

Washington Low Income Weatherization Program Evaluation, Measurement & Verification Report 2016-2017

*Prepared for
Pacific Power
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Table of Contents

1	Executive Summary.....	1
2	Introduction and Purpose of Study	8
3	Description of Program.....	9
4	Impact Evaluation	12
5	Process Evaluation.....	24
6	Cost Effectiveness Evaluation	37
7	Conclusions and Recommendations	41
8	Appendix: Pacific Power Low Income Weatherization Program Participant Survey	43

List of Tables

Table 1-1:	Washington Low Income Weatherization Program Claimed and Evaluated Energy Savings for 2016-2017	1
Table 1-2:	Payment Assistance and Arrearage Total Benefits.....	2
Table 1-3:	Non-energy Economic Impact.....	2
Table 1-4:	Low Income Program Level Results PY2016-2017	5
Table 1-5:	Low Income Program Level Cost-Effectiveness Results PY2016.....	5
Table 1-6:	Low Income Program Level Cost-Effectiveness Results PY2017	5
Table 3-1:	Pacific Power’s Low-income Weatherization Program in Washington Number of participants by Implementation Agency 2016-2017.....	10
Table 3-2:	Quantities of Measures Installed 2016-2017.....	10
Table 4-1:	Washington Low Income Weatherization Program Claimed and Evaluated Energy Savings for 2016-2017.....	12
Table 4-2:	Regression Results Washington LIW Energy Savings Per Home 2016-2017.....	17
Table 4-3:	Analysis of Changes in External Assistance Payments Based on Mean Monthly Payments	19
Table 4-4:	Analysis of Changes in Arrearages Based on Mean Monthly Arrearage Balances	20
Table 4-5:	Payment Assistance and Arrearage Total Benefits.....	21
Table 4-6:	Non-Energy Economic Impact Model Inputs.....	22
Table 4-7:	Non-energy Economic Impact.....	23
Table 5-1:	How did respondents learn about the program?	29
Table 5-2:	Why did respondents decide to participate in the program?	30
Table 5-3:	Percent of Measures Survey Respondents Confirmed Receiving	30
Table 6-1:	Low Income Weatherization Program Inputs	37
Table 6-2:	Low Income Weatherization Annual Program Costs.....	37
Table 6-3:	Low Income Weatherization Program Savings (kWh) by Program Year..	38
Table 6-4:	Benefit/Cost Ratios by Program Year	38
Table 6-5:	Low Income Weatherization Non-Energy Benefits 2016-2017.....	39
Table 6-6:	Low Income Program Level Results PY2016-2017	39
Table 6-7:	Low Income Program Level Cost-Effectiveness Results PY2016	39
Table 6-8:	Low Income Program Level Cost-Effectiveness Results PY2017.....	40

List of Figures

Figure 1-1: Washington Low Income Weatherization Program Funding Flow.....	3
Figure 3-1: Washington Low Income Weatherization Program Funding Flow.....	9
Figure 5-1: Satisfaction with Energy Savings Measures	32
Figure 5-2: Satisfaction with Scheduling, Usefulness of Energy Education, and Satisfaction with Energy Savings.....	34
Figure 5-3: Satisfaction with Agency Staff and Overall Program Satisfaction	35

1 Executive Summary

This report provides the results of ADM's impact and process evaluations of Pacific Power's Low Income Weatherization (LIW) program in Washington during 2016 and 2017.

The program provides energy-efficiency weatherization services at no cost to income-eligible Pacific Power customers living in single family homes, manufactured homes or multi-unit residential housing in Washington. During the evaluated period, Pacific Power reimbursed program implementers for installing energy efficient refrigerators as well as building shell, HVAC, lighting, and water heating measures. Two hundred sixty one households participated in the program during the evaluation period.

1.1 Impact Evaluation Results

Table 1-1 presents the claimed gross savings, evaluated gross savings, and realization rates that resulted from the program in 2016 and 2017.

*Table 1-1: Washington Low Income Weatherization Program
Claimed and Evaluated Energy Savings for 2016-2017*

Year	Measure	Quantity	Claimed Gross Savings (kWh/yr.)	Evaluated Gross Savings (kWh/yr.)	Realization Rate
2016	Washington Home - WA	136	294,462	176,936	60%
2017	Washington Home - WA	125	276,750	162,625	59%
Total		261	571,212	339,561	59%

1.2 Non-energy impacts

ADM evaluated non-energy impacts including the changes in payment assistance requirements and arrearage balances for program participants, as well as the local economic impact of the program.

The total payment assistance and arrearages benefits that resulted from the program in 2016 and 2017 are shown in Table 1-2.

Table 1-2: Payment Assistance and Arrearage Total Benefits

	2016			2017			Total
	Per Participant	Number of Participants	Total	Per Participant	Number of Participants	Total	
Payment assistance	\$31.38	136	\$4,266.73	\$46.05	125	\$5,756.75	\$10,023.48
Arrearages	\$1.99	136	\$279.34	\$21.09	125	\$2,636.25	\$2,915.59

Table 1-3 includes the local economic impacts that resulted from the program.

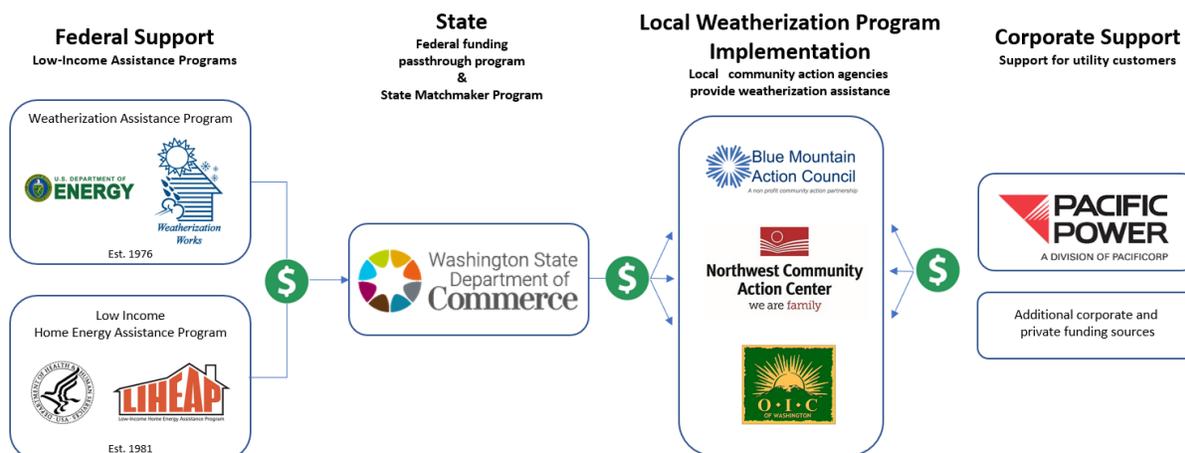
Table 1-3: Non-energy Economic Impact

Impact Type	Employment (Job-years)	Labor Income (Earnings)	Value Added (GDP)	Output (Sales)
Total	19	\$982,118	\$568,199	\$1,334,846

1.3 Process Evaluation Results

In Washington, Pacific Power’s LIW program is implemented by three non-profit community service agencies: Blue Mountain Action Council, Northwest Community Action Center, and Opportunities Industrialization Center. Each provides a variety of wraparound services to income-eligible families and individuals, including federally funding Low Income Home Energy Assistance Program (LIHEAP) and Weatherization Assistance Program (WAP) services; see Figure 1-1. Agencies leverage “braided funding” from multiple sources to offer comprehensive weatherization services to participants.

Figure 1-1: Washington Low Income Weatherization Program Funding Flow



Pacific Power benefits from working with these implementation agencies in the following ways:

- **Trained workforce.** Agencies report that the shortage of trained weatherization labor force is a limiting factor in program capacity. By working with implementing agencies, PacifiCorp benefits from access to crews that receive annual weatherization workforce training.
- **Leveraged funding.** By combining funding sources, agencies can leverage shared program resources and can maximize the number of measures installed in a single home, maximizing benefits for customers and energy savings.
- **Lower program administration costs.** By managing multiple funding streams, agencies distribute overhead costs across funders.

ADM conducted a participant survey to verify measure installations and determine customer satisfaction. All survey respondents shared positive feedback about the program. Respondents rated their satisfaction with program measures and their overall experience highly.

1.4 Cost Effectiveness Results

Guidehouse estimated the cost-effectiveness results for the Washington Low Income Weatherization Program, based on 2016 and 2017 ex-post savings estimates and expenditure provided by Pacific Power.

The conducted the following cost-effectiveness tests:

- Total Resource Cost Test (PTRC) + Conservation Adder
 - The TRC test shows benefits and costs from the perspective of all utility customers (participants and nonparticipants) in the utility service territory. The conservation adder is included to account for hard to measure non-energy benefits.
- Total Resource Cost Test (TRC) No Adder
- Utility Cost Test (UCT)
 - The UCT test is an economic test used to compare the present value of the benefits to the present value of the costs over the useful life of an energy efficiency measure or program from the utility revenue requirement perspective.
- Rate Impact Test (RIM)
 - The RIM test shows impact of efficiency measure on non-participating ratepayers overall
- Lifecycle Revenue Impacts (\$/kWh)

Since program participants do not incur costs, the Participant Cost Test (PCT) was not conducted.

The program did not pass the cost-effectiveness tests during the evaluation period.

Table 1-4 through Table 1-6 report cost effectiveness test results with and without non-energy benefits (NEIs) for the 2016-2017 period and for 2016 and 2017 individually.

*Table 1-4: Low Income Program Level Results
PY2016-2017*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3497	\$1,876,584	\$1,099,028	-\$777,556	0.59
Total Resource Cost Test (TRC) No Adder	\$0.3497	\$1,876,584	\$1,057,550	-\$819,034	0.56
Utility Cost Test (UCT)	\$0.3497	\$1,876,584	\$424,802	-\$1,451,782	0.23
Rate Impact Test (RIM)		\$2,379,378	\$424,802	-\$1,954,577	0.18
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000079253

*Table 1-5: Low Income Program Level Cost-Effectiveness Results
PY2016*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2784	\$778,519	\$598,123	-\$180,396	0.77
Total Resource Cost Test (TRC) No Adder	\$0.2784	\$778,519	\$572,790	-\$205,729	0.74
Utility Cost Test (UCT)	\$0.2784	\$778,519	\$257,594	-\$520,925	0.33
Rate Impact Test (RIM)		\$1,030,410	\$257,594	-\$772,816	0.25
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000061776

*Table 1-6: Low Income Program Level Cost-Effectiveness Results
PY2017*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.4273	\$1,098,065	\$500,905	-\$597,160	0.46
Total Resource Cost Test (TRC) No Adder	\$0.4273	\$1,098,065	\$484,760	-\$613,305	0.44
Utility Cost Test (UCT)	\$0.4273	\$1,098,065	\$167,207	-\$930,858	0.15
Rate Impact Test (RIM)		\$1,348,968	\$167,207	-\$1,181,761	0.12
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000097243

1.5 Conclusions and Recommendations

ADM's evaluation results in the following conclusions:

- During the evaluation period, the program resulted in total evaluated energy savings of 339,561 kWh/year from 261 participating households.
- The program also reduced participants' reliance on energy payment assistance programs by a total of \$10,023.48 and reduced the arrears balances carried by participants by \$2,915.59.
- The program also had a positive economic impact by creating 19 job/years and an associated \$982,118 in labor income as well as contributing \$568,199 in added value (GDP) and \$1,334,846 in economic output (sales).
- Pacific Power continued their partnership with three non-profit community service agencies to implement the LIW program in Washington. The agencies expressed positive program outcomes including reduced energy demand, improved interior air quality, increased home comfort, reduction of health and safety hazards, and retention of homes in the affordable housing inventory. The agencies expressed appreciation for a strong and effective partnership with Pacific Power.
- The program did not pass the cost-effectiveness tests during the evaluation period.

Based on its evaluation, ADM recommend the following actions for Pacific Power to consider in its future implementation of its LIW program in Washington:

- Pacific Power should continue to partner with agencies that provide federally funded weatherization services to take advantage of existing program infrastructure, leveraged funding, and access to a trained weatherization workforce.
- Pacific Power could consider sharing Pacific Power's program objectives (qualitative and quantitative) to more clearly determine the success of the program. Both Pacific Power and the agencies would likely benefit from more explicit program goals.
- Pacific Power could consider requesting more detailed tracking data from implementers to increase the accuracy and granularity of measures' specifications. For example, additional data could include baseline and efficient wattages for bulbs installed through the program, specifications for baseline and replacement efficient refrigerators, and pre- and post-installation insulation conditions. Implementers are already recording extensive data in the DOE-approved auditing software used for projects that include Weatherization Assistance Program (WAP) funding, and therefore the additional data reporting should not create an unreasonable burden.

- Pacific Power could consider reducing the interval between program implementation and evaluation to facilitate more accurate and timely energy savings estimates.
- Pacific Power could consider implementing a process for collecting weatherization program customers' email addresses to enable more accurate and comprehensive program evaluations.
- Pacific Power could consider using a blended ex-ante value from prior program years analysis, rather than updating annually to the most recent evaluation findings. The small sample sizes in Low Income program create high variability in program savings across years. Using an average value across a couple prior evaluation cycles could reduce the fluctuation in realization rates by program year.

2 Introduction and Purpose of Study

This report provides results of ADM Associates, Inc. (ADM) impact and process evaluations of the Pacific Power 2016-2017 Low Income Weatherization (LIW) program in Washington. It also includes results of a cost effectiveness evaluation completed by Guidehouse.

2.1 Impact evaluation

The primary objective of the impact evaluation was to determine ex-post verified gross energy (kWh) savings that resulted from the installation of energy saving measures through the program. The impact evaluation also includes an estimate of the program's impact on participants' reliance on energy assistance payments and participants' arrears balances.

2.2 Process evaluation

The objective of the process evaluation was to gain an in-depth understanding of program operations and identify both program strengths and opportunities for improvement. The process evaluation includes information gathered from Pacific Power staff, staff at the three agencies that implement the program, and program participants.

