.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Smart Thermostat - eFAF - WA - 3	434.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - eFAF - WA - 4	434.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - Heat Pump - WA - 1	628.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - Heat Pump - WA - 2	628.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - Heat Pump - WA - 3	628.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Smart Thermostat - Heat Pump - WA - 4	628.00	2018.10.05_WA_HES_SF_Smart_Thermostat_Brief.xlsx
Lighting		
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 1	15.18	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Bathroom Vanity - 1000 to 1999 Lumens - WA - 2	23.74	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 3	38.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 1	29.5	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Bathroom Vanity - 2000 to 3999 Lumens - WA - 2	46.10	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 3	23.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Bathroom Vanity - 500 to 999 Lumens - WA - 2	13.36	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 1	18.52	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Ceiling & Wall Flush Mount - 1000 to 1999 Lumens - WA - 2	23.45	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 3	44.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 1	35.96	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Ceiling & Wall Flush Mount - 2000 to 3999 Lumens - WA - 2	45.5	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 3	82.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 1	67.28	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Ceiling & Wall Flush Mount - 4000 to 7999 Lumens - WA - 2	85.16	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 3	13.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 1	10.42	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Ceiling & Wall Flush Mount - 500 to 999 Lumens - WA - 2	13.36	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Downlight - 2000 to 3999 Lumens - WA - 3	44.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 3	32.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Porch - 1000 to 1999 Lumens - WA - 2	55.80	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 1	136.00	2017.09.12_WA_HES_LED_Fixtures_Brief

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
Fixture - Exterior Porch - 4000 to 7999 Lumens - WA - 2	203.00	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 1	21.00	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Exterior Porch - 500 to 999 Lumens - WA - 2	31.40	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 1000 to 1999 Lumens - WA - 3	35.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 3	68.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 2000 to 3999 Lumens - WA - 2	58.97	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 250 to 499 Lumens - WA - 3	10.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 500 to 999 Lumens - WA - 3	19.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Exterior Security - 500 to 999 Lumens - WA - 2	17.09	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Track - 2000 to 3999 Lumens - WA - 3	47.0	2019.09.12_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Track - 2000 to 3999 Lumens - WA - 1	71.92	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Track - 2000 to 3999 Lumens - WA - 2	51.28	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
LED Recessed Downlight Kit - Post Purchase - WA - 1	23.0	2019.09.12_WA_HES_Post_Purchase_Lighting_Brief (1).xlsx
Fixture - Track - 250 to 499 Lumens - WA - 1	11.27	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Track - 250 to 499 Lumens - WA - 2	8.03	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
Fixture - Track - 500 to 999 Lumens - WA - 1	20.84	2017.09.12_WA_HES_LED_Fixtures_Brief
Fixture - Track - 500 to 999 Lumens - WA - 2	14.86	2018.10.05_WA_HES_LED_Fixtures_Brief.xlsx
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 3	18.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 1	13.12	2017.09.12_WA_HES_Lighting_Brief
LEDs - Decorative & Mini-Base - 250 to 1049 Lumens - WA - 2	13.62	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 3	26.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 1	18.08	2017.09.12_WA_HES_Lighting_Brief
LEDs - General Purpose & Three-Way - 1050 to 1489 Lumens - WA - 2	26.84	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 3	13.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 1	10.50	2017.09.12_WA_HES_Lighting_Brief
LEDs - General Purpose & Three-Way - 1490 to 2600 Lumens - WA - 2	8.99	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 3	9.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 1	10.26	2017.09.12_WA_HES_Lighting_Brief
LEDs - General Purpose & Three-Way - 250 to 1049 Lumens - WA - 2	11.64	2018.10.05_WA_HES_Lighting_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
LEDs - Globe - 250 to 1049 Lumens - WA - 3	13.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - Globe - 250 to 1049 Lumens - WA - 1	12.14	2017.09.12_WA_HES_Lighting_Brief
LEDs - Globe - 250 to 1049 Lumens - WA - 2	14.00	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 3	11.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - MR 250 to 499 Lumens (Pin Base) - WA - 2	10.27	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 1	32.48	2017.09.12_WA_HES_Lighting_Brief
LEDs - MR 500 to 999 Lumens (Pin Base) - WA - 2	13.99	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 1	28.75	2017.09.12_WA_HES_Lighting_Brief
LEDs - Non-MR Bi-Pin 500 to 999 Lumens (Pin Base) - WA - 2	21.69	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 1	21.13	2017.09.12_WA_HES_Lighting_Brief
LEDs - Reflectors & Outdoor - 1050 to 1489 Lumens - WA - 2	9.64	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 3	45.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 1	72.12	2017.09.12_WA_HES_Lighting_Brief
LEDs - Reflectors & Outdoor - 1490 to 2600 Lumens - WA - 2	55.53	2018.10.05_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 3	11.0	2019.09.12_WA_HES_Lighting_Brief.xlsx
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 1	23.52	2017.09.12_WA_HES_Lighting_Brief
LEDs - Reflectors & Outdoor - 250 to 1049 Lumens - WA - 2	8.00	2018.10.05_WA_HES_Lighting_Brief.xlsx
Heat Pump - Conversion to Federal Standard HSPF with Best Practice Install & Sizing - Convert FAF w/out CAC - WA - 2	6,738.0	2017.09.12_WA_HES_SF_HP_Conversion_with_BPIS_Brief.xlsx
Water Heating		
HPWH Tier 3 Basement 0-55 Gallons - Self Install - WA - 3	1,439.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Ducted Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	1,095.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 3	1,288.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Ducted Heat Pump 0-55 Gallons - Self Install - WA - 4	1,288.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Garage 0-55 Gallons - Self Install - WA - 3	1,424.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Garage 0-55 Gallons - WA - 2	1,678.00	2017.09.12_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Garage 0-55 Gallons - WA - 3	1,424.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 2	1,286.00	2018.08.15_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - Self Install - WA - 3	947.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx

