Program:

- Home Energy Assessment Program

Program Years:

- 2017-2019

Contents:

- Evaluation Report
- PSE Evaluation Report Response

This document contains Opinion Dynamics' Puget Sound Energy 2017-19 Home Energy Assessment Evaluation Report and Puget Sound Energy's Evaluation Report Response (ERR).

In accordance with WUTC conditions, all PSE energy efficiency programs are evaluated by an independent, third party evaluator.[1] Evaluations are planned, conducted and reported in a transparent manner, affording opportunities for Commission and stakeholder review through the Conservation Resource Advisory Group (CRAG) and reported to the UTC.[2] Evaluations are conducted using best-practice approaches and techniques.[3]

PSE program managers and evaluation staff prepare an ERR upon completion of an evaluation of their program. The ERR addresses and documents pertinent adjustments in program metrics or processes subsequent to the evaluation.

Please note that this is an evaluation of the program as it operated during the 2016 program year.

This and all PSE evaluations are posted to Conduit Northwest. To view an electronic copy and to leave comments, visit **https://conduitnw.org/Pages/Welcome.aspx,** search words 'Puget Sound Energy 2017-19 Home Energy Assessment Evaluation Report'.

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[1] (6)(c.) Approved Strategies for Selecting and Evaluating Energy Conservation Savings, Proposed Conditions for 2016-2017 PSE Electric Conservation.

[2] PSE 2018-2019 Biennial Plan, Exhibit 8: Evaluation, Measurement & Verification (EM&V) Framework, revised November 1, 2017.

[3] Ibid.

Puget Sound Energy

2017-19 Home Energy Assessment Evaluation Report

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1. Executive Summary

1.1 Program Summary

The Puget Sound Energy (PSE) Home Energy Assessment (HEA) program provides free assessments of PSE customers' home energy use. PSE-qualified HEA specialists perform the assessments and provide recommendations designed to reduce their energy consumption. Additionally, HEA provides direct installation of LED light bulbs and distribution of leave-behind high-efficiency products such as showerheads and faucet aerators upon request. The measures are prescriptive and are provided at no cost to the customer. The goals of the program are to increase customer awareness regarding their home's energy consumption and identify and encourage cost-effective ways to use less energy.

The HEA program is a mature program having operated for several years, however the program recently added new features such as increasing the potential number of LEDs installed per home from 20 to 30 (beginning in mid-2017) and adding specialty lighting to the measures available for direct installation (beginning in 2018). In 2018, the program also enhanced its outreach to participants by offering exclusive limited-time-offers for customers interested in upgrades after the audit and cross-promoting with the direct-to-consumer (DTC) channel offerings.

1.2 Evaluation Objectives and Research Questions

Since PSE last evaluated the program in 2013, and since new features were added in 2017 and 2018, the evaluation team conducted a comprehensive evaluation including a channeling analysis of customers who participated in other PSE programs after participating in the HEA program; an engineering-based impact evaluation of the program's savings for 2017 and 2018; a consumption analysis to determine whether the team could detect savings from behavioral changes; and a process evaluation of the program's efforts throughout 2018-2019.

The HEA program currently claims savings from all direct install (DI) and leave-behind measures and found that the overall program savings primarily came from lighting this biennium. Since this would present a risk to the future cost-effectiveness of the program as residential lighting savings continue to dwindle due to the Energy Independence and Security Act (EISA), PSE expressed interest in identifying ways to increase the value of the HEA program by identifying new direct-install or leave-behind measures to offer, quantifying the indirect savings impact it has on the entire residential portfolio (due to channeling of customers into PSE's other programs), and quantifying the potential additional savings that are not being claimed (e.g., behavior changes or actions taken outside PSE programs).

Impact

This evaluation sought answers to the following impact evaluation questions:

- How many HEA participants enrolled in another residential program after participating in HEA ("post-HEA participants")? What programs have the most post-HEA participants?
- What is the average time-lapse between participants receiving recommendations from HEA and enrolling in another residential program? What does this suggest about potential HEA influence?

- What amount of savings from the other residential programs are potentially attributable to the HEA recommendations?

- Did PSE apply the correct deemed savings values in 2017 and 2018, the years for which the evaluation team estimated program impacts?

- Are the deemed savings values for this program appropriate, or do they require updates? Is there any uncertainty surrounding deemed savings values?

- Does PSE track the data needed to evaluate direct program impacts? Does PSE track data that allows for the evaluation of indirect impacts to the entire residential portfolio?

- How many HEA participants are taking action to save energy outside of the portfolio and what types of actions are they taking?

- How much savings does this program produce outside of what is captured currently in the residential portfolio, i.e. savings from behavioral changes that go beyond the impacts from DI measures and participation in other PSE programs? What is the duration of the savings?

Process

This evaluation sought answers to the following process evaluation questions:

- How is the HEA program currently implemented? What changes have occurred since the last evaluation in 2013? When did those changes happen? What changes are program staff planning for 2019 onward?

- What success and challenges, if any, did PSE encounter as it implemented the HEA program recently?

- What are PSE's marketing efforts for the HEA program? What improvements or strategies might increase the educational value of the program?

- How does the program's theory lead to direct and indirect energy savings? What are the KPIs? What improvements can PSE make, if any, to the program theory and logic model (PTLM) and KPIs to best reflect the program's design?

- How is the process of customer referrals to other PSE programs executed from both the internal operations and the customer's perspective? What opportunities exist to enhance conversion from referral to program participation?