2.3 Cost effectiveness evaluation

The cost-effectiveness evaluation, completed by Guidehouse using cost estimates provided by Pacific Power and energy saving estimates provided by ADM, includes results of the following cost effectiveness tests:

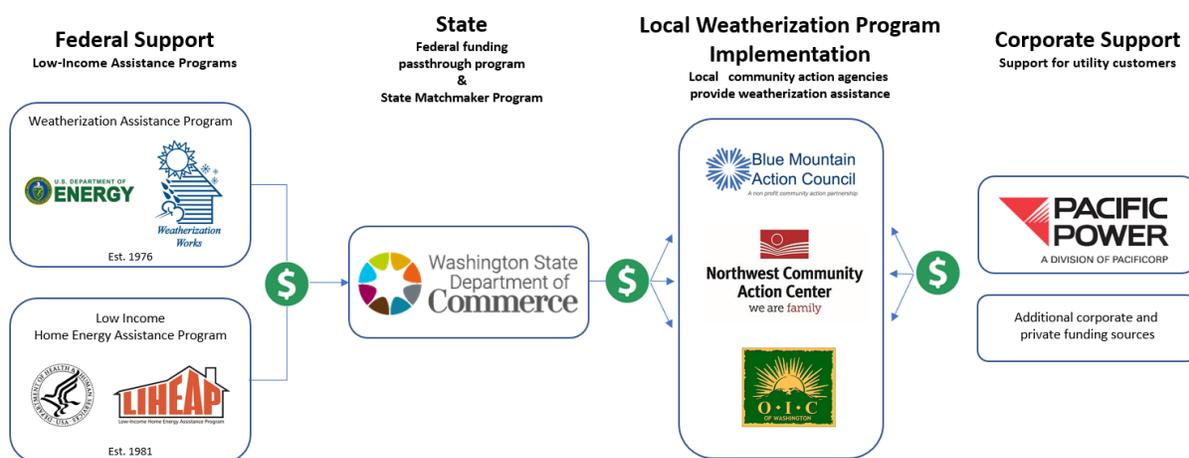
- Total Resource Cost Test (PTRC) + Conservation Adder
- Total Resource Cost Test (TRC) No Adder
- Utility Cost Test (UCT)
- Rate Impact Test (RIM)
- Lifecycle Revenue Impacts (\$/kWh)

Since program participants do not incur costs, the Participant Cost Test (PCT) was not conducted. The following chapters provide descriptions of the methods used to complete these evaluations and their results.

3 Description of Program

In Washington, Pacific Power’s low-income weatherization program is implemented by three non-profit community service agencies that provide wraparound services to vulnerable populations. All agencies offered Low Income Home Energy Assistance Program (LIHEAP) and Weatherization Assistance Program (WAP) services as part of their service offerings. Agencies receive state, federal and utility funding for their weatherization programs; see Figure 3-1. Agencies leverage “braided funding” from multiple sources to offer comprehensive weatherization services to participants.

Figure 3-1: Washington Low Income Weatherization Program Funding Flow



Pacific Power benefits from working with these implementation agencies in the following ways:

- **Trained workforce.** Agencies report that the shortage of trained weatherization labor force is a limiting factor in program capacity. By working with implementing agencies, PacifiCorp benefits from access to crews that receive annual weatherization workforce training.
- **Leveraged funding.** By combining funding sources, agencies can leverage shared program resources and can maximize the number of measures installed in a single home, maximizing benefits for customers and energy savings.
- **Lower program administration costs.** By managing multiple funding streams, agencies distribute overhead costs across funders.

Washington’s *Weatherization Plus Health* Matchmaker Program provided funding for a pilot program to provide additional resources for weatherization projects aimed at reducing energy consumption and improving interior air quality to benefit residents suffering from asthma and COPD. The Washington State program leveraged matching

dollars and resources from utilities, rental owners and other sources. Table 3-1 includes participant counts for each agency.

*Table 3-1: Pacific Power's Low-income Weatherization Program in Washington
Number of participants by Implementation Agency 2016-2017*

Agency	2016	2017	Total
Blue Mountain Action Council	10	26	36
Northwest Community Action Center	58	39	97
Opportunities Industrialization Center	68	60	128
Total	136	125	261

Covered costs: For its customers who are program participants, Pacific Power paid 50% of qualifying measures; state Matchmaker funds covered the other 50%. When Matchmaker funds were exhausted, Pacific Power covered 100% of the direct costs of qualifying measures. Pacific Power also allowed up to 15% of the total cost of measures to cover home repair costs and contributed funding for program administrative costs equal to 15% of direct costs.

Quantities of each measure installed are included in Table 3-2.

Table 3-2: Quantities of Measures Installed 2016-2017

Measure Type	2016	2017	Total
Appliances			
901 Refrigerator Replacement - WA	14	13	27
Building Shell			
00 Washington Home - WA	136	125	261
07 Weather Strip Doors - WA	90	86	176
08 Wall Insulation - WA	24	31	55
09 Ceiling Insulation - WA	79	86	165
11 Floor Insulation - WA	99	95	194
18 Air Sealed/Infiltration - WA	136	121	257
27 Home Repair Cost - WA	77	55	132
31 Thermal Doors - WA	2	1	3
46 Ground Cover - WA	83	69	152
03 Weather Strip Windows - WA	11	-	11

Measure Type	2016	2017	Total
HVAC			
10 Attic Ventilation - WA	126	111	237
15 Duct Insulation and Sealing - WA	61	74	135
555 Thermostat - WA	2	4	6
15 Duct Insulation/Sealing Insulation - WA	3		3
Lighting			
21 CFL Bulbs - WA	1,008	536	1,544
51 LED Lighting Fixtures - WA	4	29	33
21 Florescent Lighting - WA	90	-	90
600 Fluorescent Lighting Fixtures - WA	8	-	8
50 LED Bulbs - WA		365	365
Non-TRL Measures			
Low Income Weatherization Payments	-	-	-
Water Heating			
12 Pipe Insulation - WA	93	97	190
19 Low Flow Shower Head - WA	37	50	87
273 Water Heater Replacement - WA	34	17	51
501 Faucet Aerators - WA	60	84	144
503 Water Heater Blanket - WA	-	2	2
Total	2,277	2,051	4,328

Program goals: Agencies stated that program goals include: reduce energy burden for program participants, maintain affordable housing inventory, improve air quality and healthy living conditions, and reduce health and safety issues. Neither Pacific Power nor the agencies indicated that there were specific energy saving performance goals.

4 Impact Evaluation

This chapter provides the results of ADM’s impact evaluation of the Pacific Power LIW program in Washington during 2016 and 2017. The impact analysis estimates the energy and non-energy impacts that resulted from the program including:

- energy saving (kWh)
- reduced need for payment assistance
- reduced arrears balances
- local economic impact

During the evaluated period, Pacific Power reimbursed program implementers for installing energy efficient refrigerators as well as building shell, HVAC, lighting, and water heating measures.

4.1 Energy Savings

Pacific Power estimated energy savings using a single measure ex-ante value per home, *Washington Home - WA*, that represented the bundled effect of all installed measures. ADM used a regression analysis of billing data to verify the savings that resulted from the program.

Table 4-1 presents the impact evaluation results including the quantity, claimed gross savings, and evaluated gross savings, and realization rates for the evaluation period.

*Table 4-1: Washington Low Income Weatherization Program
Claimed and Evaluated Energy Savings for 2016-2017*

Year	Measure	Quantity	Claimed Gross Savings (kWh/yr.)	Evaluated Gross Savings (kWh/yr.)	Realization Rate
2016	Washington Home - WA	136	294,462	176,936.00	60%
2017	Washington Home - WA	125	276,750	162,625.00	59%
Total		261	571,212	339,561	59%

Total ex post energy savings were comparable to the prior evaluation cycle. Ex ante reported savings were higher than the prior evaluation cycle savings. The ex-ante savings for PY16 & PY17 were from the PY10-PY12 program evaluation, resulting in a low realization rate.

4.1.1 Impact Evaluation Methodology

The impact evaluation component of this report estimates annual gross energy savings (kWh) as framed by the following research question:

- How many homes received the weatherization and energy savings measures?
- What were the kWh savings achieved by the program?
- Did the program have other non-energy impacts such as reducing program participants' reliance on energy assistance payments or reducing their arrears with Pacific Power?

4.1.1.1 Data Collection and Measure Verification

ADM reviewed and reconciled program tracking data to the participation counts and ex-ante savings indicated in the 2016 and 2017 annual reports. ADM reviewed a census of program tracking data. In concert with tracking data reviews, ADM also reviewed the savings values and measure savings assumptions and calculations contained in the Technical Resource Library (TRL) files. ADM issued data requests as needed to ensure that all data was collected that could be reasonably expected or required for this evaluation.

ADM took the following steps to evaluate tracking data and verify program savings.

Review of the program tracking database is an essential first step for verifying data integrity. ADM assessed the program data management system DSMC – which facilitates data collection and organization. ADM reviewed a census of program tracking data contained in DSMC. Each program year's dataset was reviewed for completeness, consistency, and compliance with the provided TRL files.

Review of measure savings assumptions and calculations occurred concurrent with the DSMC data reviews mentioned above. Savings values are maintained in the Technical Reference Library (TRL). The TRL files sometimes include measure savings assumptions, calculations, source papers or files (e.g. RTF versions), and additional documentation that together comprise the generally accepted rules and guidance for evaluating programs. ADM reviewed all TRL documentation and included in this report any errors, omissions, or inconsistencies identified during the review.

Data requests related to EM&V activities occurred throughout the period of this evaluation. ADM provided Pacific Power various data requests for DSMC and TRL data pulls and reports, billing data, and other program data and verification, as necessary.

Established a comparison sample consisting of 2018 – 2019 program participants.

4.1.1.2 Database Review

ADM reviewed and reconciled the program tracking data to the claimed participation counts and ex-ante claimed savings in the 2016 and 2017 annual reports. Further, ADM verified that all energy savings are claimed in accordance with the applicable TRL documents and calculations.

For the *Washington Home – WA* measure in 2016 and 2017, Pacific Power claimed an ex-ante Unit Energy Savings (UES) value of 1,479 kWh/yr. for 9 homes (all served during January and February 2016) and 2,214 kWh/yr. for 252 homes (served during the remainder of the evaluation period).

ADM verified that the source of the 2,214 kWh ex-ante UES value is the *Washington Low-income Weatherization Program Evaluation Report For Program Years 2011-2012*¹ and the source of the 1,479 kWh ex-ante UES value is the *Pacific Power Washington Low-Income Weatherization Program Evaluation March 2009-February 2011*². Both ex-ante values were the result of regression analysis of billing data completed during their respective evaluations. Given that there were not significant changes to the program or measure assortment, it was reasonable to use past evaluated savings as ex-ante values to estimate energy savings.

4.1.2 Evaluated Gross Annual Energy (kWh) Savings

ADM completed a regression analysis to determine an ex-post estimate of energy savings per participating home. The following sections document how the regression analysis was completed.

4.1.2.1 Data Cleaning

ADM began its analysis by cleaning the billing and tracking data to develop a streamlined, simple format for analysis. Both the tracking and billing data contain a billing account number (called “Bill Account Number” in the tracking data and “Concat Agreement Number” in the billing data) which can be used to match a specific premise and customer with their received measures and measure installation date.

The billing data contains line-items unique to a given billing period and as such contains multiple line-items which are unique to given premise. Each line-item breaks down the billed kWh energy into multiple categories (Summer/Winter, Block 1/Block 2, Off Peak/On Peak). The billed consumption is aggregated across these categories to develop a single value for the billing period. Additionally, the data includes the date at which the billing meter registered the period consumption amount along with the number of days in the billing period. A calculation was made to determine a separate value of the number of

¹ Smith & Lehmann Consulting and H Gil Peach & Associates, August 17, 2015.

² The Cadmus Group, Inc. September 7, 2012.

days in the billing period. Approximately .15% of the data points disagreed with the original estimate for the number of days in the billing period. The independently calculated value for the billing period was used and the average kWh per day (KWHD) was calculated for each line-item.

4.1.2.2 *Incorporate Weather Data*

Zip codes in the billing data were used to match line items with the nearest weather stations by calculating the Haversine distance between latitudinal and longitudinal coordinates.

An optimizing algorithm applied on integer sets of possible cooling degree day (CDD) and heating degree day (HDD) base conditions is used on the billing data and associated weather data to determine the appropriate average degree day bases by selecting the set of parameters that minimizes the root mean squared error of a piecewise regression on consumption. The optimal values were found to be 72 for a CDD base and 55 for an HDD base.

The cumulative CDD and HDD for a given line item in the billing data is assigned based on the listed billing cycle start and end dates. These values are divided by the number of days in the billing cycle to get average cooling degree days per day (CDDD) and heating degree days per day (HDDD) values.

4.1.2.3 *Regression Analysis*

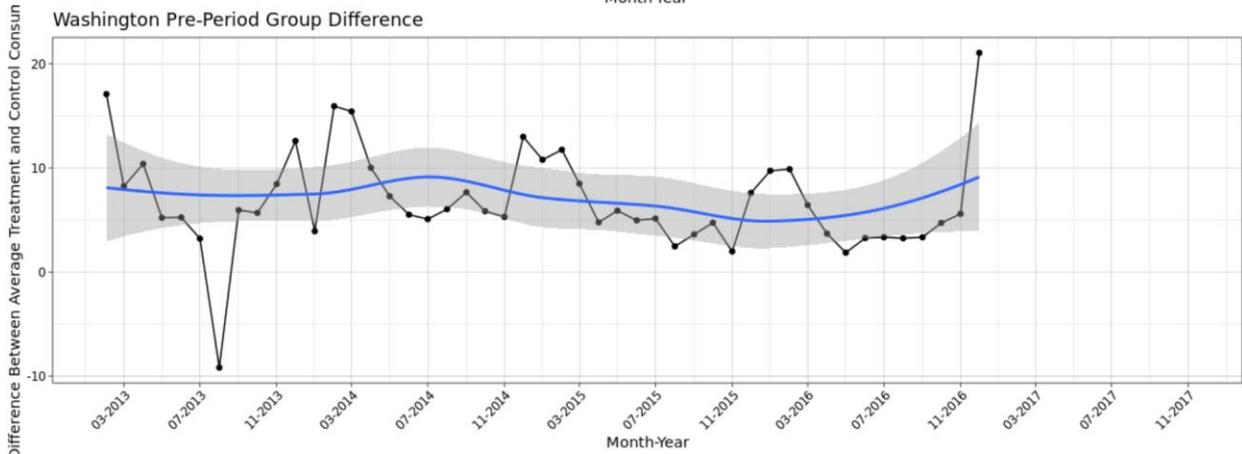
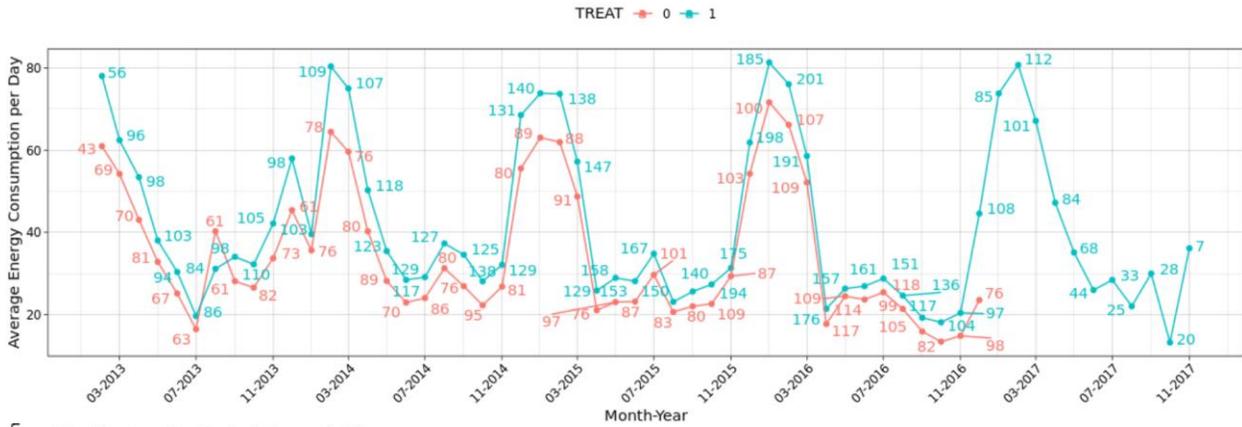
The billing and tracking data were merged together based on their account numbers and data points are assigned a “POST” dummy variable that is 1 if the billing period start date is after the “Measure Effective Date” and 0 if the billing period end date is before it.