Measure Name - Measure Version	UES (kWh)	ADM confirmed ref doc
HPWH Tier 3 Indoor Electric Resistance Heat 0-55 Gallons - WA - 3	947.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 3	1,592.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Gas Heat 0-55 Gallons - Self Install - WA - 4	1,592.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 2	1,557.00	2018.08.15_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 3	1,319.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - Self Install - WA - 4	1,319.00	2018.10.05_WA_HES_SF_HPWH_Brief.xlsx
HPWH Tier 3 Indoor Heat Pump 0-55 Gallons - WA - 2	1,557.00	2017.09.12_WA_HES_SF_HPWH_Brief.xlsx

Appendix B – General Population Survey

1. Did you or anyone else in your home buy any LED lighting products in 2019 or 2020?

    - Yes
    - No
    - I don't recall

2. Which stores did you buy your ENERGY STAR LED lighting from (consider only in-store purchases, not online purchases)? Select all that apply. [RetailLED]

    - Ace Hardware
    - Batteries Plus
    - Best Buy
    - Bi-Mart
    - CostCo
    - Dollar Tree
    - Fred Meyer
    - Goodwill
    - Grocery Outlet
    - Habitat for Humanity
    - The Home Depot
    - Lowe's
    - Target
    - True Value Hardware
    - Walmart
    - Other (Please specify)
    - I don't know

3. What type of ENERGY STAR LED lighting products did you buy? Select all that apply. [LEDtype]

    - LED light bulb(s)
    - LED fixture(s)
    - I don't know

4. When did you buy the ENERGY STAR LED bulbs? Select all that apply.

    - 2019
    - 2020

5. How many ENERGY STAR LED bulbs did you buy during 2019-2020? [LEDStandardQtyBought]

   - [numeric]
   - I don't know

6. Of the [LEDStandardQtyBought] bulbs you bought, how many are currently:

   - Installed [numeric] [LEDStandardQtyInstalled]
   - In storage [numeric]
   - Discarded or given away [numeric]

7. Of the [LEDStandardQtyInstalled] *bulbs that you have installed,* how many replaced LEDs and how many replaced bulbs that were not LEDs? [LEDStandardReplaced]

   - Number of replaced LED bulbs [numeric] [LEDStandardReplacedLEDs]
   - Number of replaced bulbs that were not LEDs (CFL, incandescent, halogen, etc.) [numeric] [LEDStandardReplacedNonLEDs]
   - Number installed in new lamps or fixtures.
   - I don't know

8. If the ENERGY STAR LED light bulbs you bought had cost $1.40 more each, would you still have bought them? (Definitely, Probably, Don't know, Probably not, Definitely not.) = [LEDStandardInitialBehaviorWODisc]

9. You indicated that you bought [LEDStandardQtyBought] ENERGY STAR LED bulbs. How many fewer would you have bought if they had cost $1.40 more each? [LEDStandardQtyAdjust]

   - [numeric]
   - I don't know

10. Do you recall if the ENERGY STAR LED bulbs you bought were discounted?

    - Yes, there were discounted
    - No, they were not discounted
    - I don't remember