To answer these research questions, the evaluation team completed several data collection and analytic activities, including an interview with the program manager, interviews with energy specialists who conduct the home assessments, a review of program materials, a participant web survey, an analysis of the survey results, an analysis of program-tracking data, a consumption analysis, a deemed savings review, and an engineering analysis. The evaluation team holistically reviewed the results of these analyses to arrive at key findings and provide program recommendations.

1.3   High-Level Findings

Table 1 summarizes the key performance indicators (KPIs) used to assess overall program performance. As shown in the "overall program health" column, the evaluation results determined that the program is well-designed to capture significant participation, implemented in a fashion that satisfies PSE's customers, exceeding expectations for the proportion of HEA referrals that go onto participate in other PSE energy efficiency program opportunities, and receiving strong installation and persistence rates for DI and leave-behind measures. As such, the program far exceeded its goal for energy savings based solely on the direct-install and leave behind measure savings.

In addition, the evaluation team found that over three-quarters of participants self-reported taking at least one of the energy efficiency recommendations they received during the home assessment. While this is a substantial proportion, participants gave an average score of 3.0 out of 5 for how much of an influence the HEA experience had on their decision to take additional actions.

Table 1. HEA Key Performance Indicators

KPI	Definition	Goal	Currently Collected by Program (Y/N)	Included in Evaluation Scope (Y/N)	KPI Status	Overall Program Health	KPI Data Source
Participation	Number of participants biennially	None	Y	Y	2017=12,051 2018=12,435 2019=Pending[a]		Program tracking data
Expenditure	Dollars spent biennially	$5,150,814[b]	Y	Y	$5,088,708 (projected)[c]		PSE
Customer Satisfaction	Average score on a 1 to 5 scale	4.25 or greater[e]	Y	N	4.25-point average out of 5		Participant survey
HEA Referrals Conversion or Program Lift[f]	% who converted from HEA referral to program participation	15%	Y	Y	22% of 2017 participants channeled by March 2018		Program tracking data; Channeling analysis
Installation and Persistence Rates[f]	The in-service rates for each measure type	TBD	N	Y	ISR_{LED}= 92.5% ISR_{SH} = 79.6% ISR_{FA} = 80.5%		Participant survey
Behavioral Transformation[f]	% of HEA participants who do more energy efficient behaviors	TBD	N	Y	77% of participants took at least one recommended action		Participant survey
Electric Energy Savings[d]	Amount of MWh savings for 2018	5,148 MWh	Y	Y	2018 savings=8,929 MWh		Program tracking data; Engineering Analysis

KPI	Definition	Goal	Currently Collected by Program (Y/N)	Included in Evaluation Scope (Y/N)	KPI Status	Overall Program Health	KPI Data Source
Scheduling Wait Time	Days between scheduling and assessment completion	Less than 11 days	Y	N	Average of 16.8 days	🚦	Participant survey
Program Influence[f]	Average score on a 1 to 5 scale	TBD	N	Y	3.00-point average out of 5	🚦	Participant survey

Notes: [a] The evaluation team will work with PSE to finalize these numbers at the end of the program year.

    [b] Original biennium goal for 2018-2019 was $5,283,759.

    [c] Provided by PSE through email correspondence.

    [d] PSE does not have therm savings goals for this program for the biennium.

    [e] The original goal was defined as the average score of 8.5 on a 0-10-point scale.

    [f] Recommended by the evaluation team.

1.3.1   Program Impact Findings

Overall, the HEA program reaches numerous PSE customers, thereby providing a unique opportunity to directly install equipment and provide education about how customers use energy in their homes and how they can take actions to reduce their usage. Since 2017, the program has served over 12,000 customer a year. While the HEA program garners energy savings in and of itself from DI and leave-behind measures during the assessment, the program has the potential to provide even more value to the overall portfolio of energy savings in multiple ways: (1) It can serve as a key marketing tool for identifying and referring customers to other programs that can help them address energy saving opportunities in their homes, and (2) it can influence savings beyond the PSE program portfolio by encouraging customers to make behavior changes. Two in ten HEA participants participated in other programs post-HEA, most commonly upgrading their lighting, weatherization and retail appliances. These referrals from HEA contributed 5% of the portfolio's electric savings and 3% to the gas savings, which highlight HEA's value to the portfolio beyond the DI and leave-behind measures.

The majority of the savings from this program has traditionally come from DI lighting savings. Given that lighting savings is dwindling due to advancements in lighting technology in the general marketplace, PSE was interested in exploring whether there are any behavioral savings associated with this program that are not currently captured in the HEA program or other PSE programs. The evaluation team conducted a consumption analysis of participant's energy usage coupled with a channeling analysis (used to remove savings already captured in other programs). The evaluation team was not able to detect any measurable behavioral savings at the meter-level through a pooled consumption analysis approach.

The table below summarizes the impact-related research questions and findings from this evaluation and provides a reference to the section in the main report where further details are available.