Comparison groups are created from the population of program participants that participated in program during 2018 and 2019. Any premise classified as a member of the comparison group had their data filtered to data points prior to their measure installation date.

Data points that indicated there was less than 3 kWh of consumption per a day across a given billing period were removed. This removed 6.1% of data points. Any premise that had less than 6 data points in their pre or post period was removed from consideration in the analysis.

A graphical review of pre-period data for the treatment and comparison groups was conducted to ensure the parallel trends assumption of the difference-in-differences methodology was not broken.

Washington Pre-Period Group Comparison



After verifying the validity of the comparison group, ADM completed a regression analysis using the following equation.

$$\frac{kWh}{Day} = a_0 + a_1 * Post + a_2 * Treat + a_3 * CDDD + a_4 * HDDD + a_5$$

$$* Post * Treat + a_6 * Post * CDDD + a_7 * Treat * CDDD + a_8 * Post * HDDD$$

$$+ a_9 * Treat * HDDD + a_{10} * Post * Treat * CDDD + a_{11} * Post$$

$$* Treat * HDDD + \left(1 \left| \frac{AcctNum}{Month} \right. \right) + \epsilon$$

Where the terms in this equation are described in the table below:

Symbol	Definition
<i>kWh / Day</i>	The average daily consumption in each billing period.
<i>Treat</i>	A dummy variable representing inclusion in either the treatment group (treat = 1) or the comparison group (treat = 0).
<i>Post</i>	A dummy variable representing before (post = 0) or after (post = 1) the measure installation.
<i>CDDD</i>	The average daily cooling degree days for a given data point (one billing period). Base temperature of 72 degrees Fahrenheit
<i>HDDD</i>	The average daily heating degree days for a given data point (one billing period). Base temperature of 55 degrees Fahrenheit
ϵ	Error term

The inclusion of the HDDD and CDDD terms control for weather variation during the pre- and post-periods and between the treatment and comparison groups. The model includes a nested random effects term allowing each premise (defined by its account number) to adopt unique intercept values for each month.

Average daily savings are then calculated according to the following formula.

$$kWh_{savings} = \alpha_5 + \alpha_{10} * HDDD_{AvgPostTreat} + \alpha_{11} * CDDD_{AvgPostTreat}$$

The results of the regression analysis are included in Table 4-2

Table 4-2: Regression Results Washington LIW Energy Savings Per Home 2016-2017

Daily Energy Savings (kWh)	Annual Energy Savings (kWh)	Treatment Premises	Comparison Premises	Pre-Period Treatment Data Points	Post-Period Treatment Data Points	Pre-Period Comparison Data Points	Post-Period Comparison Data Points
3.56	1,301	212	114	6,420	6,163	3,940	2,128

4.2 Non-energy Impact Analysis

ADM estimated non-energy impacts of Pacific Power’s Low-Income Weatherization Program in Washington for 2016 and 2017. Three types of non-energy impacts were assessed:

- Reduced external assistance payments to program participants to help them in paying electric bills; and

- Reduced arrearages for program participants, where an arrearage is measured by an unpaid ending monthly balance on a customer's bill.
- Economic impact that results from program activity during the evaluation period.

4.2.1 Method of Analysis

ADM determined the magnitude of the payment assistance and arrearage impact on a per-participant basis using a difference-in-differences analysis. With this analysis, the magnitude of the benefit attributable to the program was determined by comparing changes in payment assistance or arrearages before and after participation for program participants to changes for a comparison group.

Program participants were divided into two groups for the analyses: those participating in 2016 and those participating in 2017. Separate analyses were performed for each group. The comparison group for each analysis included those customers who participated in the program in 2018 or 2019.

Periods for before and after participation were defined as follows.

- For the analysis for 2016 participants, the before period included 2015 and 2016. The after period was 2017, the year after program participation for these customers.
- For the analysis for 2017 participants, the before period included 2016 and 2017. The after period was 2018, the year after program participation for these customers.

4.2.2 Results from Analysis of External Assistance Payments

For the analysis of external assistance payments, PacifiCorp provided payment data for the years 2016, 2017, 2018, and 2019 for LIW program participants in the Washington (WA) service territory. The data provided identified participants by site and customer account numbers and included payment amounts, payment dates, and source of payment (e.g., Payment Assistance Organization, Paystation, Collection Agency). For the analysis of external assistance payments, data were extracted for valid payments made by a payment assistance organization.

Table 4-3 presents the results of the difference-in-differences analysis of external assistance payments. Mean monthly external assistance payments were calculated for participant and comparison group customers for before and after periods for program participants in 2016 and 2017. The numbers of observations used for the calculations of means are as follows.

- For the analysis of 2016 program participants, the numbers of observations for participants were 173 in the before period and 65 in the after period. For the comparison group, there were 67 observations in the before period and 117 in the after period.

- For the analysis of 2017 program participants, the numbers of observations for participants were 133 in the before period and 44 in the after period. For the comparison group, there were 149 observations in the before period and 98 in the after period.

*Table 4-3: Analysis of Changes in External Assistance Payments
Based on Mean Monthly Payments*

	Program Participants				Comparison Group				Net difference (benefit)	
	Before	After	Change	% Change	Before	After	Change	% Change	Amount	
2016	\$439.64	\$582.25	\$142.61	32.44%	\$352.15	\$526.14	\$173.99	49.41%	\$31.37	
2017	\$552.90	\$560.89	\$7.98	1.44%	\$500.81	\$554.85	\$54.04	10.79%	\$46.05	

The analysis of changes in external assistance payments shows the following.

- For 2016 program participants, mean monthly external assistance payments increased by \$142.61 from the before period to the after period. For comparison group customers, there was an increase in payments of \$173.99. Had program participants showed the same increase as comparison group customers, the mean monthly external assistance payment would have been higher by \$31.37. Thus, for 2016 program participants the net program benefit associated with external assistance payments was \$31.37 per participant. That is, in the absence of the program 2016 participants would have required average monthly external assistance payments that would have been \$31.37 higher.
- For 2017 program participants, mean monthly external assistance payments increased by \$7.98 from the before period to the after period. For comparison group customers, there was an increase in payments of \$54.04. Had program participants showed the same increase as comparison group customers, the mean monthly external assistance payment would have been higher by \$46.05. Thus, for 2017 program participants the net program benefit associated with external assistance payments was \$46.05 per participant. That is, in the absence of the program 2017 participants would have required average monthly external assistance payments that would have been \$46.05 higher.

4.2.3 Results from Analysis of Arrearages

For the analysis of arrearages, PacifiCorp provided arrearage data for the years 2016, 2017, 2018, and 2019 for LIW program participants in the Washington (WA) service

territory. Using these data, we calculated the change in arrearages for Program participants and compared this to the change in arrearages for the comparison group.

- Table 4-4 presents the calculations for this difference-in-differences analysis of arrearages. Mean monthly arrearages were calculated for participant and comparison group customers for before and after periods for program participants in 2016 and 2017. The numbers of observations used for the calculations of means are as follows.
- For the analysis of 2016 program participants, the numbers of observations for participants were 2,339 in the before period and 1,089 in the after period. For the comparison group, there were 2,680 observations in the before period and 1,456 in the after period.
- For the analysis of 2017 program participants, the numbers of observations for participants were 2,107 in the before period and 1,043 in the after period. For the comparison group, there were 2,883 observations in the before period and 1,367 in the after period.

Table 4-4: Analysis of Changes in Arrearages Based on Mean Monthly Arrearage Balances

	Program Participants				Comparison Group				Net difference
	Before	After	Change	% Change	Before	After	Change	% Change	
2016	\$65.46	\$80.71	\$15.31	23.39%	\$42.36	\$59.66	\$17.30	40.84%	\$1.99
2017	\$91.36	\$66.36	-\$25.00	-27.36%	\$51.84	\$47.93	-\$3.91	-7.54%	\$21.09

The analysis of changes in arrearages shows the following.

- For 2016 program participants, mean monthly arrearages increased by \$15.31 from the before period to the after period. For comparison group customers, there was an increase in mean arrearages of \$17.30. Had program participants showed the same increase as comparison group customers, the mean monthly arrearages would have been higher by \$1.99. Thus, for 2016 program participants the net program benefit associated with arrearages was \$1.99 per participant. That is, the 2016 program participants had mean monthly arrearages that were \$1.99 lower than would have occurred had they not participated in the program.

- For 2017 program participants, mean monthly arrearages decreased by \$25.00 from the before period to the after period. For comparison group customers, there was a decrease in mean arrearages of \$3.91. Had program participants showed only the same decrease as comparison group customers, the mean monthly arrearages would have been higher by \$21.09. Thus, for 2017 program participants the net program benefit associated with arrearages was \$21.09 per participant. That is, the 2017 program participants had mean monthly arrearages that were \$21.09 lower than would have occurred had they not participated in the program.

The total payment assistance and arrearages benefits that resulted from the program in 2016 and 2017 are shown in Table 4-5.

Table 4-5: Payment Assistance and Arrearage Total Benefits

	2016			2017			Total
	Per Participant	Number of Participants	Total	Per Participant	Number of Participants	Total	
Payment assistance	\$31.38	136	\$4,266.73	\$46.05	125	\$5,756.75	\$10,023.48
Arrearages	\$1.99	136	\$279.34	\$21.09	125	\$2,636.25	\$2,915.59

4.2.4 Economic Impact Analysis

ADM analyzed the program’s non-energy economic impacts using the Regional Input-Output Modeling System (RIMS-II) from the Bureau of Economic Analysis (BEA). RIMS-II is an input-output model which allows the user to calculate the distributed effects of regional final demand (spending) changes. As a result of the weatherization program, participants can expect to shift some of their spending from energy costs to purchases in the local economy. This additional spending results in distributed effects such as increased sales, job creation, and added value to the local economy. RIMS-II provides local multipliers to capture these distributed effects.

There are several assumptions relevant to this Economic Impact Analysis that must be considered when using RIMS-II multipliers.³

1. Multipliers contain no time dimension. The length of time it will take for an impact to be completed is not a factor in the modeling system.

³ More information regarding the RIMS-II multipliers can be found at in the RIMS-II user guide located at: https://www.bea.gov/sites/default/files/methodologies/RIMSII_User_Guide.pdf

2. The modeling system assumes industry homogeneity, in other words, all business within an industry use the same production process with the same inputs.
3. RIMS-II is a fixed-price model, meaning that it assumes no change in prices will result from changes in demand.
4. The modeling system is built on national input-output models that are adjusted to account for local conditions. The multipliers therefore assume that if a product can be purchased within the region they will be.
5. RIMS-II is a single region system and does not account for any feedback that may occur between regions.

The RIMS-II system multipliers were acquired for the two geographic areas included in the Pacific Power service area: Yakima County and the area that includes Walla Walla, Columbia, and Garfield Counties. Approximately 30% of program spending occurred in Yakima County, with the remaining 70% of spending occurred in the three-county area.

ADM used the RIMS-II Type II multipliers from 2012 U.S. Benchmark I-O data and 2017 Regional Data. All monetary values were converted to 2017 dollars using the Bureau of Labor Statistics Consumer Price Index.

The inputs used for the non-energy impacts analysis are shown in Table 4-6.

Table 4-6: Non-Energy Economic Impact Model Inputs

Category	Description	Amount	Sector
Program spending categories	Agency Administration	\$227,739	Construction
	Agency Weatherization	\$1,598,989	Construction
	State/Federal Government Contributions	\$1,008,322	Construction
Program Cost	Cost to Ratepayers: tariff collections	-\$2,007,106	Household
Energy Savings for Participants	Present Value of Participant avoided energy costs	\$2,351,999	Household
Revenue Loss for Pacific Power	Reduction in Pacific Power Revenue	-\$2,351,999	Utilities

The economic impact analysis inputs are described in detail below.

Agency Administration and Agency Weatherization Amount contributed by Pacific Power for program administration expenses and weatherization measures as reported in the program tracking data for 2016 and 2017.

State and Federal Government Contributions Portion of administration and measure costs reported in the program tracking data that was assumed to be covered by state or federal program funding.

Program costs Net cost to ratepayers based on the Ratepayer Impact Measure (RIM) reported in the 2016 and 2017 annual reports.

Energy Savings for Participants Net present value of the lifetime energy savings resulting from the program. Savings are the net benefits from the Participant Cost Test as reported in the 2016 and 2017 annual reports.

Revenue Loss for Pacific Power is Pacific Power’s lost revenue that results from customer avoided energy costs.

The resulting non-energy impacts (NEI) are shown in Table 4-7.