11. Do remember seeing a label or sign letting customers know that the discount was provided by Pacific Power?

    - Yes
    - No
    - I don't remember

12. How important was the discount to your purchase of ENERGY STAR LED light bulbs? *[LEDStandardImportance]*

    - (Scale 0-10, 0 = Not important, 10 = Very important)

13. Were any of the ENERGY STAR LED bulbs you purchased in 2019 or 2020 installed in a business or commercial building?

    - Yes
    - No
    - I don't know

14. Approximately how many of the ENERGY STAR LED bulbs you purchased were installed in a business or commercial building? [LEDStandardInCommercial]

    - Quantity: [numeric]

15. How many of the [LEDStandardQtyInstalled] installed LED bulbs are in each of the following locations? [LEDStandardHOU]

Bathroom	**[numeric]**
Bedroom	
Dining room	
Exterior	
Garage	
Hallway	
Kitchen	
Living room	
Office	
Other room	
Installed at building other than home	
Don't know	

16. When did you buy the ENERGY STAR LED fixtures? Select all that apply.

    - 2019
    - 2020

17. How many ENERGY STAR LED fixtures did you buy during 2019-2020? [LEDFixtureQtyBought]

    - [numeric]
    - I don't know

18. Of the [LEDFixtureQtyBought] fixtures you bought, how many are currently:

    - Installed [numeric] [LEDFixtureQtyInstalled]
    - In storage [numeric]
    - Discarded or given away [numeric]

19. Of the [LEDFixtureQtyInstalled] fixtures *that you have installed*, how many replaced LEDs and how many replaced bulbs that were not LEDs? [LEDFixtureReplaced]

    - Number of replaced bulbs that were LEDs [numeric] [LEDFixtureReplacedLEDs]
    - Number of replaced bulbs that were not LEDs (CFL, incandescent, halogen, etc) [numeric] [LEDFixtureReplacedNonLEDs]
    - Number installed in new lamps or fixtures

20. If the ENERGY STAR LED fixtures you bought had cost $2.40 more each, would you still have bought them?

    - Definitely
    - Probably
    - Don't know
    - Probably not
    - Definitely not

21. You indicated that you bought [LEDFixtureQtyBought] ENERGY STAR LED fixtures. How many fewer would you have bought if they had cost $2.40 more each? [LEDFixtureQtyAdjust]

    - [numeric]
    - I don't know

22. Do you recall if the ENERGY STAR LED fixtures you bought were discounted?

- Yes, there were discounted
- No, they were not discounted
- I don't remember

23. Do remember seeing a label or sign letting customers know that the discount was provided by Pacific Power?

- Yes
- No
- I don't remember

24. How important was the discount to your purchase of ENERGY STAR LED fixtures? [LEDFixtureImportance]

- (Scale 0-10, 0 = Not important, 10 = Very important)

25. Were any of the ENERGY STAR LED fixtures you purchased in 2019-2020 installed in a business or commercial building?

- Yes
- No
- I don't know

26. Approximately how many of the ENERGY STAR LED fixtures you purchased were installed in a business or commercial building? [LEDFixtureInCommercial]

- Quantity: ___

27. How many of the [LEDFixtureQtyInstalled] LED fixtures that are installed are in your home are in each of the following locations? [LEDFixtureHOU]

Bathroom	[numeric]
Bedroom	
Dining room	
Exterior	
Garage	
Hallway	
Kitchen	
Living room	
Office	
Other room	
Installed in a building other than home	
Don't know	

28. Had you bought any LED light bulbs before 2019?

- Yes
- No
- I don't know

29. Which characteristic do you consider when purchasing light bulbs? Select all that apply.

- Price
- Energy efficiency
- ENERGY STAR certification
- Brightness of the bulb
- How long the bulb lasts
- The ability to dim the bulb
- Color of the light
- Other (please specify)
- I don't know

30. Why did you purchase the ENERGY STAR LED lighting? Select all that apply.

- To replace burned out bulbs
- To replace working bulbs to lower energy use
- To add new light fixture(s) in my home
- To take advantage discounted pricing
- Other (please specify)
- I don't know

31. *After buying* the discounted ENERGY STAR lighting products, have you taken any of the following additional steps to save energy in your home? Select all the apply.