Table 2. Program Impact Findings Summary

Impact Research Questions	Evaluation Finding	Section Reference
How many HEA participants enrolled in another residential program after participating in HEA ("post-HEA participants")? What programs have the most post-HEA participants?	The evaluation team found that 22%, or 2,600 participants, of the total 2017 HEA participants enrolled in another residential program by March 2018. The programs with the most post-HEA participants are Retail Lighting (69%), Single Family Weatherization (12%), and Retail Appliances (12%).	5.2.1
What is the average time-lapse between participants receiving recommendations from HEA and enrolling in another residential program? What does this suggest about potential HEA influence?	Opinion Dynamics analyzed the average time lapse between HEA participation and enrolling in another residential program (based on installation or purchase date on program tracking records). A shorter time lapse between programs suggests a strong connection between HEA and the savings from the larger portfolio. The average time lapse between HEA and other program participation was four months, which suggests the HEA program has a reasonably strong influence on the decision to participate in other PSE programs. Additionally, four months is a short period of time considering that many of these programs require finding a contractor, potentially finding financing, and time to install the measures.	5.2.1
What amount of savings from the other residential programs are potentially attributable to the HEA recommendations?	Based on the channeling analysis, post-HEA participants saved around 1.2 GWh and 52,000 therms by participating in other residential programs which represented 5% of the electric savings and 3% of the gas savings of the portfolio.	5.2.1
Did PSE apply the correct deemed savings values in 2017 and 2018, the years for which the evaluation team estimated program impacts?	PSE applied deemed savings values from the Regional Technical Forum (RTF) for low-flow showerheads and PSE-derived values for faucet aerators and LEDs. PSE applied the values applicable to the installation dates as provided in the program tracking database. For consistency with the Multifamily Retrofit Program (MFRT), the evaluation team applied deemed savings that align with the savings reported date. This resulted in a 10% reduction in reported savings compared to evaluated savings but savings were still enough to far exceed the program's planning goal.	5.2.3
Are the deemed savings values for this program appropriate, or do they require updates? Is there any uncertainty surrounding deemed savings values?	The evaluation team identified that the deemed savings for faucet aerators and LEDs are appropriately derived. Showerhead savings for those with gas water heaters were based on a conversion of the deemed electric savings from the RTF. However, this value embeds savings from both the reduction of energy from the water heater as well as waste-water reduction savings. The evaluation team removed the waste-water electric savings prior to converting to therms, resulting in a reduction in gas savings for showerheads.	5.2.3
Does PSE track the data needed to evaluate direct program impacts?	PSE tracks all necessary data to evaluate program impacts through both an engineering analysis and a consumption analysis. It also tracks all necessary data to calculate indirect impacts to the residential portfolio. PSE provided its	4.3 and Section 5

Impact Research Questions	Evaluation Finding	Section Reference
Does PSE track data that allows for the evaluation of indirect impacts to the entire residential portfolio?	residential program participation data, thus allowing the team to identify which PSE programs HEA participants went on to participate in.	
How many HEA participants are taking action to save energy outside of the portfolio and what types of actions are they taking?	Eighty percent (80%) of participants recall energy saving recommendations that were given during the home energy assessment. Seventy-seven percent took at least one recommended action and approximately 50% of participants took recommendations to change air or furnace filters regularly, turn off any lights that are not being used, and adjust thermostats to recommended settings.	6.2.4
How much savings does this program produce outside of what is captured currently in the residential portfolio, i.e. savings from behavioral changes that go beyond the impacts from DI measures and participation in other PSE programs? What is the duration of the savings?	One method to estimate the energy savings from behavioral changes is to subtract the engineering-based annual program savings from the consumption analysis-based savings. Theoretically the difference would represent the savings generated from the program over and above those that result from the installation of LEDs and water saving measures. Unfortunately, the estimated program savings from the consumption analysis are much lower than those estimated using an engineering analysis approach. It is important to recognize that the engineering analysis savings are ex-post gross values while the consumption analysis savings are ex-post net values. Even taking this into consideration, the evaluation team was unable to detect savings from behavioral changes for the HEA program.	5.2.4

1.3.2 Program Process Findings

PSE experienced successes with the HEA program in overall customer satisfaction, the quick delivery of the program after participant sign-up, highly qualified staff interacting with customers, the number of LEDs offered to participants, and the geographic reach of the program. Some challenges of the program included meeting customer expectations about the program, the leave behind measures being of lower quality, and coordination issues between Franklin Energy Services and the subcontractors.

The evaluation team found that most participants first heard about the program through PSE's emails and through previous participant word-of-mouth. There is, however, no current system to encourage customer-to-customer referrals (for example, providing previous participants with an incentive if they refer a friend). To increase the educational value of the program, PSE may want to follow-up with participants after the assessment is completed with recommendation reminders and other program referrals. Participants noted they would prefer follow-ups via email or website channels.

Energy specialists educate and inform HEA participants of other energy efficient opportunities available through PSE. From the participant perspective, however, the HEA program was not rated as highly influential in explaining subsequent participation as they self-reported a moderate average influence rating of 3 (on a scale from 1 to 5) for any subsequent program. Furthermore, over 80% of HEA participants self-reported interest in

participating in further PSE programs, while only 22% were successfully channeled into a subsequent program. Seven percent suggested informational follow ups about energy savings tips, offers for rebates, and a hard copy of the assessment report. Offering more information via emails, and the PSE website about other programs should spur more channeled enrollment.

The table below summarizes all of the process-related research questions and findings and references the section in the main report where further details are available.