Table 4-7: Non-energy Economic Impact

Impact Type	Employment (Job-years)	Labor Income (Earnings)	Value Added (GDP)	Output (Sales)
Total	19	\$982,118	\$568,199	\$1,334,846

The \$2,835,050 in program expenditures resulted in an additional \$1,334,846 in economic output (sales); for each dollar spent through the program an additional \$0.47 of output was generated. The program spending resulted in 19 additional job-years and \$982,118 of additional earnings. Finally, the program is expected to generate \$568,199 in added value (Gross Domestic Product) for the local economy.

5 Process Evaluation

ADM completed a process evaluation of the Pacific Power LIW program during 2016 and 2017 that consisted of:

- In-depth interviews with program staff
- Review of program materials
- Program participant survey

5.1 In-depth Interviews with Program Staff and Review of Program Materials

ADM evaluators interviewed LIW program staff from Pacific Power and from the three nonprofit agencies that implemented the program. Interviews were conducted to gain insight into program design, to identify program objectives and to assess the program during the evaluation period of 2016 and 2017. The evaluators also reviewed available program materials.

5.1.1 Roles and Responsibilities

Pacific Power is a subsidiary of PacifiCorp. PacifiCorp's LIW program manager oversees the program in Utah, Wyoming, Washington, Idaho and California. The program manager who oversaw the program during the 2016-2017 evaluation period is no longer with PacifiCorp and was therefore unavailable to interview. Current program staff, some of whom held positions in the LIW program during evaluation period, were interviewed.

Pacific Power's LIW program manager works with three community nonprofit organizations to implement the program for Pacific Power in Washington. The evaluators interviewed staff at all three of Pacific Power's low-income weatherization program partners in Washington.

Implementation agencies are responsible for the following program management activities:

- Determine applicants' eligibility
- Perform energy audits and identify eligible measures
- Manage installation of qualifying measures
- Provide certified quality control inspectors to visit and inspect all project sites
- Process invoices for payment by Pacific Power

5.1.2 Tracking and Reporting

Pacific Power provided ADM with program tracking data that specified what measures were installed per project and estimated energy savings. Customers' phone numbers and email addresses at the time of participation in the program were included in the tracking data when available. Data about measures installed per project site were provided by the implementation agencies to Pacific Power when they submitted invoices for completed projects.

During the evaluation period, agencies submitted invoices for completed weatherization jobs on a paper, multipart form which was mailed to Pacific Power for processing.

5.1.3 Communication

Agencies report that the open and frequent communication with Pacific Power's low-income weatherization manager is a strength of the program. They characterized the relationship as a strong partnership. One agency appreciates that Pacific Power's home inspections provide an implicit endorsement that utility funds were spending appropriately.

The following quotes are representative of the feelings expressed by agencies:

"Becky [PacifiCorp's LIW program manager] was always asking – 'Are there other measures that we should be considering?' Over the past 10 years there have been a lot of improvements. Always, we talked about it when Becky came – how to improve the program."

"I really appreciate the partnership with PacifiCorp and their willingness to work with us through the challenges of some of our funding restrictions that are not brought on by the company. There are outside influences that impose requirements on us, and PacifiCorp, at every turn, has been there willing to help, and ask the difficult questions – going back to the agency to find out what it is that they could do to be more flexible and helpful to modify our partnership so that it is easier on us to continue to deliver this needed service in the community. Working together makes it easier."

5.1.4 Marketing and Outreach

The availability of the program was communicated to potential participants primarily through referrals from the Low Income Home Energy Assistance Program (LIHEAP) program and the *Weatherization Plus Health* that recruited asthma and COPD patients to submit program applications. Agencies did not feel that additional promotion was necessary since their weatherization were operating at capacity.

5.1.5 Quality Assurances and Quality Controls (QA/QC)

The program's quality assurance and quality control practices were driven by DOE's Weatherization Assistance Program QA/QC requirements that were implemented in 2015, after the previous program evaluation period. DOE requires that all jobs are inspected by Quality Control Inspectors (QCIs) who have been certified by the Building Performance Institute.

Agencies reported complying with DOE auditing, quality control and inspection requirement for federal weatherization programs.

Agencies' QCIs inspected work before submitting invoices to Pacific Power for qualified installed measures and services.

Agencies reported that Pacific Power visited them multiple times per year to inspect all homes that received Pacific Power-funded measures to verify that clients were meeting eligibility criteria and to confirm that energy audits were conducted appropriately.

5.1.6 In Depth Interview Takeaways

The following findings resulted from ADM's in-depth interviews with program staff:

- In May 2017, in response to the state's delayed release of Matchmaker funding, Pacific Power removed its \$1 million low-income weatherization program spending cap.
- Agencies indicate that Pacific Power has been a leader in Washington in allowing a portion of its LIW funding to be spent on home repairs which helps preserve the affordable housing inventory.
- LIW wait times in Washington are shorter than average weatherization program wait times. One agency reported that they did not have any wait list; the time between application and home energy audit visit averaged one week. Another agency indicated that the average wait from application to in-home energy audit was 2 to 6 weeks, and their wait list had only 20-30 names on it. This quick response time is notable among low-income weatherization programs. Washington State's Matchmaker funds and Weatherization plus Health program are likely large contributors to this quick response time.
- One agency implemented a change to the program application process during the evaluation period that combined the application processes for the energy assistance and weatherization programs and cross trained all their intake staff. The agency reported that this new process improved the application process and efficiency.

- One agency requires program participants to complete 1.5 hour classroom energy conservation education session. The agency also reinforces the importance of energy education by providing clients with energy conservation information during each interaction with agency staff.
- Despite agency efforts to communicate that Pacific Power is providing funding for weatherization costs, agencies report that program participants still identify the agencies as the program providers. One agency representative noted that program participants develop relationships with weatherization crew members throughout the auditing and installation process and, therefore, associate the program benefits with agencies, despite effort to give funding attribution to Pacific Power.
- One agency reported a 30-35% deferral rate because of poor home conditions. Home deferrals are a significant constraint to how many households can participate in the program.
- One agency reported that 70% of clients are primarily Spanish speaking, and that all staff members (auditors, inspectors, installers included) are bilingual.
- During the evaluation period, agencies used 3-part paper forms to bill Pacific Power for eligible measures. Agencies would like to move to a more efficient and accurate electronic system to send invoices to Pacific Power.
- All agencies remarked that Washington State's strict labor regulations and the difficulty of weatherization work created significant barriers to hiring contractors.
- Agencies noted that biggest constraint to the number of homes that can be served is the length of time it takes fully train new staff in weatherization skills.
- Pacific Power reimburses agencies only after projects are completed. This can create a financial hardship for nonprofit agencies operating on grants because they must maintain sufficient funds to cover expenses for the duration of projects.
- One agency remarked that Pacific Power is more flexible than some of its other funding sources and is easier for the agency to work with.
- When Matchmaker funds are not available, Pacific Power covers 100% of direct costs plus the additional funding for home repair and administrative expenses. Despite this additional funding, Pacific Power funding does not cover some Health and Safety measures that Department of Commerce requires, nor does it the full cost of program administration.
- One agency indicated that they wish that the previously authorized \$200 reimbursement for energy education were still available.

5.2 Program Participant Survey

ADM surveyed program participants during the process evaluation. The participant survey evaluation was designed to research and document the experiences of program participants. ADM used survey results to assess implementation strategies and program design. The participant survey was designed to answer the following questions.

- How did participants hear about the program?
- Why did customers decide to participate in the program?
- How satisfied were participants with the work performed, the scheduling and application processes, and other aspects of program participation?
- What were the perceived energy and non-energy benefits associated with the program?

To address these researchable issues, ADM reviewed program documentation and administered participant surveys.

Program Documentation Review: ADM reviewed tracking data that included information about installed measures and program participants' contact information.

Participant Survey: ADM conducted a mixed mode (online and telephone) survey of participants who received measures or services from the program. Participant emails ($n = 23$) and phone numbers ($n = 250$) were identified from data provided by Pacific Power and linked to the tracking data. ADM attempted to contact all 261 program participants as part of the survey efforts.

ADM emailed survey invitations and two reminders to participants in December 2019, resulting in one completed survey and four hard bounced email replies. ADM staff made 727 phone calls to 250 participants with phone numbers during the months of December and January (up to four times per household) resulting in 63 completed surveys (34 completed in English, 30 completed in Spanish), 10 refusals, 6 who did not recall participating in the program, 51 disconnected phones and 24 wrong numbers. Phone calls and email campaign messages were discontinued after ADM collected enough surveys ($n = 64$) to represent the total population of 261 program participants with at least 90% statistical confidence and +10% precision (typically the quantity of 68 is a standard sample size for 90/10 precision, however, with a small sample size as seen in this study a finite population correction is standard and was applied).

ADM analyzed survey responses from 64 participants: online responses to an email campaign ($n = 1$) and telephone responses ($n = 63$). Program participants were offered monetary incentives (\$10 gift cards) for completing the survey. Survey topics covered measure installation rates as well as customer experiences with the program, installation crew, and agency staff.

5.2.1 Participant Survey Results

This section summarizes feedback received from survey respondents.

5.2.2 Program Awareness

LIW program survey respondents first learned about the program through a variety of channels. Most participants reported learning about the program from friends or neighbors (36%) a community agency (31%) and Pacific Power (14%) as well as other sources as indicated below in Table 5-1. Five percent of participants responded that they did not remember where they learned about the program.

Table 5-1: How did respondents learn about the program?

Response	<i>n</i>	Percentage of Respondents
From a friend/neighbor	23	36%
From a community agency/another program	20	31%
From information received through Pacific Power	9	14%
From an information brochure	1	2%
From a property owner/landlord	1	2%
From a contractor	1	2%
From the internet	1	2%
Don't remember	3	4%
Other	5	7%

Respondents reported deciding to participate in the program to save money on their energy bills (86%), because the services were provided at no cost (67%), to improve home comfort (50%), to reduce energy use for environmental reasons (44%), to improve the value of the home (25%) and other reasons not clearly indicative of the previous categories (13%) as shown in

Table 5-2.

Table 5-2: Why did respondents decide to participate in the program?

Response	<i>n</i>	Percentage of Respondents
To save money on energy bills	55	86%
To services were provided at no cost	43	67%
To improve home comfort	32	50%
To reduce energy use for environmental reasons	28	44%
To improve value of the home	16	25%
Other	8	13%

*Note: The sum of *n* may exceed the total surveyed (64) and percentages may exceed 100% because respondents could choose more than one response.*

5.2.3 Measures Installed

ADM asked survey respondents to confirm that measures were installed in their homes through the program. Survey respondents confirmed receipt of all (100%) ENERGY STAR refrigerators, LED light bulbs, thermostats and water heater blankets. Respondents confirmed receipt of 67-96% (Average of measures = 82%) of most other measures except for ground cover (50%), weather stripping on window(s) (33%) and thermal door(s) (0%). It is likely that the extended period between participation and collection of survey data as well as the unseen nature of many weatherization measures (insulations being inside walls or under the floor for example) can explain the lower than 100% confirmation rates. Lastly the thermal door measure was not able to be verified due to an inability to reach any of the three participants who received this measure (repeated calls were made to each household and messages left when voicemail was available). Table 5-3 displays a summary of the measures that survey respondents reported receiving.

Table 5-3: Percent of Measures Survey Respondents Confirmed Receiving

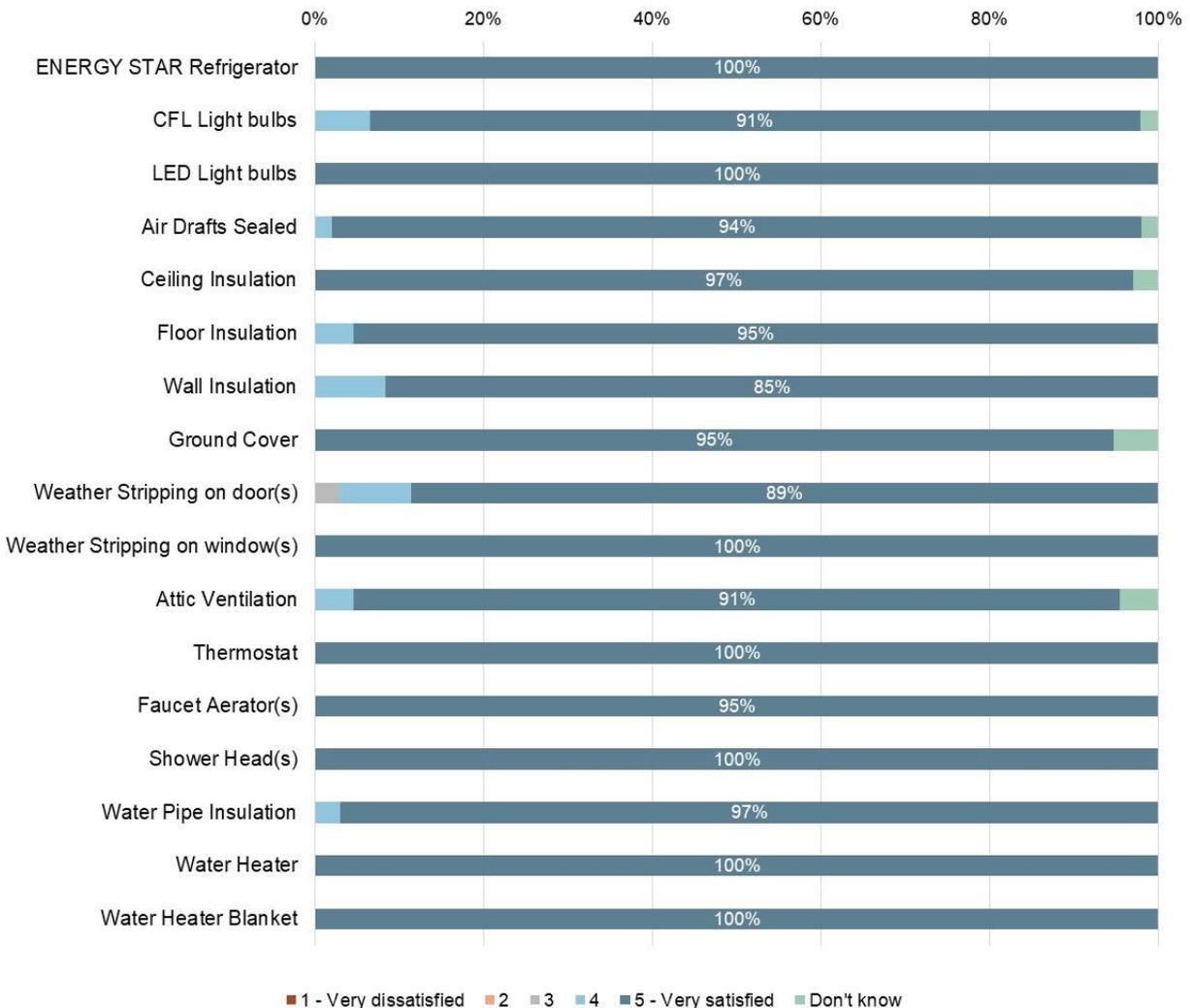
Measures	Yes	No	Don't know	Percentage confirming Yes
ENERGY STAR certified refrigerator	5	0	0	100%
LED light bulbs	3	0	0	100%
CFL light bulbs	46	1	1	96%
Air drafts sealed	52	7	5	81%
Ceiling insulation	32	4	2	84%
Floor insulation	44	4	1	90%
Wall insulation	13	2	0	87%

Ground cover	19	16	3	50%
Weather stripping on door(s)	35	9	1	78%
Weather stripping on window(s)	1	2	0	33%
Attic ventilation	44	9	4	77%
Duct sealing and/or insulation	28	3	6	76%
Thermostat	1	0	0	100%
Faucet aerator(s)	20	4	0	83%
Low flow shower head(s)	10	1	0	91%
Water pipe insulation	33	9	6	69%
Water heater	8	3	1	67%
Water heater blanket	1	0	0	100%
Thermal door(s)	0	0	0	0%

Note: The percentages may exceed 100% because respondents were only asked to confirm receipt of measures indicated in tracking data and percentages were calculated for each item individually.