- Installed an ENERGY STAR certified appliance such as a refrigerator, dishwasher, clothes washer, or clothes dryer
- Installed low flow faucet aerators
- Installed low flow showerheads
- Installed an ENERGY STAR certified heat pump water heater
- Installed water heater jacket, blanket, or insulation
- Installed an ENERGY STAR certified room air conditioner
- Installed an ENERGY STAR central air conditioner, heat pump, or evaporative cooler

- Installed a Smart Thermostat (for example, EcoBee or Nest)
- Other (please specify)
- I don't know

32. Did you receive an incentive or discount to buy the ENERGY STAR appliance?

    - Yes
    - No
    - I don't know

33. Rate how important the discount you received on the ENERGY STAR LED lighting product, was in your decision to purchase the ENERGY STAR appliance? [ApplianceSO1] [1-5 scale]

    - Not important (1) Somewhat important (3) Very important (5)

34. If you had not received the discount on the LEDs how likely is it that would you still have bought the ENERGY STAR appliance? [ApplianceSO2] [1-5 scale]

    - Very likely(1) Unsure (3) Very unlikely (5)

35. What kind of ENERGY STAR certified appliance did you purchase?

    - Refrigerator
    - Dishwater
    - Clothes washer
    - Clothes dryer
    - Other (Please specify.)
    - I don't know

36. Did you receive an incentive or discount to buy the low flow aerator(s)?

    - Yes
    - No
    - I don't know

37. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to purchase the low flow aerator(s)? [AeratorO1] [1-5 scale]

    - Not important (1) Somewhat important (3) Very important (5)

38. If you had not received the discount on the LEDs, how likely is it that would you still have bought the low flow aerator(s)? [AeratorSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

39. How many low flow faucet aerators did you install in bathroom sinks?

- [numeric]
- I don't know.

40. How many low flow faucet aerators did you install in kitchen sinks?

- Quantity:[numeric]
- I don't know.

41. Did you receive an incentive or discount to buy the low flow showerhead(s)?

- Yes
- No
- I don't know

42. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to purchase the low flow showerhead(s)? [ShowerheadO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

43. If you had not received the discount on the LEDs how likely is it that would you still have bought the low flow aerator(s)? [ShowerheadSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

44. How many low flow showerheads did you install?

- [numeric]
- I don't know.

45. Did you receive an incentive or discount to buy the ENERGY STAR certified water heater?

- Yes
- No
- I don't know

46. Rate how important the discount you received on the ENERGY STAR was in your decision to buy the ENERGY STAR water heater? [WaterHeaterSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

47. If you had not received the discount on the LEDs how likely is it that would you still have bought the ENERGY STAR water heater? [WaterHeaterSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

48. What type of ENERGY STAR water heater did you install?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

49. What type of water heater did you replace?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

50. Did you receive an incentive or discount to buy the water heater jacket, blanket or insulation?

- Yes
- No
- I don't know

51. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to buy the water heater jacket, blanket or insulation? [WHInsulSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

52. If you had not received the discount on the LEDs how likely is it that would you still have bought the water heater jacket, blanket or insulation? [WHInsulSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

53. What kind of water heating system do you have?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

54. Did you receive an incentive or discount to buy the room air conditioner(s)?

- Yes
- No
- I don't know

55. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to buy the ENERGY STAR room air conditioner? [RoomACO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

56. If you had not received the discount on the LEDs how likely is it that would you still have bought the ENERGY STAR room air conditioner? [RoomACSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

57. What kind of room air conditioner did you buy?

- Brand [text response]
- Model number[text response]
- BTUs [numeric]
- Energy Efficiency Ratio (EER) of room air conditioner [numeric]

58. How many ENERGY STAR room air conditioners did you buy and install?

- Quantity: ___
- I don't know.

59. What type of cooling system did you replace with your new ENERGY STAR room air conditioner?

- Older room air condition
- Evaporative cooler
- Central air conditioner
- Fans
- Room was not cooled before
- Other (please specify)
- I don't know

60. What type of new central cooling system did you install?

- ENERGY STAR certified central air conditioner
- Heat pump
- Evaporative cooler
- I don't know

61. Did you receive an incentive or discount to buy the cooling system?

- Yes
- No
- I don't know

62. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to buy the ENERGY STAR certified central cooling system? [CentralCoolingSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

63. If you had not received the discount on the LEDs how likely is it that would you still have bought the ENERGY STAR certified central cooling system? [CentralCoolingSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

64. What kind of cooling system did you buy?

- Brand [text response]
- Model number[text response]
- BTUs [numeric]
- Energy Efficiency Ratio (SEER) of room air conditioner [numeric]

65. Heat pumps also have a Heating Seasonal Performance Factor (HSPF) rating which indicates how efficient the heat pump is. What is the HSPF is for the heat pump you installed?