Table 3. Program Process Findings Summary

Process Research Questions	Evaluation Finding	Section Reference
How is the HEA program currently implemented? What changes have occurred since the last evaluation in 2013? When did those changes happen? What changes are program staff planning for 2019 onward?	The program provides free home assessments of PSE single family customers' home energy use by HEA specialists. Specialists provide participants with reports that include recommended equipment upgrades, information about home energy usage, and tiered recommendations for prioritized energy-saving actions. The assessment also includes direct installation of LEDs and leave-behind water saving measures at no cost to the customer. Beginning in mid-2017, the maximum number of LEDs a customer could receive increased from 20 bulbs to 30 bulbs. In 2018, the program also began to offer specialty LEDs. Lastly, beginning in late 2017, Franklin Energy Services (FES) performed all audits instead of any qualified Contractor Alliance Network (CAN) contractor. Planned changes for the future include possibly adding non-lighting DI measures, making the assessment report more user-friendly, providing follow up emails or calls after assessment visits, and improving the referral tracking process.	6.2.2
What success and challenges, if any, did PSE encounter as it implemented the HEA program recently?	PSE experienced successes with the HEA program in overall customer satisfaction, the quick delivery of the program after participant sign-up, the highly qualified staff, the number of LEDs offered to participants, and the geographic reach of the program. Some challenges of the program included meeting customer expectations about the program, the leave behind measures being of lower quality, and coordination issues between Franklin Energy Services and the subcontractors.	6.2.3
What are PSE's marketing efforts for the HEA program? What improvements or strategies might increase the educational value of the program?	The marketing efforts for HEA include traditional tactics (e.g., e-mails, direct mailers) as well as more innovative means of program promotion. These include social media campaigns, door-to-door "blitzes" occurring in ten communities and featuring direct program sign-ups, targeted "bonanzas," which offer a suite of PSE programs to a single community over four to six weeks and include door-to-door tactics and PSE sign-up events, and sports partnerships with major and junior league teams. The evaluation team found that most participants first heard about the program through PSE's emails and through previous participant word-of-mouth. There is, however, no current system to encourage customer-to-customer referrals (for example, providing previous participants with an incentive if they refer a friend). To increase the educational value of the program, PSE may want to follow-up with participants after the assessment is completed with recommendation	6.2.6

Process Research Questions	Evaluation Finding	Section Reference
	reminders and other program referrals. Participants noted they would prefer follow-ups via email or website channels.	
How does the program's theory lead to direct and indirect energy savings? What are the KPIs? What improvements can PSE make, if any, to the program theory and logic model (PTLM) and KPIs to best reflect the program's design?	Through the process of scheduling specialists to conduct assessments, PSE directly influenced savings by installing LEDs and/or providing water saving measures. Indirectly, PSE influenced savings by recommending customer behavioral changes to reduce energy consumption and encouraging participation in other PSE energy saving programs. Given the program's goals, the KPIs currently include energy savings, customer participation, program expenditures, wait time between scheduling and receiving assessments, customer satisfaction, conversion of HEA referrals to other programs, and in-service rates of installed equipment. The evaluation team recommended tracking program lift (% of HEA participants who go on to participate in another PSE program) and participant ratings of HEA's influence. PSE could improve the HEA PTLM by adding potential barriers, updating the implementation structure, including program referral pathways, and clarifying documentation methods.	6.2.2
How is the process of customer referrals to other PSE programs executed from both internal operations and the customer's perspective? What opportunities exist to enhance conversion from referral to program participation?	As described by the PTLM, the program's process included educating and informing HEA participants of other energy efficient opportunities available through PSE. From the participant perspective, however, the HEA program was not rated as highly influential in explaining subsequent participation as it did not exceed a self-reported influence rating of 3 (on a scale from 1 to 5) for any subsequent program. Furthermore, over 80% of HEA participants reported interest in participating in further PSE programs while only around 22% of participants were successfully channeled into a subsequent program. Offering more information via emails, and the PSE website about other programs should spur more channeled enrollment.	6.2.5

1.4   Overall Conclusions and Recommendations

The following discussion presents the evaluation team's recommendations based on the impact and process related findings.

Deemed Savings Values for Direct Install and Leave-Behind Measures

■ **PSE converts electric showerhead savings to gas with embedded waste-water reduction savings.** The RTF does not provide gas savings; therefore, PSE converted the kWh savings for showerheads to therms for those with gas water heating. However, the kWh savings from the RTF embeds additional savings from waste-water reduction. We recommend removing the additional waste-water savings prior to converting from electric to therm savings. Though this will reduce the deemed gas savings for this measure, it provides a more accurate estimate of savings. The waste-water savings for showerheads

with gas water heating are counted toward electric savings as these savings are due to a decrease in pump energy consumption.

◼ **Not all showerheads in homes with gas water heating were given electric savings toward waste-water.** Waste-water savings are additional savings for showerheads and are embedded in the electric energy savings for homes with electric water heating. However, homes with gas water heating should receive waste-water savings counted toward electric savings. We recommend ensuring that waste-water savings for all homes receiving showerheads with gas water heating receive the additional electric waste-water savings. Making this change led to an increase in reported electric savings.

Increasing Energy Saving Potential from HEA and Value to Entire Portfolio

◼ **When the program is no longer able to claim lighting savings, it will greatly reduce the energy savings directly from HEA.** However, HEA will still have an opportunity to contribute savings to the portfolio overall through a number of options including: (1) enhancing efforts to refer more customers to other program opportunities (2) adding different DI and leave-behind measures; and (3) finding ways to boost and measure behavioral savings.

◼ Per referrals to other programs, more efforts to follow-up with participants on recommendations could further boost savings in the portfolio. One of the common recommendations for program improvement that participants mentioned was to provide follow-up from PSE or the energy specialists to remind them about the energy saving recommendations and to answer further questions about upgrade costs/rebates. Further, portfolio and HEA-specific energy savings would likely improve if PSE upgraded program technological equipment. Energy specialists reported both hardware and software issues that led to difficulties in providing customers with smooth assessment experiences and complete lists of recommendations.

◼ Per DI measures, PSE should consider the energy saving potential from adding measures such as pipe wrap or water heating blankets to those with electric water heating or "light touch" weatherization measures such as air sealing or attic-hatch insulation.