ADM asked respondents to rate their satisfaction with the measures they received through the program on a scale from 1 to 5, in which 1 meant “very dissatisfied” and 5 meant “very satisfied”. Almost all respondents (89-100%) rated their satisfaction with the measures as very satisfied, with a few ratings of “4” and “don’t know” interspersed. One participant rated their satisfaction with weather stripping on door(s) as a “3” with no comment as to why.

Figure 5-1: Satisfaction with Energy Savings Measures



All respondents who confirmed receipt of refrigerators, thermostats, water heaters and water heater blankets through the program reported they were still installed (100%).

Respondents who recalled details on the number of bulbs received from the program (67% LED, 28% CFL) reported that some bulbs were never installed, all stating they were given to them as extras or spares. Additionally, there were three (9%) respondents who reported they could not recall whether any CFL bulbs had been installed and one who stated they don't know (3%).

The respondent who mentioned some or all LED light bulbs had been removed stated they broke or burned out (100%) more than one year after they were installed. Of the respondents that mentioned some or all CFL light bulbs had been removed, 83% stated they broke or burned out, and 17% noted other reasons (replaced with LED or moved). All bulbs that were removed were removed more than one year after they had been installed. Most respondents (67% LED, 75% CFL) who reported receiving light bulbs said

the new bulbs replaced incandescent bulbs. LEDs replaced CFLs (33%) or older LEDs, while 13% noted the new CFLs replaced older CFLs. A small portion of participants (13%) could not recall the type of lighting the CFL bulbs replaced, or they did not know (3%).

Among the individuals who verified having faucet aerators installed, 5% reported they didn't know how many were installed in their home. Among those who did recall the number installed, approximately 84% reported they had not uninstalled any of the faucet aerators they received through the program. The remainder of respondents noted they had either removed the faucet aerators they received through the program (67%) more than a year later after installation, or the aerator broke (33%) within the first year.

All participants verified having all low flow shower heads installed, while 20% stating they were removed (half within one year and half more than one year later).

Participants were prompted again later in the survey to recall whether they received some of the measures not easily seen in the home (insulations, ground cover etc.). For example, two participants who initially denied that ceiling insulation was installed as reported, later confirmed that the installation had been installed. In the case of air drafts that were sealed in the home, one of the seven who initially denied that the installation occurred (14%) later recalled that it was installed. Two of the seven (29%), later changed their answer to don't know. A similar pattern of response changes can be seen across many measures (as shown in Table 5.4 below) suggesting participants recall of the installations faltered over time. Therefore, we assume a 100% installation rate for these measures, including water pipe insulation for which a second prompt was not given.

*Table 5-4: Respondents' consistency in recall of installation
Number of participants who answered a repeated prompt with the same response*

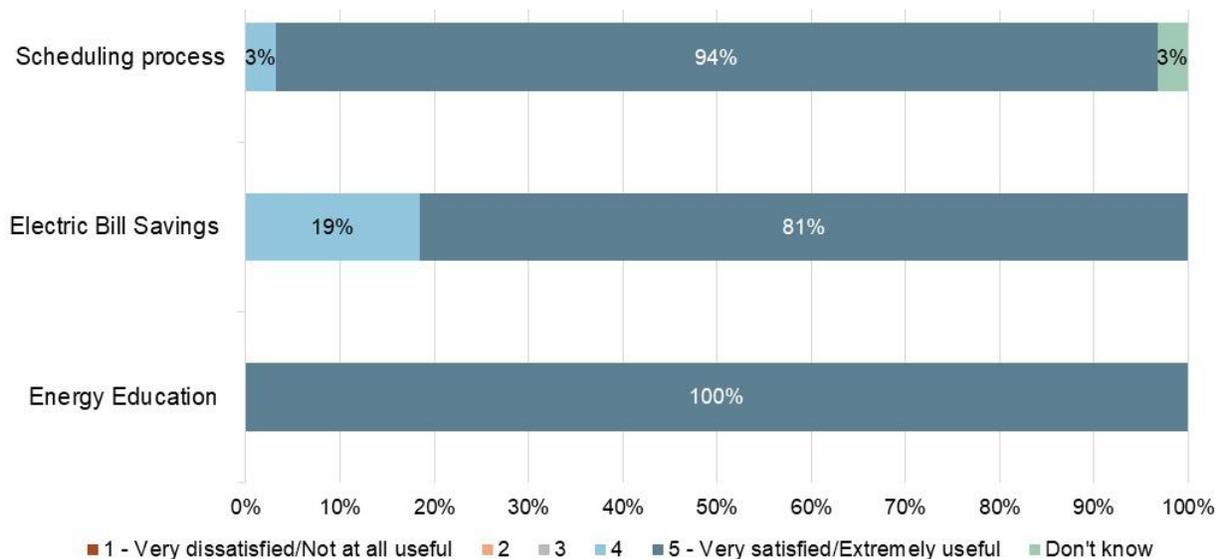
Measures	Yes 1st/2nd Survey Prompts	No 1st/2nd Survey Prompts	Don't know 1st/2nd Survey Prompts	2nd Prompt Responded "Don't Remember"
Air drafts sealed	52/53	7/4	5/7	0
Ceiling insulation	32/34	4/2	2/2	0
Floor insulation	44/43	4/2	1/3	0
Wall insulation	13/13	2/2	0/0	0
Ground cover	19/21	16/11	3/5	0
Attic ventilation	44/46	9/7	4/1	3
Duct sealing and/or insulation	28/30	3/2	6/0	4

5.2.4 Audit Experience

Most survey respondents reported they had a positive experience with the home energy audit. Seventy-eight percent of respondents rated their satisfaction with scheduling their audit a 4 (3%) or 5 (94%) while 3% responded they did not know (see Figure 5-2). Nearly all respondents (92%) stated their visit was scheduled at a convenient time, and the home energy auditor or inspector arrived at their home on time or at least within 15 minutes of the scheduled appointment. Six percent of participants reported they did not remember the details of the audit.

Many respondents (77%) indicated they spoke with the auditor about ways to save energy in their home or that the auditor left educational materials about how to save energy, while the remainder reported they did not receive information (13%), they did not remember (6%) or did not know (5%). Eighty-eight percent of respondents indicated they felt they knew more about saving energy after the auditor's visit and they all rated the information's usefulness a 5 (100%) on a scale from 1 to 5 in which 1 represented "not at all useful" and 5 represented "extremely useful" (see Figure 5-2).

Figure 5-2: Satisfaction with Scheduling, Satisfaction with Energy Savings and Usefulness of Energy Education.



Eighty-six percent of respondents noted that they have done something in their home or changed their behavior to use less electricity since the auditor visited; the remainder (14%) changed nothing.

Of the respondents who reported an effort to use less electricity and left comments with specifics, 43% made heating related adjustments (lowering and regulating thermostat, opening/closing doors and windows), 40% were more conscious of keeping lights off

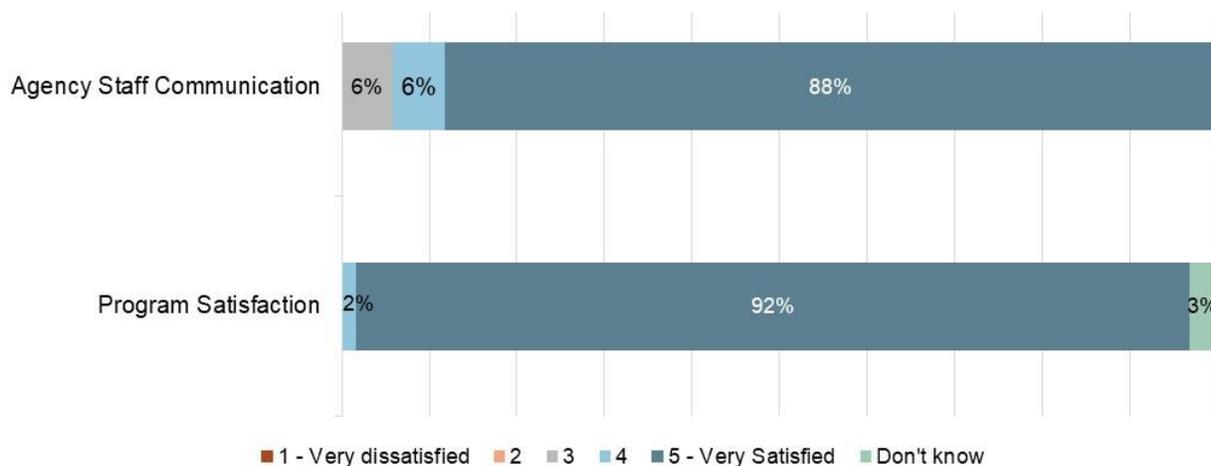
when they are not in use, 26% unplugged appliances when not in use and 17% purchased or made efforts to use more energy efficient devices or appliances⁴. Eighty-four percent of respondents said that they have noticed energy savings since participating in the program; all these respondents rated their satisfaction with the savings either a 4 (19%) or 5 (81%) as shown in Figure 5-2.

5.2.5 Program Satisfaction

Approximately a quarter of survey respondents (27%) indicated they had contacted agency staff with questions about which items or services they could receive through this program through the course of their participation. Of those who contacted agency staff, 94% rated their satisfaction a 4 (6%) or 5 (88%) as seen in Figure 5-3. One participant gave a rating of 3 (6%) commenting they called and asked the contractor to fix a pipe they broke and was told there was nothing the contractor could do to help.

Overall, the vast majority (94%) of program participants surveyed reported satisfaction with the LIW program. Most participants rated the program a 4 (2%) or 5 (92%) out of 5, indicating they were satisfied with the program overall. Only 8% of respondents rated the program a 1 (3%) out of 5 or reported they “don’t know” (3%). Figure 5-3 displays the results. Respondents were given the opportunity to provide additional feedback and took this opportunity to request a more clear or direct process to communicate with staff, inclusion or consideration of additional measures (e.g. windows), and to voice dissatisfaction with the contractor staff (failure to clean up or complete the work).

Figure 5-3: Satisfaction with Agency Staff and Overall Program Satisfaction



⁴ Percentages may total greater than 100% as respondents often reported more than one category of energy savings behavior.

5.2.6 Participant Survey Takeaways

ADM noted the following results from the participant survey:

- Most survey respondents shared positive feedback and support for the program.
- A small portion of respondents noted issues with the program and shared comments regarding areas for potential improvement including:
 - More direct or clear ways to communicate issues with agency staff
 - Inclusion of additional measures
 - Improving customer service
- A small portion of participants chose the “don’t remember” or “don’t know” option available in many questions or changed their answers indicating difficulty recalling details 2-4 years after participation.

6 Cost Effectiveness Evaluation

Pacific Power contracted with Guidehouse to calculate the program cost-effectiveness based on the evaluated savings assessed by ADM. ADM provided the measure life and incremental cost inputs needed to calculate the cost-effectiveness of the program. Guidehouse conducted the following cost-effectiveness tests:

- Total Resource Cost Test (PTRC) + Conservation Adder
- Total Resource Cost Test (TRC) No Adder
- Utility Cost Test (UCT)
- Rate Impact Test (RIM)
- Lifecycle Revenue Impacts (\$/kWh)

The Low-Income Weatherization program provides weatherization measures at no cost to eligible customers. Since participants do not incur costs, the Participant Cost Test (PCT) was not conducted.

Measure life and incremental cost values were assigned on an individual measure basis and came from the TRL files provided by Pacific Power. Table 6-1 includes the cost effectiveness evaluation inputs for 2016 and 2017.

Table 6-1: Low Income Weatherization Program Inputs

Parameter	PY2016	PY2017
Discount Rate	6.66%	6.66%
Residential Line Loss	9.67%	9.67%
Residential Energy Rate (\$/kWh) ¹	\$0.0836	\$0.0906
Inflation Rate	1.90%	1.90%

¹ Future rates determined using a 1.90% annual escalator.

Table 6-2 reports program costs by year.

Table 6-2: Low Income Weatherization Annual Program Costs

Program Year	Engineering Costs	Utility Admin	Program Delivery	Program Development	Inspection Costs	Incentives	Total Utility Costs	Gross Customer Costs
2016	\$0	\$32,243	\$91,495	\$607	\$0	\$654,175	\$778,519	\$0
2017	\$0	\$23,640	\$134,214	\$5,868	\$4,043	\$930,299	\$1,098,065	\$0
2016-2017	\$0	\$55,883	\$225,709	\$6,475	\$4,043	\$1,584,475	\$1,876,584	\$0

Table 6-3 includes energy savings resulting from the program for the evaluation period.

Table 6-3: Low Income Weatherization Program Savings (kWh) by Program Year

Program Year	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
2016	294,462	60%	176,936	100%	176,936	30
2017	276,750	59%	162,625	100%	162,625	30
2016-2017	571,212	59%	339,561	100%	339,561	30

Table 6-4 includes the summarized results of the following cost effectiveness tests for the evaluation period: Total Resource Cost Test (PTRC), Total Resource Cost Test (TRC), Utility Cost Test (UCT), and Rate Impact Test (RIM). Participant Cost Test (PCT) was not performed because there was no cost to the participant. The program did not pass the cost-effectiveness tests during the evaluation period, as reported in Table 6-4.