- HSPF rating: ___
- I don't know

66. What type of cooling appliance did your new evaporative cooler replace?

- An existing evaporative cooler
- A room air conditioner
- Central air conditioning
- An electric fan
- I did not have a cooling appliance before
- I don't know

67. Did you receive an incentive or discount to buy the smart thermostat?

- Yes
- No
- I don't know

68. Rate how important the discount you received on the ENERGY STAR LED lighting product was in your decision to buy the smart thermostat? [SmartThermSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

69. If you had not received the discount on the LEDs how likely is it that would you still have bought the smart thermostat? [SmartThermSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)[

70. What kind of heating system do you have?

- Electric forced air furnace
- Electric forced air furnace plus central AC
- Heat pump
- Gas forced air furnace plus central AC
- I don't know

71. How long you would drive in minutes to reach each of the following retail location

	Length in minutes	Don't know
Grocery	[numeric]	98
Do-It-Yourself or DIY retailer (e.g. Home Depot, Lowe's etc.)		98
Mass merchant (e.g. Walmart, Target)		98
Warehouse Club (e.g. Costco, Sam's Club)		98

72. In 2019 or 2020, did you participate in any of the following Pacific Power programs that promoted energy saving? Select all that apply. [NPScreening]

- Purchased LED lighting products discounted by Pacific Power from a retail store.
- Received a rebate or discount from Pacific Power energy efficient appliances, heating or cooling products, or home insulation or weatherization products and services.
- Received a rebate or discount from Pacific Power on energy efficient products included in a new home that you purchased.
- Received a Pacific Power Wattsmart Homes Starter Kit that included LED light bulbs and may have included low flow faucet aerators and a showerhead.
- No one in my home participated in any Pacific Power energy efficiency program.

73. Have you received information from Pacific Power about how to save energy in your home from any of these sources? Select all apply.

- Signage at retail stores
- Newspaper or magazine ads
- Bill inserts
- Messages printed on your bill
- Pacific Power website
- TV ad
- Pacific Power representative
- Pacific Power newsletter
- Community event
- Social media such as Facebook or Twitter
- Home Energy Report
- Other (please specify)
- No I have not received any information from Pacific Power about how to save energy

74. In 2019 and 2020, have you taken any of the following steps to save energy in your home based on information you received from Pacific Power? Select all the apply. [NPSOScreening]

- Installed an ENERGY STAR certified appliance such as a refrigerator, dishwasher, clothes washer, or clothes dryer
- Installed low flow faucet aerators
- Installed low flow showerheads
- Installed an ENERGY STAR certified heat pump water heater
- Installed water heater jacket, blanket, or insulation
- Installed an ENERGY STAR certified room air conditioner
- Installed an ENERGY STAR central air conditioner, heat pump, or evaporative cooler
- Installed a Smart Thermostat (for example, EcoBee or Nest)
- Other (please specify)
- I have not taken any of these energy saving actions [exclusive]
- I don’t know [exclusive]

75. Did you receive an incentive or discount to buy the ENERGY STAR appliance?

- Yes
- No
- I don't know

76. Rate how important energy efficiency information from Pacific Power was in your decision to purchase the ENERGY STAR appliance? [ApplianceNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

77. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the ENERGY STAR appliance? [ApplianceNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

78. What kind of ENERGY STAR certified appliance did you purchase?

- Refrigerator
- Dishwater
- Clothes washer
- Clothes dryer
- Other (Please specify.)
- I don't know

79. Did you receive an incentive or discount to buy the low flow aerator(s)?

- Yes
- No
- I don't know

80. Rate how important energy efficiency information from Pacific Power was in your decision to purchase the low flow aerator(s)? [AeratorNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

81. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the low flow aerator(s)? [AeratorNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

82. How many low flow faucet aerators did you install in bathroom sinks?

- [numeric]
- I don't know.

83. How many low flow faucet aerators did you install in kitchen sinks?

- [numeric]
- I don't know.

84. Did you receive an incentive or discount to buy the low flow showerhead(s)?

- Yes
- No
- I don't know

85. Rate how important energy efficiency information from Pacific Power was in your decision to purchase the low flow showerhead(s)? [ShowerheadNPO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

86. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the low flow aerator(s)? [ShowerheadNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

87. How many low flow showerheads did you install?

- Quantity: ___
- I don't know.