◼ Behavioral savings is a more challenging one to address and may require a multi-pronged approach. While 88% recall receiving any energy saving recommendations, 54% recalled recommendations to change air filters and 50% recalled recommendations to turn off lights when not in use. The majority of participants did not recall receiving any of the other 20 behavioral recommendations provided. Some participants additionally reported not recalling the recommendations due to the overwhelming amount of information given during the assessment itself. Responding to these suggestions by providing follow-ups should increase engagement with the participants and may increase the program's behavioral saving potential if the potential is there. While this evaluation did not detect any via consumption analysis, it is possible the behavioral savings are too small to pick up in the statistical model and other engineering-based approaches can measure those savings. Regardless of method, it is also possible that the baseline consumption of participants is not high enough, on average, to capture behavioral savings. The evaluation conducted the same analytical approach for the evaluation of a similar program in another jurisdiction and found substantial behavioral savings beyond DI measures, however one major difference was the baseline consumption level of participants in comparison to PSE's program.

Increasing Program Participation and Setting Customer Expectations

- **PSE could improve marketing efforts that encourage word-of-mouth advertising.** Initial HEA marketing had the greatest success through email. The evaluation team found that most participants first heard about the program through PSE's emails, and through previous participant word-of-mouth. There is currently no system to encourage customer-to-customer referrals even though hearing about the program from friends and family was the second most common way for participants to initially learn about the program. Additionally, since it is the evaluation team's understanding that the program implementer and specialists have not taken much of a role advertising the program, PSE could benefit from allowing the program implementers and specialists to distribute referral cards to participants to spur greater awareness and enrollment in the HEA program.

- **Participants should receive additional information leading up to the assessment.** Specialists generally agreed that most customers did not know what to expect from the assessment or expected to receive more from the assessment than could be provided. Though customer satisfaction with the program is high, providing more information prior to participation may improve the process and allow specialists more time to focus on behavioral and subsequent program recommendations.

2.   Program Description

The PSE HEA program is a home assessment program that provides customers with a customized report that provides recommendations to reduce energy usage and direct installation or distribution of leave-behind high-efficiency products to help lower energy bills. This section provides a description of the program's design, implementation and performance.

2.1   Program Design

The HEA program provides free home assessments of PSE single family customers' home energy use. After PSE trains contractors and those contractors recruit and schedule assessments, HEA specialists perform assessments and provide customers with recommendations to reduce electric and gas consumption.

The goals of the program are to increase customer awareness about their energy use at home, identify cost-effective ways to use less energy (through installation of energy efficient equipment and/or behavioral changes), and encourage participation in other PSE energy efficiency programs. As such, the program's key metrics of success are based on customer experience (i.e., satisfaction ratings of various program elements and program overall), scheduling (i.e., number of days between sign-up and assessment), and program referral conversion rates from HEA into other programs.

2.2   Program Implementation

During the assessment, energy specialists enter participants' homes to inspect and assess energy using equipment, including any heating and cooling equipment, in-home appliances, and the state of home insulation. The program also includes direct installation of LEDs and leave-behind water measures (bath and kitchen faucet aerators and fixed and handheld low-flow showerheads) at no cost to the customer.

An output of the program is the assessment report which includes images of areas in the home that participants could upgrade and available incentives for carrying out the improvements. The report also includes educational information about DI and leave-behind measures, information about home energy usage, and tiered recommendations for prioritized energy-saving actions. Beyond the energy efficiency measures, energy specialists may also make referrals to PSE energy efficiency programs when they identify situations where participants could upgrade to energy efficient equipment (e.g., replacing an outdated heat pump, removing older secondary appliances).

Overall, the HEA program is a mature program that recently experienced several changes to its implementation in the last few years. These changes included increasing the maximum number of distributed LEDs from 20 bulbs to 30 bulbs as warranted (beginning in mid-2017) and adding specialty LEDs (beginning in 2018) to the mix of measures offered to participants. The program additionally changed its implementation strategy. Originally, any qualified Contractor Alliance Network (CAN) contractor could perform audits. However, beginning in late 2017, FES has performed all audits. Notably, FES offered CAN contractors who used to perform assessments an opportunity to sub-contract through FES so they could continue to offer HEA audits. The current evaluation examines how the program is performing in response to these significant changes.

3. Key Research Questions

This section summarizes the research questions used to conduct this evaluation of the HEA program. The goals of this evaluation were to evaluate the program's design, implementation, performance and impacts.

3.1 Impact Evaluation Research Questions

The following research questions were addressed through a channeling analysis, a consumption analysis on HEA participants from 2017, a deemed savings review, and an engineering analysis of participant information from 2017 to 2018.

- How many HEA participants enrolled in another residential program after participating in HEA ("post-HEA participants")? What programs have the most post-HEA participants?

- What is the average time-lapse between participants receiving recommendations from HEA and enrolling in another residential program? What does this suggest about potential HEA influence?

- What amount of savings from the other residential programs are potentially attributable to the HEA recommendations?

- Did PSE apply the correct deemed savings values in 2017 and 2018, the years for which the evaluation team estimated program impacts?

- Are the deemed savings values for this program appropriate, or do they require updates?

- Is there any uncertainty surrounding deemed savings values?

- Does PSE track the data needed to evaluate direct program impacts? Does PSE track data that allows for the evaluation of indirect impacts to the entire residential portfolio?

- How many HEA participants are taking action to save energy outside of the portfolio and what types of actions are they taking?