The 2016-2017 Low Income Weatherization program outperformed prior years with respect to average savings achieved per household. The average program and incentive costs per participating household were slightly lower than prior program years. Avoided costs per kWh decreased between the 2013-2015 program cycle and the 2017 16-17 program cycle, causing the program to not pass TRC for the 2017 program year.

Table 6-4: Benefit/Cost Ratios by Program Year

Program Year	PTRC	TRC	UCT	RIM
2016	0.77	0.74	0.33	0.25
2017	0.46	0.44	0.15	0.12
2016-2017	0.59	0.56	0.23	0.18

In addition to the energy benefits reported above, the program offers significant non-energy benefits (NEIs) as reported in

Table 6-5.

Table 6-5: Low Income Weatherization Non-Energy Benefits 2016-2017

Non-Energy Benefit	Program Impact			Perspective Adjusted
	2016	2017	Total	
Payment Assistance	\$4,267.00	\$5,756.75	\$10,023.75	PTRC, TRC, UCT, RIM
Home Repair Costs	\$30,817.00	\$30,817.00	\$61,634.00	PTRC, TRC
Arrearage	\$279.00	\$2,636.25	\$2,915.25	PTRC, TRC
Economic Impact	\$284,099.50	\$284,099.50	\$568,199.00	PTRC, TRC
Total	\$319,462.50	\$323,309.50	\$642,772.00	

Table 6-6 through

Table 6-8 report cost effectiveness test results for the 2016-2017 period and for 2016 and 2017 individually.

*Table 6-6: Low Income Program Level Results
PY2016-2017*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3497	\$1,876,584	\$1,099,028	-\$777,556	0.59
Total Resource Cost Test (TRC) No Adder	\$0.3497	\$1,876,584	\$1,057,550	-\$819,034	0.56
Utility Cost Test (UCT)	\$0.3497	\$1,876,584	\$424,802	-\$1,451,782	0.23
Rate Impact Test (RIM)		\$2,379,378	\$424,802	-\$1,954,577	0.18
Lifecycle Revenue Impacts (\$/kWh)	\$0.0000079253				

*Table 6-7: Low Income Program Level Cost-Effectiveness Results
PY2016*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.2784	\$778,519	\$598,123	-\$180,396	0.77
Total Resource Cost Test (TRC) No Adder	\$0.2784	\$778,519	\$572,790	-\$205,729	0.74
Utility Cost Test (UCT)	\$0.2784	\$778,519	\$257,594	-\$520,925	0.33
Rate Impact Test (RIM)		\$1,030,410	\$257,594	-\$772,816	0.25
Lifecycle Revenue Impacts (\$/kWh)	\$0.0000061776				

*Table 6-8: Low Income Program Level Cost-Effectiveness Results
PY2017*

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.4273	\$1,098,065	\$500,905	-\$597,160	0.46
Total Resource Cost Test (TRC) No Adder	\$0.4273	\$1,098,065	\$484,760	-\$613,305	0.44
Utility Cost Test (UCT)	\$0.4273	\$1,098,065	\$167,207	-\$930,858	0.15
Rate Impact Test (RIM)		\$1,348,968	\$167,207	-\$1,181,761	0.12
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000097243

7 Conclusions and Recommendations

ADM's evaluation results in the following conclusions:

- During the evaluation period, the program resulted in total evaluated energy savings of 339,561 kWh/year from 261 participating households.
- The program also reduced participants' reliance on energy payment assistance programs by a total of \$10,023.48 and reduced the arrears balance carried by participants by \$2,915.59.
- The program also had a positive economic impact by creating 19 job/years and an associated \$982,118 in labor income as well as contributing \$568,199 in added value (GDP) and \$1,334,846 in economic output (sales).
- Pacific Power continued their partnership with three non-profit community service agencies to implement the LIW program in Washington. The agencies expressed positive program outcomes including reduced energy demand, improved interior air quality, increased home comfort, reduction of health and safety hazards, and retention of homes in the affordable housing inventory. The agencies expressed appreciation for a strong and effective partnership with Pacific Power.
- The 2016 and 2017 combined program, and each individual year, did not pass the cost-effectiveness tests. The decreased avoided costs create an additional barrier to passing cost effectiveness. Pacific power could consider discussions with stakeholders on the application of contractor/agency payments for the TRC test. Currently the program costs include both material and labor costs. The TRC test is designed to capture benefits and costs from the perspective of all utility customers (participants and nonparticipants) in the utility service territory. ADM confirmed that for the 16 -17 program cycle the labor payments for the work completed stayed in the service territory. Meaning, because the work was completed by agencies and contractors with employees residing in the service territory, the economic benefit for the work completed is essentially shifted to another utility customer. Pacific Power could consider applying only the material cost as a program cost.

Based on its evaluation, ADM recommend the following actions for Pacific Power to consider in its future implementation of its LIW program in Washington:

- Pacific Power should continue partnering with agencies that provide federally funded weatherization services to take advantage of existing program infrastructure, leveraged funding, and access to a trained weatherization workforce.
- Pacific Power could consider sharing Pacific Power's program objectives (qualitative and quantitative) to more clearly determine the success of the program.

Both Pacific Power and the agencies would likely benefit from more explicit program goals.

- Pacific Power could consider requesting more detailed tracking data from implementers to increase the accuracy and granularity of measures' energy saving data. For example, additional data could include baseline and efficient wattages for bulbs installed through the program, specifications for baseline and replacement efficient refrigerators, and pre- and post-installation insulation conditions. Implementers are already recording extensive data in the DOE-approved auditing software used for projects that include Weatherization Assistance Program (WAP) funding, and therefore the additional data reporting should not create an unreasonable burden.
- Pacific Power could consider reducing the interval between program implementation and evaluation to facilitate more accurate and timely energy savings estimates.
- Pacific Power could consider implementing a process for collecting weatherization program customers' email addresses to enable more accurate and comprehensive program evaluations.
- Pacific Power could consider using a blended ex-ante value from prior program year's analysis, rather than updating annually to the most recent evaluation findings. The small sample sizes in Low Income program create high variability in program savings across years. Using an average value across a couple prior evaluation cycles could reduce the fluctuation in realization rates by program year.

8 Appendix: Pacific Power Low Income Weatherization Program Participant Survey

Variables

- Weather Strip Windows
- Weather Strip Doors
- Wall Insulation
- Ceiling Insulation
- Attic Ventilation
- Floor Insulation
- Pipe Insulation
- Duct Insulation and Sealing
- Air Sealed/Infiltration
- Low Flow Showerhead
- Florescent Lighting
- Home Repair Cost
- Water Heater Replacement
- Thermal Doors
- Ground Cover
- LED Bulbs
- Faucet Aerators
- Water Heater Blanket
- LED Lighting Fixtures
- Thermostat
- Florescent Lighting Fixtures
- Refrigerator Replacement
- Customer Name
- Site Address
- Site City
- Site State
- Site Zip
- Customer Phone
- Contact Email Address
- Agency Name

Page exit logic: IF: Question "Do you recall participating in [question('value'), id='299'] Home Energy Efficiency Program? Through this program you may have received light bulbs, or you may have had an appliance replaced with an ENERGY STAR certified appliance; you may also have received home weatherization or other home energy improvement measures." is one of the following answers ("No", "Don't know") THEN: Disqualify and display:

Thank you for your time!

Do you recall participating in [question('value'), id='299'] Home Energy Efficiency Program? Through this program you may have received light bulbs, or you may have had an appliance replaced with an ENERGY STAR® certified appliance; you may also have received home weatherization or other home energy improvement measures.

- Yes
- No
- Don't know

How did you first learn about the Home Energy Efficiency Program?

- From an information brochure
- From a friend/neighbor
- From your property owner/landlord
- From a community agency
- From a contractor
- From the internet
- From information received through Pacific Power
- Other (please specify)

Why did you choose to participate in the program? (Select all that apply)

- To save money on energy bills
- No
- To reduce energy use for environmental reasons
- The services were provided at no cost
- To improve home comfort
- To improve value of the home
- Other (please specify)
- Don't remember
- Don't know

Program records indicate that you received the following items from the Home Energy Efficiency Program. Could you please confirm whether these records are correct? *

	Yes	No	Don't know
LED light bulbs			
CFL light bulbs			
ENERGY STAR certified refrigerator			
Window replacement			
Ceiling insulation			
Furnace fan			
Duct sealing and/or duct insulation			

Logic: Hidden unless: Question "LED light bulbs" is one of the following answers ("Yes")

Before today, had you ever heard of light emitting diode light bulbs, or LED light bulbs?

- Yes
- No
- Don't know

Logic: Hidden unless: Question "LED light bulbs" is one of the following answers ("Yes")

Do you believe you could identify a typical LED light bulb if one was placed in front of you?

- Yes
- No
- Don't know

Logic: Hidden unless: Question "CFL light bulbs" is one of the following answers ("Yes")

Before today, had you ever heard of compact fluorescent light bulbs, or CFL light bulbs?

- Yes
- No
- Don't know

Logic: Hidden unless: Question "CFL light bulbs" is one of the following answers ("Yes")

Do you believe you could identify a typical CFL light bulb if one was placed in front of you?

- Yes
- No
- Don't know

Logic: Show/hide trigger exists.

Did someone visit your household to discuss ways of saving energy and to install energy efficient equipment?

- Yes
- No
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "Did someone visit your household to discuss ways of saving energy and to install energy efficient equipment?" is one of the following answers ("Yes")

Are you the person who scheduled the home visit?

- Yes
- No
- Don't know

Logic: Hidden unless: Question "Are you the person who scheduled the home visit?" is one of the following answers ("Yes")

On a scale of 1 to 5, where 1 is "very difficult" and 5 is "very easy," how would you rate the process of scheduling the visit?

Very Difficult	1	2	3	4	Very Easy	5	Don't remember	Don't know
----------------	---	---	---	---	-----------	---	----------------	------------

Logic: Show/hide trigger exists. Hidden unless: Question "Did someone visit your household to discuss ways of saving energy and to install energy efficient equipment?" is one of the following answers ("Yes")

Were you at home at the time of this visit?

- Yes
- No
- Don't remember
- Don't know

Logic: Hidden unless: Question "Were you at home at the time of this visit?" is one of the following answers ("Yes")

During the home visit, did the program representative talk to you about how to save energy in your home, or provide recommendations about how to use your appliances and equipment in an energy efficient way?

- Yes
- No
- Don't remember
- Don't know

Using a scale where 1 means "completely disagree" and 5 means "completely agree," how much do you agree with the following statements about the work that was done on the home:

	Completely disagree 1	2	3	4	Completely agree 5	Don't know
--	---------------------------------	---	---	---	------------------------------	-------------------

The completion of the work was timely and efficient						
The work crew was courteous and professional						
The information provided about your home's energy use was useful						
The information provided about your home's energy use was easy to understand						

Logic: Show/hide trigger exists. Hidden unless: Question "LED light bulbs" is one of the following answers ("Yes")

You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?

- Yes, that is the correct number of LED light bulbs
- No, I received a different number of LED light bulbs
- Don't remember
- Don't know

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("No, I received a different number of LED light bulbs")

What is the correct number of LED light bulbs that you received? *

Logic: Show/hide trigger exists. Hidden unless: Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR Question "What is the correct number of LED light bulbs that you received?" is greater than "0"

Has anyone removed any of the LED light bulbs that were installed through this program?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: #16 Question "Has anyone removed any of the LED light bulbs that were installed through this program?" is one of the following answers ("Yes")

Why were some LED light bulbs removed? (Select all that apply)

- LED light bulb(s) broke or burned out
- LED light bulb(s) did not work as needed (e.g., lights too dim)
- Using them in another home or at work
- Storing them for later use
- Gave them away
- Returned them to the program
- Other (please specify)

Logic: Hidden unless: Question "Why were some LED light bulbs removed? (Select all that apply)" is one of the following answers ("LED light bulb(s) broke or burned out", "LED light bulb(s) did not work as needed (e.g., lights too dim)", "Using them in another home or at work", "Storing them for later use", "Gave them away", "Returned them to the program", "Other (please specify)")

How long were the LED light bulbs installed before someone removed them?

- Less than one year
- More than one year

Logic: Show/hide trigger exists. Hidden unless: (Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR Question "What is the correct number of LED light bulbs that you received?" is greater than "0")

Were any of the LED light bulbs you received from the program never installed?

- Yes
- No
- Don't know

Logic: Show: Hidden unless: Question "Were any of the LED light bulbs you received from the program never installed?" is one of the following answers ("Yes")

Why were some of the LED light bulbs never installed?

*Page entry logic: This page will show when: (Question "LED light bulbs" is one of the following answers ("Yes")) AND Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs")) Validation: Must be numeric Whole numbers only Positive numbers only
Validation: Must be numeric Whole numbers only Positive numbers only
Logic: Hidden unless: (Question "LED light bulbs" is one of the following answers ("Yes")) AND Question "You indicated that you received LED light bulbs from the program. Program records*

indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs"))

To verify, of the [question("value"), id="18"] LED light bulbs you received, how many are currently installed, were installed and removed, or were never installed?

- Number of LED light bulbs currently installed
- Number of LED light bulbs installed and removed
- Number of LED light bulbs never installed
- Total : [#]

Page entry logic: This page will show when: (Question "LED light bulbs" is one of the following answers ("Yes") AND (Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR #15 Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("No, I received a different number of LED light bulbs"))

Logic: Hidden unless: (Question "LED light bulbs" is one of the following answers ("Yes") AND (Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("No, I received a different number of LED light bulbs"))

On a scale of 1 to 5, where 1 is "not at all confident" and 5 is "completely confident," how confident are you of where in your home the LED light bulbs are currently installed?

Not at all confident					Completely confident	Don't remember
1	2	3	4	5		

Page entry logic: This page will show when: (Question "LED light bulbs" is one of the following answers ("Yes") AND Q22A is greater than "0") Must be numeric Whole numbers only Positive numbers only

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "LED light bulbs" is one of the following answers ("Yes") AND Q22A is greater than "0")

To the best of your recollection, how many of the [question("value"), id="267"] LED light bulbs received through the program are currently installed in each of the following locations?