88. Did you receive an incentive or discount to buy the ENERGY STAR water heater?

- Yes
- No
- I don't know

89. Rate how important energy efficiency information from Pacific Power was in your decision to buy the ENERGY STAR water heater? [WaterHeaterNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

90. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the ENERGY STAR water heater? [WaterHeaterNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

91. What type of ENERGY STAR water heater did you install?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

92. What type of water heater did you replace?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

93. Did you receive an incentive or discount to buy the water heater jacket, blanket or insulation?

- Yes
- No
- I don't know

94. Rate how important energy efficiency information from Pacific Power was in your decision to buy the water heater jacket, blanket or insulation? [WHInsulNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

95. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the water heater jacket, blanket or insulation? [WHInsulNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

96. What type of water heater do you have?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (please specify)
- I don't know

97. Did you receive an incentive or discount to buy the room air conditioner(s)?

- Yes
- No
- I don't know

98. Rate how important energy efficiency information from Pacific Power was in your decision to buy the ENERGY STAR room air conditioner? [RoomACNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

99. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the ENERGY STAR room air conditioner? [RoomACNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

100. What kind of room air conditioner did you buy?

- Brand [text response]
- Model number[text response]
- BTUs [numeric]
- Energy Efficiency Ratio (EER) of room air conditioner [numeric]

101. How many ENERGY STAR room air conditioners did you install?

- Quantity: ___
- I don't know.

102. What type of cooling system did you replace with your new ENERGY STAR room air conditioner?

- Older room air condition
- Evaporative cooler
- Central air conditioner
- Fans
- Room was not cooled before
- Other (please specify)
- I don't know

103. What type of new cooling system did you install?

- Central air conditioner
- Heat pump
- Evaporative cooler
- I don't know

104. Did you receive an incentive or discount to buy the ENERGY STAR certified central cooling system?

- Yes
- No
- I don't know

105. Rate how important energy efficiency information from Pacific Power was in your decision to buy the cooling system? [CentralCoolingNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

106. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the cooling system? [CentralCoolingNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

107. What kind of cooling system did you buy?

- Brand [text response]
- Model number[text response]
- BTUs [numeric]
- Energy Efficiency Ratio (SEER) of room air conditioner [numeric]

108. Heat pumps also have a Heating Seasonal Performance Factor (HSPF) rating which indicates how efficient the heat pump is. What is the HSPF is for the heat pump you installed?

- HSPF rating: ___
- I don't know

109. What type of cooling appliance did your new cooling system replace?

- An existing evaporative cooler
- A room air conditioner
- Central air conditioning
- An electric fan
- I did not have a cooling appliance before
- I don't know

110. Did you receive an incentive or discount to buy the smart thermostat?

- Yes
- No
- I don't know

111. Rate how important energy efficiency information from Pacific Power was in your decision to buy the smart thermostat? [SmartThermNPSO1] [1-5 scale]

- Not important (1) Somewhat important (3) Very important (5)

112. If you had not received energy efficiency information from Pacific Power, how likely is it that would you still have bought the smart thermostat? [SmartThermNPSO2] [1-5 scale]

- Very likely(1) Unsure (3) Very unlikely (5)

113. What kind of heating system do you have?

- Electric forced air furnace
- Electric forced air furnace plus central AC
- Heat pump
- Gas forced air furnace plus central AC
- I don’t know

114. Which of the following best describes your home?

- Manufactured or mobile home
- Single-family home
- Duplex or townhouse
- Apartment or condominium
- Other (please specify)
- I don’t know

115. Do you own or rent your home?

- Own
- Rent
- Prefer not to answer

116. When was your home built?

- Before 1960
- 1960-1979
- 1980-1999
- 2000-2009
- 2010 or later
- I don't know

117. How large is your home?

- Less than 1,000 square feet
- 1,000-2,000 square feet
- 2,000-3,000 square feet
- 3,000-4,000 square feet
- Greater than 4,000 square feet
- I don't know

118. What is the main fuel used for heating your home?

- Electricity
- Natural Gas
- Propane
- Oil
- Don’t heat home
- Other (Please specify)
- I don’t know

119. Is English the primary language spoken in your household?

- Yes
- No

120. Including yourself, how many people are living in your household? [FamilySize]

- [DROP DOWN BOX – 1-12, 13 or more, 99. Prefer not to answer]

121. Is your annual household income over or under [FPL CUTOFF based on Household Members]?

- Over
- Under
- I don’t know
- Prefer not to answer

122. Thank you for your valuable feedback. In exchange for you time, we’d like to send you a $5 electronic gift card that you can use at one of dozens of retailers. We will email your gift card to:

- [Email]

If you would like us to send it to a different email address, enter it here:

On behalf of Pacific Power, thank you for your time and feedback! If you have any questions regarding this survey or the status of your gift card, email adm-surveys@pacificorp.com. Have a great day!