- How much savings does this program produce outside of what is captured currently in the residential portfolio, i.e. savings from behavioral changes that go beyond the impacts from direct install measures and participation in other PSE programs? What is the duration of the savings?

3.2 Process Evaluation Research Questions

The process related questions were addressed by conducting interviews with the program manager and implementer, interviews with energy specialists, a review of program tracking data, and a web survey of participants from the 2017 through March 2019 time period.

- How is the HEA program currently implemented? What changes have occurred since the last evaluation in 2013? When did those changes happen? What changes are program staff planning for 2019 onward?

- What success and challenges, if any, did PSE encounter as it implemented the HEA program recently?

■ What are PSE's marketing efforts for the HEA program? What improvements or strategies might increase the educational value of the program?

■ How does the program's theory lead to direct and indirect energy savings? What are the KPIs? What improvements can PSE make, if any, to the program theory and logic model (PTLM) and KPIs to best reflect the program's design?

■ How is the process of customer referrals to other PSE programs executed from both the internal operations and the customer's perspective? What opportunities exist to enhance conversion from referral to program participation?

4. Overview of Evaluation Activities

The evaluation team used information provided by PSE program staff and the program implementer, as well as primary data collected through a participant web survey.

4.1 Program Staff Interviews

The evaluation team conducted an in-depth interview with PSE's HEA staff and FES staff about the design and implementation of the program. The team asked questions to understand program implementation and identify recent programmatic changes. Additionally, the team was interested in examining the marketing and channeling efforts surrounding the program, as well as understanding the implementation successes and challenges.

4.2 Data Request and Program Materials Review

The evaluation team submitted a data request to acquire HEA program materials including program staff contact information, program tracking data, energy consumption data, customer referral tracking data to other programs and source of savings data files. The team also received program implementation materials, marketing materials and energy efficiency education materials. The evaluation team reviewed the content and found the materials relating to the assessment, recommendations, and marketing to be complete and of high quality. The team did find, however, that the program operations manual appeared out of date though this did not cause an issue for the evaluation

The team also conducted a review of the latest version of PSE's HEA program PTLM to ensure all the standard PTLM components (i.e., inputs, activities, outputs, and outcomes) were present and whether the information in the PTLM reflects the evaluation team's understanding of the program's design. After reviewing the PTLM and the program materials, the team used the findings to direct the further evaluation activities.

4.3 Program Data Tracking Review

The evaluation team thoroughly examined 2017 and 2018 program tracking data to identify errors, duplicative records, and outliers, if any. Additionally, the team confirmed that all necessary fields to conduct the impact evaluation using both engineering analysis and consumption analysis approaches were included and sufficiently populated.

4.4 HEA Specialist Interviews

Since FES offered suggestions regarding opportunities to improve expectation-setting by PSE customers for a free audit and since PSE also expressed interest in discovering opportunities to increase the program's value to customers, the evaluation team scheduled and conducted a set of 10 HEA specialist interviews to gather this feedback from the staff who directly interacted with assessment recipients. The interviews covered topics of interest to the evaluation including: customer value perceptions, implementation procedures and practices, and report content recommendations. The team also used the findings from these interviews to inform the participant survey development.

4.5 Participant Survey

The team implemented a web survey to gather feedback from HEA participants. Participants from 2017 through 2019 were sampled to identify key differences between their experiences since the program went through modifications during this time period. Since PSE has a policy to ensure that customers are not contacted for surveys multiple times within a 6 month period, the team chose a sampling strategy to maximize the number of 2019 respondents while also maximizing the number of 2017 and 2018 participants who could still be surveyed in the future, if PSE is interested in doing so.

The survey focused on impact- and process-related topics regarding measure installation, measure retention, additional actions influenced by the program, participation in other PSE programs, and satisfaction with program elements that had not been addressed by PSE's survey team.

4.6 Channeling Analysis

The team conducted the channeling analysis to identify how many HEA participants from 2017 subsequently enrolled in another PSE residential energy efficiency program ("post-HEA participants). The analysis identified the number of post-HEA participants that were "channeled" into other programs and the savings these participants contributed to PSE's residential portfolio of energy savings.

The team conducted a channeling analysis using the 2017 HEA program tracking database and PSE's program participation tracking database that included each measure installed through its residential programs from 2017 through March 2018, as well as the names of the programs in which customers participated. The program participation tracking database included basic participant information (e.g., name, account number), program names, and deemed electric and gas savings per measure installed. For each residential program, the evaluation team used this file to analyze participation and savings from post-HEA participants, and the time between HEA participation and other program participation.

4.7 Consumption Analysis

The evaluation team estimated the annual customer-level energy savings for 2017 HEA participants using a matched comparison group and a linear fixed effects regression model. This approach theoretically captures the energy savings resulting from the installation of HEA program measures, as well as the savings that arise from changes in energy using behavior based on recommendations HEA participants received during the assessment.

The model uses PSE's customers as the fixed effect, which allows the evaluation team to control for all household factors that do not vary over time. The matched comparison group design is quasi-experimental, as opposed to an experimental design such as a randomized control trial (RCT) that randomly selects both the control and treatment groups. Creating a matched comparison group involves choosing non-participants which are as similar as possible to the treatment group to serve as the comparison group. This analysis used a comparison group created by matching based on energy usage in the pre-participation period, 2016.

Once the team estimated per customer energy savings values, they are multiplied by the number of customers who participated in 2017 and in 2018 to arrive at program level savings for each of these years. Appendix D provides a detailed description of the full methodology used to estimate HEA customer and program savings using a consumption analysis approach.