- Bedrooms
- Bathrooms
- Living room
- Kitchen
- Entryway
- Dining room
- Garage
- Basement
- Den
- Stairway
- Office
- Laundry room
- Other
- Total: [#]

Page entry logic: This page will show when: (#15 Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR Question "What is the correct number of LED light bulbs that you received?" is greater than "0")
Logic: Hidden unless: (#15 Question "You indicated that you received LED light bulbs from the program. Program records indicate you received [question("value"), id="18"] LED light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of LED light bulbs?" is one of the following answers ("Yes, that is the correct number of LED light bulbs") OR Question "What is the correct number of LED light bulbs that you received?" is greater than "0"

What type of light bulbs did the LED light bulbs replace? (Select all that apply)

- Incandescent
- CFL light bulbs
- LED light bulbs
- Installed in new fixture
- Other (please specify)
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "CFL light bulbs" is one of the following answers ("Yes")

You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?

- Yes, that is the correct number of CFL light bulbs
- No, received a different number of CFL light bulbs
- Don't remember
- Don't know

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("No, received a different number of CFL light bulbs")

What is the correct number of CFL light bulbs that you received? *

Logic: Show/hide trigger exists. Hidden unless: (Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs") OR Question "What is the correct number of CFL light bulbs that you received?" is greater than "0")

Has anyone removed any of the CFL light bulbs that were installed through this program?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "Has anyone removed any of the CFL light bulbs that were installed through this program?" is one of the following answers ("Yes")

Why were some CFL light bulbs removed? (Select all that apply)

- CFL light bulbs broke or burned out
- CFL light bulbs did not work as needed (e.g., lights too dim)
- Using them in another home or at work
- Storing them for later use
- Gave them away
- Returned them to the program
- Other (please specify)

Logic: Hidden unless: Question "Why were some CFL light bulbs removed? (Select all that apply)" is one of the following answers ("CFL light bulbs broke or burned out", "CFL light bulbs did not work as needed (e.g., lights too dim)", "Using them in another home or at work", "Storing them for later use", "Gave them away", "Returned them to the program", "Other (please specify)")

How long were the CFL light bulbs installed before someone removed them?

- Less than one year
- More than one year

Logic: Show/hide trigger exists. Hidden unless: (Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs") OR Question "What is the correct number of CFL light bulbs that you received?" is greater than "0")

Were any of the CFL light bulbs you received from the program never installed?

- Yes
- No
- Don't remember
- Don't know

Logic: Hidden unless: Question "Were any of the CFL light bulbs you received from the program never installed?" is one of the following answers ("Yes")

Why were some of the CFL light bulbs never installed?

Page entry logic: This page will show when: (Question "CFL light bulbs" is one of the following answers ("Yes") AND Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs"))

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "CFL light bulbs" is one of the following answers ("Yes") AND #27 Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs"))

To verify, of the [question("value"), id="13"] CFL light bulbs you received, how many are currently installed, were installed and removed, or were never installed?

- Number of CFL light bulbs currently installed
- Number of CFL light bulbs installed and removed
- Number of CFL light bulbs never installed
- Total : [#]

Logic: Hidden unless: (Question "CFL light bulbs" is one of the following answers ("Yes") AND (#27 Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs") OR #27 Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("No, received a different number of CFL light bulbs")))

On a scale of 1 to 5, where 1 is "not at all confident" and 5 is "completely confident," how confident are you of where in your home the CFL light bulbs are currently installed?

Not at all confident					Completely confident	
1	2	3	4		5	Don't know

Page entry logic: This page will show when: (Question "CFL light bulbs" is one of the following answers ("Yes") AND Q35A is greater than "0") Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "CFL light bulbs" is one of the following answers ("Yes") AND Q35A is greater than "0")

To the best of your recollection, how many of the [question("value"), id="269"] CFL light bulbs received through the program are currently installed in each of the following locations?

- Bedrooms
- Bathrooms
- Living room
- Kitchen
- Entryway
- Dining room
- Garage
- Basement
- Den
- Stairway
- Office

- Laundry room
- Other
- Total: [#]

Logic: Hidden unless: (#27 Question "You indicated that you received CFL light bulbs from the program. Program records indicate you received [question("value"), id="13"] CFL light bulbs. To the best of your knowledge, is that number correct or did you receive a different number of CFL light bulbs?" is one of the following answers ("Yes, that is the correct number of CFL light bulbs") OR #28 Question "What is the correct number of CFL light bulbs that you received?" is greater than "0")

What type of light bulbs did the CFL light bulbs replace? (Select all that apply)

- Incandescent
- CFL
- LED
- Installed in new fixture
- Other (please specify)
- Don't remember
- Don't know

Logic: Hidden unless: Question "ENERGY STAR certified refrigerator" is one of the following answers ("Yes")

You indicated that your refrigerator was replaced. What is the door-style of the new refrigerator?

- Freezer-on-top
- Freezer-on-bottom
- Side-by-side
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "ENERGY STAR certified refrigerator" is one of the following answers ("Yes")

Is the refrigerator you received still installed? *

- Yes
- No
- Don't remember
- Don't know
- Logic: Hidden unless: #41 Question "Is the refrigerator you received still installed? " is one of the following answers ("No")
- Why is the refrigerator not currently installed? *

Logic: Hidden unless: #41 Question "Is the refrigerator you received still installed? " is one of the following answers ("No")

How long did you have the refrigerator before it was removed?

- Less than one year
- More than one year

Logic: Hidden unless: (((((Question "18 Air Sealed/Infiltration - WY" is greater than "0" OR Question "09 Ceiling Insulation - WY" is greater than "0") OR Question "11 Floor Insulation - WY" is greater than "0") OR Question "08 Wall Insulation - WY" is greater than "0") OR Question "46 Ground Cover - WY" is greater than "0") OR Question "31 Thermal Doors - WY" is greater than "0")

Program records show that you had some home energy improvements such as air drafts sealed, insulation, ground cover, and/or a new thermal door installed by a participating agency or contractor. Is that correct?

	Yes	No	Don't know
Air drafts sealed			
Ceiling insulation			
Floor insulation			
Wall insulation			
Ground cover			
Thermal door			

Logic: Hidden unless: (((((Question "Air drafts sealed" is one of the following answers ("Yes") OR Question "Ceiling insulation" is one of the following answers ("Yes")) OR Question "Floor insulation" is one of the following answers ("Yes")) OR Question "Wall insulation" is one of the following answers ("Yes")) OR Question "Ground cover" is one of the following answers ("Yes")) OR Question "Thermal door" is one of the following answers ("Yes"))

On a scale of 1 to 5, where 1 is "not at all important" and 5 is "extremely important," how important were the following factors in your decision to receive air draft sealing, insulation, ground cover and/or a thermal door?

	Not at all important 1	2	3	4	Extremely important 5	Don't know
Improve home comfort						
The improvements were provided at no cost						
Reduce electric bills						

Logic: Hidden unless: (((((Question "Air drafts sealed" is one of the following answers ("Yes") AND Question "Ceiling insulation" is one of the following answers ("Yes")) AND Question "Floor insulation" is one of the following answers ("Yes")) AND Question "Wall insulation" is one of the following answers ("Yes")) AND Question "Ground cover" is one of the following answers ("Yes")) AND Question "Thermal door" is one of the following answers ("Yes"))

Where there any other factors that were also important to your decision to receive the home energy improvements? If so, what were they?

Logic: Show/hide trigger exists. Hidden unless: Question "Weather stripping on doors" is one of the following answers ("Yes")

You indicated that you received energy saving weather stripping on door(s) from the program. Our records indicate you received weather stripping on [question('value'), id='4'] door(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of doors with weather stripping in your home? *

- Yes, that is the correct number of doors sealed with weather stripping
- No, a different number of doors were sealed with weather stripping
- Don't remember
- Don't know

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Show/hide trigger exists. Hidden unless: #47 Question "You indicated that you received energy saving weather stripping on door(s) from the program. Our records indicate you received weather stripping on [question('value'), id='4'] door(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of doors with weather stripping in your home?" is one of the following answers ("No, a different number of doors were sealed with weather stripping")

What is the correct number of doors sealed with weather stripping?

*Page entry logic: This page will show when: #47 Question "You indicated that you received energy saving weather stripping on door(s) from the program. Our records indicate you received weather stripping on [question('value'), id='4'] door(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of doors with weather stripping in your home?" is one of the following answers ("Yes, that is the correct number of doors sealed with weather stripping")**Logic: Hidden unless: (Question "CFL light bulbs" is one of the following answers ("Yes") AND Q36A is greater than "0")*

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: #47 Question "You indicated that you received energy saving weather stripping on door(s) from the program. Our records indicate you received weather stripping on [question('value'), id='4'] door(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of doors with weather stripping in your home?"

is one of the following answers ("Yes, that is the correct number of doors sealed with weather stripping")

To verify, of the [question('value'), id='4'] doors sealed with weather stripping, how many doors are currently sealed with weather stripping, were sealed with weather stripping but are no longer sealed, or were never sealed?

- Number of doors currently sealed with weather stripping
- Number of doors that were sealed but are no longer sealed
- Number of doors that were never sealed
- Total:

Logic: Show/hide trigger exists. Hidden unless: (Q47Bis greater than "0" OR Q48B is greater than "0")

Why was the weather stripping removed from the door(s)? (Select all that apply)

- Weather stripping broke
- Weather stripping not working as needed
- Door(s) not working as needed
- Other (please specify)

Logic: Hidden unless: Question "Why was the weather stripping removed from the door(s)? (Select all that apply)" is one of the following answers ("Weather stripping broke", "Weather stripping not working as needed", "Door(s) not working as needed", "Other (please specify)")

How long was the weather stripping installed on door before someone removed it?

- Less than one year
- More than one year

Logic: Hidden unless: (Q47C is greater than "0" OR Q48C is greater than "0")

Why was the weather stripping never installed on the door(s)?

Logic: Show/hide trigger exists. Hidden unless: Question "Weather stripping on windows" is one of the following answers ("Yes")

You indicated that you received energy saving weather stripping on window(s) from the program. Our records indicate you received weather stripping on [question('value'), id='2'] window(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of windows with weather stripping in your home?

- Yes, that is the correct number of windows sealed with weather stripping
- No, a different number of windows were sealed with weather stripping
- Don't know
- Don't remember

Validation: Must be numeric Whole numbers only Positive number only

Logic: Show/hide trigger exists. Hidden unless: #54 Question "You indicated that you received energy saving weather stripping on window(s) from the program. Our records indicate you received weather stripping on [question('value'), id='2'] window(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of windows with weather stripping in your home? " is one of the following answers ("No, a different number of windows were sealed with weather stripping")

What is the correct number of windows sealed with weather stripping?

Page entry logic: This page will show when: #54 Question "You indicated that you received energy saving weather stripping on window(s) from the program. Our records indicate you received weather stripping on [question('value'), id='2'] window(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of windows with weather stripping in your home? " is one of the following answers ("Yes, that is the correct number of windows sealed with weather stripping")

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: #54 Question "You indicated that you received energy saving weather stripping on window(s) from the program. Our records indicate you received weather stripping on [question('value'), id='2'] window(s) in your home. To the best of your knowledge, is that number correct, or did the agency or contractor seal a different number of windows with weather stripping in your home? " is one of the following answers ("Yes, that is the correct number of windows sealed with weather stripping")

To verify, of the [question('value'), id='2'] windows sealed with weather stripping, how many windows are currently sealed with weather stripping, were sealed with weather stripping but are no longer sealed, or were never sealed?

- Number of windows currently sealed with weather stripping
- Number of windows that were sealed but are no longer sealed
- Number of windows that were never sealed
- Total:

Logic: Show/hide trigger exists. Hidden unless: (Q54B is greater than "0" OR Q55B is greater than "0")

Why was the weather stripping removed from the windows?

- Weather stripping broke
- Weather stripping not working as needed
- Windows not working as needed
- Other (please specify)

Logic: Hidden unless: #58 Question "Why was the weather stripping removed from the window(s)? " is one of the following answers ("Weather stripping broke", "Weather stripping not working as needed", "Window(s) not working as needed", "Other (please specify)")

How long was the weather stripping installed on the window(s) before someone removed it?

- Less than one year
- More than one year

Logic: Hidden unless: (Q54C is greater than "0" OR Q55C is greater than "0")

Why was the weather stripping never installed on the windows?

Logic: Hidden unless: (Question "Attic ventilation" is one of the following answers ("Yes") OR Question "Duct sealing and/or duct insulation" is one of the following answers ("Yes"))

Program records show that you had some home energy improvements such as attic ventilation, duct sealing, and/or duct insulation installed by a participating agency or contractor. Is that correct?

	Yes	No	Don't remember	Don't know
Attic Ventilation				
Duct Sealing				
Duct Insulation				

Logic: Hidden unless: ((Question "Attic ventilation" is one of the following answers ("Yes") OR Question "Duct sealing and/or duct insulation" is one of the following answers ("Yes")) OR Question "Duct insulation" is one of the following answers ("Yes"))

On a scale of 1 to 5, where 1 is "not at all important" and 5 is "extremely important," how important were the following factors in your decision to receive the attic ventilation, duct sealing, and/or duct insulation?

	Not at all important 1	2	3	4	Extremely important 5	Don't know
Improve home comfort						
The improvements were provided at no cost						
Reduce electric bills						

Logic: Hidden unless: (Question "Attic ventilation" is one of the following answers ("Yes") OR Question "Duct sealing and/or duct insulation" is one of the following answers ("Yes"))

Were there any other factors that were important to your decision to receive the home energy improvements? If so, what were they?

Logic: Show/hide trigger exists. Hidden unless: Question "Thermostat" is one of the following answers ("Yes")

You indicated that you received a smart thermostat from the program. Is the smart thermostat currently installed?

- Yes
- No
- Don't remember
- Don't know

Logic: Hidden unless: #64 Question "You indicated that you received a smart thermostat from the program. Is the smart thermostat currently installed?" is one of the following answers ("No")

Why was the thermostat never installed?

Logic: Show/hide trigger exists. Hidden unless: #64 Question "You indicated that you received a smart thermostat from the program. Is the smart thermostat currently installed?" is one of the following answers ("Yes")

Was the thermostat you received ever removed?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: #66 Question "Was the smart thermostat you received ever removed? " is one of the following answers ("Yes")

Why was the thermostat removed?

- Smart thermostat broke
- Smart thermostat not working as needed
- Returned it to the program
- Other (please specify)

Logic: Hidden unless: #67 Question "Why was the smart thermostat removed?" is one of the following answers ("Smart thermostat broke", "Smart thermostat not working as needed", "Other (please specify)")

How long was the smart thermostat installed before someone removed it?