Appendix C – Starter Kit Survey

1. Our records indicate that you received a Pacific Power Home Energy Savings Program Starter Kit in 2019. Starter Kits contain four LED light bulbs, and customers with electric water heating also receive high-performance showerheads and kitchen and bathroom faucet aerators. Did you receive a Home Energy Savings Program Starter Kit in the mail?

    - Yes
    - No
    - I don't know

2. What fuel does your main water heater use?

    - Electricity
    - Natural gas
    - Propane
    - Other (Please specify)
    - I don’t know

3. How satisfied were you with the following aspects of your Home Energy Savings Program Starter Kit?

    - Ease of ordering
    - Ease of installation
    - Quality of components
    - Timeliness of delivery
    - Process to request a kit
    - Kit contents
    - Energy savings that resulted from install kit
    - Pacific Power as your electricity provider

4. Why were you dissatisfied?

    - [OPEN-ENDED]

5. How important were each the following reasons for requesting a kit?

    - Saving money on utility bills
    - Concern for the environment
    - Curiosity about energy-efficient products
    - Opportunity to get the products in the kit for free

6. How did you hear about the Starter Kits?

    - Newspaper/magazine/print media
    - Utility bill insert
    - My bill
    - Pacific Power website
    - Word of mouth (friend, relative, coworker, etc.)
    - Contractor or plumber
    - TV ad
    - Pacific Power representative
    - Pacific Power newsletter
    - Retailer/store
    - Community event
    - Social media such as Facebook or Twitter
    - Home Energy Report
    - Other (Please specify)
    - I don't know

7. How long after receiving your kit did you install its contents?

    - First LED light bulb
    - Second LED light bulb
    - Third LED light bulb
    - Fourth LED light bulb

8. Why did you decide not to use all the LEDs yet? [SELECT ALL THAT APPLY]

    - Waiting for current lights to burn out
    - Not the correct wattage
    - Disliked the color tone/quality of the emitted light
    - Did not fit into my fixtures
    - Other (Please specify)

9. Why did you decide not to use the faucet aerator(s) that came in your kit? [SELECT ALL THAT APPLY]

    - Faucet aerators were already installed in all sinks
    - Did not integrate well with current plumbing
    - Disliked the pressure/water volume
    - Disliked the way it looked
    - Other (Please specify)

10. Why did you decide not to use the high-efficiency shower head(s) included in the kit? [SELECT ALL THAT APPLY]

    - High-efficiency showerheads were already installed in all showers
    - Did not integrate well with current plumbing
    - Disliked the pressure/water volume
    - Disliked the way it looked
    - Other (Please specify)

11. Before you learned that the Home Energy Savings Program Starter Kits were available, were you planning to buy and install LED light bulbs?

    - Yes
    - No
    - I don't know

12. Before you received the kit, what percent of lights in your home were LED bulbs?

    - 0%
    - 25%
    - 50%
    - 75%
    - 100%
    - I don't know

13. If you had not received the Starter Kit, how likely is it that you would have bought and installed the items you received

    - LED light bulb
    - [SHOW IF KIT - 2 BATH >0, OR KIT - 1 BATH >0] Faucet aerator
    - [SHOW IF KIT - 2 BATH >0, OR KIT - 1 BATH >0] High-efficiency showerhead

14. If you had not received the Starter Kit, when do you think you might have purchased the items that were in it?

    - LED light bulb
    - [SHOW IF KIT - 2 BATH >0, OR KIT - 1 BATH >0] Faucet aerator
    - [SHOW IF KIT - 2 BATH >0, OR KIT - 1 BATH >0] High-efficiency showerhead

15. Before you received the kit, what percent of sinks in your home had faucet aerators installed?

- 0%
- 25%
- 50%
- 75%
- 100%
- I don’t know

16. Before you received the kit, what percent of showers in your home had high-efficiency showerheads installed?

- 0%
- 25%
- 50%
- 75%
- 100%
- I don’t know

17. Since receiving your Home Energy Savings Program Starter Kit, have you taken any of the following additional steps to save energy? [SELECT ALL THAT APPLY]