4.8 Engineering Analysis

The evaluation team conducted an engineering analysis for measures claimed as part of 2017 and 2018 program years. The engineering analysis ensured that the deemed savings values presented in program materials and other relevant sources (e.g., Source of Savings (SoS), Regional Technical Forum) are reasonable estimates and do not incorporate errors. In addition, the evaluation team assessed the application of these deemed savings within the database for each program measure and identified errors, if any. As a result of the engineering analysis, the evaluation team highlights areas for improvement and provides recommendations for each reviewed measure, when applicable.

To arrive at ex-post gross savings for the program, the engineering analysis relied on web-based survey data to confirm measure-specific installation and persistence. These were incorporated into the evaluated impact results and Section 5.1.3 provides more detail on the methods used to derive these adjustments.

5. Impact Evaluation

The following section describes the methodology and findings for the HEA program's impact evaluation activities, which included a channeling analysis, a consumption analysis and an engineering analysis. The evaluation team used the channeling analysis which identified 2017 HEA participants who went on to participate in a PSE residential program from 2017 through March 2018. The team conducted a consumption analysis to estimate the 2017 ex-post net program savings which are inclusive of the energy savings from measures installed as well as behavioral changes to reduce energy consumption. Last, the team used the engineering analysis to provide measure-level and program-level ex-post gross savings for 2017 and 2018.

5.1 Methodology

5.1.1 Channeling Analysis

To conduct the channeling analysis, the evaluation team identified customers who participated in the HEA program in 2017 and went on to participate in another PSE residential energy efficiency program. The team completed this analysis by looking for matches between the 2017 HEA participant dataset and an additional dataset that contained information about customers participating in HEA residential programs between 2017 and March 2018, including dates of participation, measures installed, and ex-ante gross energy savings from the installed measures. This analysis allowed the team to identify the percentage of customers who were channeled into other PSE programs, the time elapsed before they participated in another PSE program, and their savings contributions to those programs.

PSE supplied Opinion Dynamics with a few files to conduct this analysis. In addition to the HEA program tracking data, the team received a PSE program participation tracking database that included each measure installed through each residential program. The database included basic participant information (e.g., name, account number) and deemed electric and gas savings per measure. For each residential program, the evaluation team used this file to analyze participation and savings from post-HEA participants, and the time between HEA participation and other program participation.

The evaluation team also received a referral tracking database. This database included a comprehensive list of the program referrals each 2017 HEA participant received from an HEA specialist. The evaluation team combined this referral tracking database with the residential program tracking database to analyze connections between HEA program referrals and post-HEA program participation.

The analysis required a few key assumptions.

- Not all the program names matched between the two databases (e.g., some of the program names ended with "Kits"). To align the program names across files, the evaluation team altered a few of the program names so the programs matched across data sources. Appendix C provides a table of the program names that were altered within each file.

- To establish the upper bound of potential channeled savings, Opinion Dynamics also assumed if a customer participated in a residential program any day after enrolling in the HEA program, they enrolled in this program because of a referral made through HEA.

- The number of customers across the databases did not match. Out of the 11,622 HEA participants in 2017 that were present in the residential tracking database, 212 (less than 2%) were not in the referral tracking database. For those participants, Opinion Dynamics assumed they did not receive any referrals to other programs.

5.1.2 Consumption Analysis

The evaluation team conducted a consumption analysis to determine net savings of the HEA program. The analysis approach is quasi-experimental and uses a matched comparison group. The evaluation team selected the matched comparison group by choosing non-participants that are as similar as possible to customers in the treatment group. The team conducts this matching to achieve as much balance as possible between participants and non-participants, so that when the customers are compared during the treatment period it is clear whether the HEA intervention had an effect. The team selected the comparison pool by examining customers' energy usage in 2016, the year prior to the treatment group's participation. The evaluation team matched electricity and gas usage separately and allowed selection of non-participating customers up to twice (so a comparison group customer can be matched to more than one participant).

Table 5 below shows the final comparison group and participants included in the analysis.

Table 5. Accounts Included in Final Billing Analysis Model

Metric	Treatment Group	Matched Comparison Group
Months of participation	January 1 – December 31, 2017	NA
# customers included in the analysis	4,569	6,637
Usage data included	9+ Months of Pre- and Post-Participation Data	9+ Months of Pre- and Post-Participation Data (based on HEA date from matched treatment customer)

After data cleaning, which included the removal of HEA participants who went on to participate in other PSE energy efficiency programs (i.e., customers identified in the channeling analysis), the team retained about 51% of initial participants in the analysis to match with non-participants. While dropping almost half of participants may seem high for data cleaning, these drops were all necessary.

The evaluation team dropped many of the customers (about 30%) because they did not have enough pre-participation period data (we required at least 75% of the 365 days in 2016, or about nine months). Sufficient pre-participation period data is especially important when creating a matched comparison group based on this data. We removed another 19% of customers because they were identified as having participated in other energy efficiency programs. These customers are removed so that the estimated energy savings are not confounding those from the HEA program and other PSE programs. After creating the matched comparison group, the evaluation team dropped an additional 13% so we could have weather data and a matched comparison customer for all the treatment customers. The team examined the average daily electricity and gas usage for the dropped treatment customers vs the retained treatment customers, and found that dropped customers had a slightly higher level of electricity usage and a roughly equivalent level of gas usage. The evaluation team concluded that there was very little opportunity for introduced bias due to dropped customers. The team speculates that the

average daily consumption of the dropped customers would have to be about twice the size of the consumption of the customers kept in the model to have a significant effect on the overall estimated savings from the program.