- Less than one year
- More than one year

Logic: Hidden unless: (#64 Question "You indicated that you received a smart thermostat from the program. Is the smart thermostat currently installed? " is one of the following answers ("Yes") AND #66 Question "Was the smart thermostat you received ever removed? " is one of the following answers ("No"))

To the best of your recollection, what type of thermostat did the smart thermostat that you received through the program replace?

- Analog
- Programable

Logic: Show/hide trigger exists. Hidden unless: Question "Faucet aerator(s)" is one of the following answers ("Yes")

You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"), id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?

- Yes, that is the correct number of faucet aerators
- No, I received a different number of faucet aerators
- Don't remember
- Don't know

Validation: Must be numeric Whole number only Positive numbers only

Logic: Show/hide trigger exists. Hidden unless: #70 Question "You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"),

id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?" is one of the following answers ("No, received a different number of faucet aerators")

What is the correct number of faucet aerators that you received?

Logic: Show/hide trigger exists. Hidden unless: (#70 Question "You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"), id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?" is one of the following answers ("Yes, that is the correct number of faucet aerators") OR #71 Question "What it the correct number of faucet aerators that you received?" is greater than "0"))

Has anyone removed any of the faucet aerators that were installed through this program?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: #72 Question "Has anyone removed any of the faucet aerators that were installed though this program?" is one of the following answers ("Yes")

Why were some of the faucet aerators removed?

- Faucet aerator broke
- Faucet aerator not working as needed
- Other (please specify)

Logic: Hidden unless: #73 Question "Why were some faucet aerators removed?" is one of the following answers ("Faucet aerator broke", "Faucet aerator not working as needed", "Other (please specify)")

How long were the faucet aerator(s) installed before someone removed them?

- Less than one year
- More than one year

Logic: Show/hide trigger exists. Hidden unless: (#70 Question "You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"), id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?" is one of the following answers ("Yes, that is the correct number of faucet aerators") OR #71 Question "What it the correct number of faucet aerators that you received?" is greater than "0"))

Were any of the faucet aerators you received from the program never installed?

- Yes
- No
- Don't remember
- Don't know

Logic: Hidden unless: #75 Question "Were any of the faucet aerators you received from the program never installed?" is one of the following answers ("Yes")

Why were some of the faucet aerators never installed?

Page entry logic: This page will show when: #70 Question "You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"), id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?" is one of the following answers ("Yes, that is the correct number of faucet aerators")

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: #70 Question "You indicated that you received energy saving faucet aerators from the program. Program records indicate you received [question("value"), id="19"] faucet aerators. To the best of your knowledge, is that number correct or did you receive a different number of faucet aerators?" is one of the following answers ("Yes, that is the correct number of faucet aerators")

To verify, of the [question('value'), id='19'] faucet aerators you received, how many are currently installed, were installed and removed, or were never installed?

- Number of faucet aerators currently installed
- Number of faucet aerators installed and removed
- Number of faucet aerators never installed
- Total:

Page entry logic: This page will show when: #71 Question "What it the correct number of faucet aerators that you received?" is greater than "0"

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: #71 Question "What it the correct number of faucet aerators that you received?" is greater than "0"

To verify, of the [question('value'), id='19'] faucet aerators you received, how many are currently installed, were installed and removed, or were never installed?

- Number of faucet aerators currently installed
- Number of faucet aerators installed and removed
- Number of faucet aerators never installed
- Total:

Page entry logic: This page will show when: Q75A is greater than "0"

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: Q75A is greater than "0"

To the best of your recollection, how many of the [question("value"), id="279"] faucet aerator(s) received through the program are currently installed in each of the following locations? *

- Bathrooms
- Kitchen
- Other
- Total:

Page entry logic: This page will show when: Q76A is greater than "0"

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: Q76A is greater than "0"

To the best of your recollection, how many of the [question("value"), id="280"] faucet aerator(s) received through the program are currently installed in each of the following locations? *

- Bathrooms
- Kitchen
- Other
- Total:

Logic: Show/hide trigger exists. Hidden unless: Question "Low flow shower head(s)" is one of the following answers ("Yes")

You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads. To the best of your knowledge, is that number correct or did you receive a different number of shower heads? *

- Yes, that is the correct number of shower heads
- No, received a different number of shower heads
- Don't know
- Don't remember

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: Question "You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads.

To the best of your knowledge, is that number correct or did you receive a different number of shower heads? " is one of the following answers ("No, received a different number of shower heads")

What is the correct number of shower heads that you received? *

Logic: Show/hide trigger exists. Hidden unless: (Question "You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads. To the best of your knowledge, is that number correct or did you receive a different number of shower heads? " is one of the following answers ("Yes, that is the correct number of shower heads") OR Question "What is the correct number of shower heads that you received?" is greater than "0")

Has anyone removed any of the shower heads that were installed through this program?

*

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "Has anyone removed any of the shower heads that were installed through this program?" is one of the following answers ("Yes")

Why were some shower heads removed?

- Shower head(s) broke
- Shower head(s) not working as needed
- Returned to the program
- Other (please specify)

Logic: Hidden unless: Question "Why were some shower heads removed?" is one of the following answers ("Shower head(s) broke", "Shower head(s) not working as needed", "Returned to the program", "Other (please specify)")

How long were the showerheads installed before someone removed them?

- Less than one year
- More than one year

Logic: Show/hide trigger exists. Hidden unless: (Question "You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads. To the best of your knowledge, is that number correct or did you receive a different number of shower heads? " is one of the following answers ("Yes, that is the correct number of shower heads") OR Question "What is the correct number of shower heads that you received?" is greater than "0")

Were any of the shower heads you received from the program never installed? *

- Yes
- No
- Don't know

Logic: Hidden unless: Question "Were any of the shower heads you received from the program never installed?" is one of the following answers ("Yes")

Why were some of the shower heads you received through the program never installed?

Page entry logic: This page will show when: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Question "You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads. To the best of your knowledge, is that number correct or did you receive a different number of shower heads? " is one of the following answers ("Yes, that is the correct number of shower heads"))

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Question "You indicated that you received energy saving shower heads from the program. Program records indicate that you received [question("value"), id="12"] shower heads. To the best of your knowledge, is that number correct or did you receive a different number of shower heads? " is one of the following answers ("Yes, that is the correct number of shower heads"))

To verify, of the [question("value"), id="12"] shower heads you received, how many are currently installed, were installed and removed, or were never installed? *

- Number of shower heads currently installed
- Number of shower heads installed and removed
- Number of shower heads never installed
- Total:

Page entry logic: This page will show when: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Question "What is the correct number of shower heads that you received?" is greater than "0")

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Question "What is the correct number of shower heads that you received?" is greater than "0")

To verify, of the [question("value"), id="160"] shower heads you received, how many are currently installed, were installed and removed, or were never installed? *

- Number of shower heads currently installed
- Number of shower heads installed and removed
- Number of shower heads never installed
- Total:

Page entry logic: This page will show when: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Q86A is greater than "0")

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Q86A is greater than "0")

To the best of your recollection, how many of the [question("value"), id="281"] shower heads received through the program are installed in each of the following locations? *

- Bathrooms
- Other
- Total:

Page entry logic: This page will show when: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Q87A is greater than "0")

Validation: Must be numeric Whole numbers only Positive numbers only

Logic: Hidden unless: (Question "Low flow shower head(s)" is one of the following answers ("Yes") AND Q87A is greater than "0")

To the best of your recollection, how many of the [question("value"), id="282"] shower heads received through the program are installed in each of the following locations? *

- Bathrooms
- Other
- Total:

Logic: Question "Water pipe insulation" is one of the following answers ("Yes")

You indicated you had water pipe insulation installed by a participating agency or contractor. On a scale of 1 to 5, where 1 is "not at all important" and 5 is "extremely important," how important were the following factors in your decision to receive the water pipe insulation?

	Not at all important 1	2	3	4	Extremely important 5	Don't know
Improve home comfort						
The improvements were provided at no cost						
Reduce electric bills						

Logic: Hidden unless: Question "Water pipe insulation" is one of the following answers ("Yes")

Were there any other factors that were also important to your decision to receive the water pipe insulation? If so, what were they?

Page entry logic: This page will show when: Question "Water heater" is one of the following answers ("Yes")

Logic: Show/hide trigger exists. Hidden unless: Question "Water heater" is one of the following answers ("Yes")

You indicated that your water heater was replaced. Is your water heater currently installed? *

- Yes
- No
- Don't know
- Don't remember

Logic: Hidden unless: Question "You indicated that your water heater was replaced. Is your water heater currently installed?" is one of the following answers ("No")

Why is the water heater not currently installed? *

Logic: Hidden unless: Question "You indicated that your water heater was replaced. Is your water heater currently installed?" is one of the following answers ("No")

When was the water heater removed or otherwise no longer installed?

- Within one year of installation
- More than one year after installation

Page entry logic: This page will show when: Question "Water heater blanket" is one of the following answers ("Yes")

Logic: Show/hide trigger exists. Hidden unless: Question "Water heater blanket" is one of the following answers ("Yes")

You indicated you had a water heater blanket installed as part of the program. Is your water heater blanket currently installed? *

- Yes
- No
- Don't remember
- Don't know

Logic: Hidden unless: Question "You indicated you had a water heater blanket installed as part of the program. Is your water heater blanket currently installed?" is one of the following answers ("No")

Why is the water heater blanket not currently installed?

Logic: Hidden unless: Question "You indicated you had a water heater blanket installed as part of the program. Is your water heater blanket currently installed?" is one of the following answers ("No")

When was the water heater blanket removed or otherwise no longer installed?

- Within one year of installation
- More than one year after installation

Was the home visit scheduled at a convenient time for you?

- Yes
- No
- Don't remember
- Don't know

Did the home energy auditor or inspector arrive within 15 minutes of the scheduled appointment?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists.

When the auditor or inspector visited your home, did they talk with you about ways to use less electricity in your home or leave materials with you that described how you could save electricity?

- Yes
- No
- Don't remember
- Don't know

Logic: Show/hide trigger exists. Hidden unless: Question "When the auditor or inspector visited your home, did they talk with you about ways to use less electricity in your home or leave materials with you that described how you could save electricity?" is one of the following answers ("Yes")

Because of the information you received from the auditor or inspector, have you done anything in your home or changed any habits to use less electricity?

- Yes
- No
- Don't know

Logic: Hidden unless: Question "Because of the information you received from the auditor or inspector, have you done anything in your home or changed any habits to use less electricity?" is one of the following answers ("Yes")

Because of the information you received from the auditor or inspector, what are the things you have done to use less electricity?

Logic: Hidden unless: Question "Because of the information you received from the auditor or inspector, do you feel you now know more about how to save electricity in your home?" is one of the following answers ("Yes, I know more now")

On a scale of 1 to 5, where 1 is "not at all useful" and 5 is "extremely useful," how useful was the energy education about saving electricity that you received from the auditor or inspector?

Not at all useful 1	2	3	4	Extremely useful 5	Don't know
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Would it have been helpful if the auditor or inspector had provided additional information about your bill, energy saving tips, or referred you to other agencies?

- Yes, more information would have been helpful
- No, what was provided was enough
- Don't know

The final set of questions is about your satisfaction with the home improvements or items you received and other aspects of the program. For each, please rate your satisfaction on a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied."

	Very dissatisfied 1	2	3	4	Very Satisfied 5	Don't know
The scheduling of the visit						
The information you received about ways to use less electricity						

Logic: Hidden unless: ((((((((((((((((((Question "LED light bulbs you received through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "CFL light bulbs you received through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "ENERGY STAR certified refrigerator(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "Air drafts sealed through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "Ceiling insulation you received through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "Floor insulation you received through the program" is one of the following answers ("Very dissatisfied 1", "2") OR Question "Wall insulation you received through the program" is one of the following answers ("Very

dissatisfied 1", "2")) OR Question "Ground cover you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Thermal door(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Weather stripping on door(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Weather stripping on window(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Attic ventilation you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Smart thermostat you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Faucet aerator(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Shower head(s) you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Water pipe insulation you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Water heater you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "Water heater blanket you received through the program" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "The scheduling of the visit" is one of the following answers ("Very dissatisfied 1", "2")) OR Question "The information you received about ways to use less electricity" is one of the following answers ("Very dissatisfied 1", "2"))

You indicated you were less than satisfied with some of the product(s) or service(s) you received. What was less than satisfactory about the product(s) or service(s)?

Logic: Show/hide trigger exists.

In the course of participating in the program, how often did you contact agency staff with questions about the items or services you could or did receive through this program?

- Never
- Once
- 2 or 3 times
- 4 times or more

Logic: Show/hide trigger exists. Hidden unless: Question "In the course of participating in the program, how often did you contact agency staff with questions about the items or services you could or did receive through this program?" is one of the following answers ("Once", "2 or 3 times", "4 times or more")

How satisfied were you with the communication from agency staff? Please rate your satisfaction on a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied."

Very dissatisfied 1	2	3	4	Very Satisfied 5	Don't know
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Logic: Hidden unless: Question "How satisfied were you with the communication from agency staff? Please rate your satisfaction on a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied."" is one of the following answers ("Very dissatisfied 1", "2")

What was not satisfactory?

Have you noticed any savings on your electric bill since the home improvements were completed or items were installed?

- Yes
- No
- Not sure
- Don't know

How satisfied are you with any savings you noticed on your electric bills? Please rate your satisfaction on a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied."

Very dissatisfied 1	2	3	4	Very Satisfied 5	Don't know
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How satisfied were you overall with the Low Income Weatherization Program? Please rate your satisfaction on a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied."

Very dissatisfied 1	2	3	4	Very Satisfied 5	Don't know
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Logic: Show/hide trigger exists.

Do you have any suggestions for improving the Program?

- Yes
- No

Logic: Hidden unless: Question "Do you have any suggestions for improving the Program?" is one of the following answers ("Yes")

What suggestions do you have for improving the program?

Page exit logic: Skip / Disqualify Logic IF: #85 Question "Would you like your gift card to be sent to the following email address: [question('value'), id='31']?" is one of the following answers ("No (Please enter correct email address)") THEN: Flag response as complete

Logic: Show/hide trigger exists.

Would you like your gift card to be sent to the following email address: [question('value'), id='31']?

- Yes
- No (please enter correct email address)
- I will pass on the gift card

Logic: Hidden unless: #85 Question "Would you like your gift card to be sent to the following email address: [question('value'), id='31']? " is one of the following answers ("Yes")

To confirm, your email address is [question("value"), id="31"]?

- Yes
- No