- Installed additional LED Light Bulbs
- Installed an ENERGY STAR® appliance such as a refrigerator, dishwasher, clothes washer, or clothes dryer.
- Installed water heater jacket, blanket, or insulation
- Installed additional low flow faucet aerators
- Installed additional low flow showerheads
- Installed an ENERGY STAR® room air conditioner
- Installed an energy efficient water heater
- Installed an energy efficient central air conditioner, heat pump, or evaporative cooler
- Installed a Smart Thermostat (for example, EcoBee or Nest)
- Other (Please specify)
- I have not taken any additional energy saving steps
- I don’t know

18. How many LEDs have you purchased and installed?

- Quantity: ___
- I don't know

19. Were any of the additional LED bulbs you purchased discounted from their normal price?

- Yes
- No
- I don't know

20. Do you know if Pacific Power sponsored the discount for the light bulb(s) you purchased?

- Yes, the discount was sponsored by Pacific Power
- No, the discount was not sponsored by Pacific Power
- I don't know

21. What kind of appliance did you purchase?

- Appliance type: ___
- I don't know

22. How many low flow faucet aerators did you install in bathroom sinks?

- Quantity: ___
- I don't know

23. How many low flow faucet aerators did you install in kitchen sinks?

- Quantity: ___
- I don't know

24. How many low flow showerheads did you install?

- Quantity: ___
- I don't know

25. How many ENERGY STAR® room air conditioners did you install?

- Quantity: ___
- I don't know

26. What type of water heater did you install?

- Natural gas storage tank water heater
- Electric storage tank water heater
- Heat pump water heater
- Natural gas tankless water heater
- Electric tankless water heater
- Other (Please specify)
- I don't know

27. Was the new central cooling system that you installed an air conditioner, heat pump, evaporative cooler?

- Air conditioner
- Heat pump
- Evaporative cooler
- I don't know

28. Air conditioners and heat pumps have an energy efficiency rating called Seasonal Energy Efficiency Ratio (SEER) that is displayed on the Energy Guide label. What is the SEER rating of the unit you installed?

- SEER rating: ___
- I don't know

29. Heat pumps have an energy efficiency rating called a Heating Seasonal Performance Factor (HSPF) that is displayed on the Energy Guide label. What is the HSPF of the unit you installed?

- HSPF rating: ___
- I don't know

30. Evaporative coolers have an energy efficiency rating called an Energy Efficiency Ratio (EER) that is displayed on the Energy Guide label. What is the EER of the unit you installed?

- EER rating: ___
- I don't know

31. What kind of heating system do you have?

- Air source heat pump
- Electric forced air furnace
- Electric forced air furnace plus central air conditioner
- Gas forced air furnace plus central air conditioner
- I don’t know

32. Did you receive a Pacific Power incentive, rebate, or discount when you [Q17 SPILL_MEASURE]?

- Yes
- No
- I don’t know

33. How important was your experience with the Home Energy Savings Program Starter Kits when you [SPILL_MEASURE]?

34. How likely would you have been to take the additional steps to save energy if you had ***not*** received the Home Energy Savings Program Starter Kit?

35. Which of the following best describes your home?

- Manufactured or mobile home
- Single-family home
- Duplex or townhouse
- Apartment or condominium
- Other (please specify)
- Don’t know

36. When was your home built?

- Before 1960
- 1960-1979
- 1980-1999
- 2000-2009
- 2010 or later
- Don't know

37. Do you own or rent your home?

- Own
- Rent
- Prefer not to answer

38. What is the main fuel used to heat your home?

- Electricity
- Natural gas
- Propane
- Oil
- Other (Please specify)
- Don’t heat home
- Don’t know

39. What fuel does your main water heater use?

- Electricity
- Natural gas
- Propane
- Other (Please specify)
- Don’t know

40. Including yourself, how many people are living in your household?

41. Is your annual household income over or under [FPL threshold CUTOFF based on members of household]?

- Over
- Under
- Don’t know
- Prefer not to answer

42. We appreciate your time and would like to send you a $5 electronic gift card to thank you. We will send it to [EMAIL]. If you would like us to send your gift card to a different address, please enter the new address below. You should receive an email with the link to your gift card within 10 days.

- Please send my gift card to the above email address.
- Please send my electronic gift card to the following email address: __
- I do not wish to receive a gift card

If you have questions regarding this survey or would like to know the status of your gift card, you can send an email to adm-surveys@admenergy.com. On behalf of Pacific Power, thank you for participating. Have a great day!