The consumption analysis used a linear fixed effect regression (LFER) model, which accounts for time-invariant factors, such as square footage, appliance stock, habitual behaviors, household size, and other factors that do not vary over time. The model accounts for differences in weather and pre-program energy use between participants. We also added dummy variables for each calendar month, i.e., binomial terms with "1" signifying the bill occurred in that month of the year and a "0" otherwise. The monthly variables help control for seasonal trends in energy use and allow for a more accurate estimate of baseline usage absent the program. Likewise, the model includes dummy variables for the day of the week, which can help control for working vs weekend day variability. A more detailed discussion of the billing analysis methodology, including data-cleaning steps, is provided in Appendix D.

5.1.3   Engineering Analysis

The evaluation team conducted an engineering analysis for measures claimed as part of 2017 and 2018 program years. The key objectives of this analysis included the following:

- Ensure that the deemed savings values presented in program materials and other relevant sources (e.g., Source of Savings, Regional Technical Forum) are reasonable estimates and do not incorporate errors.

- Incorporate in-service rates into the evaluated impact results using web-based survey data.

Deemed Savings Review

The evaluation team conducted a deemed savings review of all reported HEA program measures in 2017 and 2018. The purpose of the review was to assess the reasonableness of per-measure savings values and identify discrepancies where applicable.

Table 4 identifies the current savings source for each 2017 and 2018 HEA program measure. PSE relied on deemed savings assumptions from multiple sources, including past evaluation program data, multiple versions of the RTF, the Arkansas TRM, a 2013 Michigan Water Metering Study, a 2000 Seattle Study, Northwest Energy Efficiency Alliance (NEAA) market share data, and PSE service territory data.

Table 4. HEA Deemed Savings Approach

Measure	Savings Source	Current Savings Approach
LEDs	PSE Derived	Calculated using algorithms and assumptions from multiple sources
Aerators	PSE Derived	Calculated using algorithms and assumptions from multiple sources
Showerheads	RTF Deemed	Installed in 2016[a]: RTF (v2.1) Installed in 2017: RTF (v2.4) Installed in 2018: RTF (v3.1)

Source: 2018 HEA Business Cases and SoS documentation.
Note: [a] The installation date is the date in which the measure is installed, and reporting savings date is the date in which PSE claims savings. Not always do these dates align.

Installation and Persistence

As part of the participant survey, the evaluation team inquired about measure installation rates (IR) and persistence rates (PR) to obtain measure-level in-service rates (ISRs) through the participant survey. The engineering estimates used these values in calculations for annual per-customer savings (Figure 1). Specifically, the team asked participants to confirm the quantity of installed measures and, when necessary, to provide the corrected quantity. That quantity was then divided by the quantity customers said to have initially received since it is possible that not all measures they received were installed. This verified IR is the first component of the total ISR. Where applicable, participants were also asked to confirm whether program measures remained installed in their homes to create a PR. The team then created a measure-specific ISR by multiplying the two components.

Figure 1. Installation Rate Components
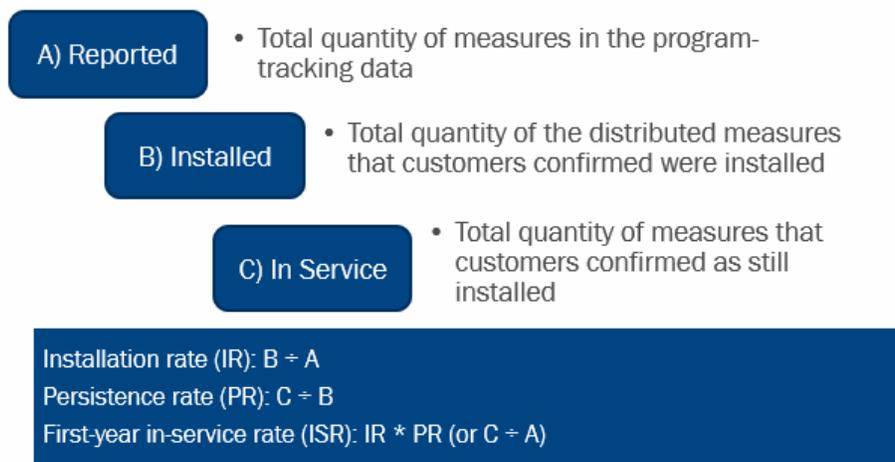
5.2   Key Findings

This section provides the results of the channeling, consumption and engineering analyses. The channeling analysis identified HEA program participants that subsequently participated in other PSE residential programs and the savings these participants contributed to those programs. The consumption analysis provides the ex-post net energy savings for the program in 2017. The engineering analysis provides the measure-level deemed savings values, the measure-level ex-post gross savings values, the survey-based ISRs, the application of measure quantities to determine per-participant gross energy and demand savings, and the total evaluated saving estimates for the program.

5.2.1   Channeling Analysis

This section presents the channeling analysis results amongst customers who received a Home Energy Assessment (HEA) in 2017. This analysis includes 2017 participants and captures their participation in other PSE programs post-HEA through March 2018.

Program Participation Post-HEA

The first part of the analysis consisted of identifying the programs that saw either more or less participation from those who had previously participated in the HEA program. The evaluation team found that around 22%, or 2,600

participants, of the total 2017 HEA participants continued on to participate in another residential program by March 2018 (See Figure 2).

Figure 2. Post-HEA Participation (N = 11,622 HEA Participants in 2017)

■ HEA-Only Participants   ■ Post-HEA Participants
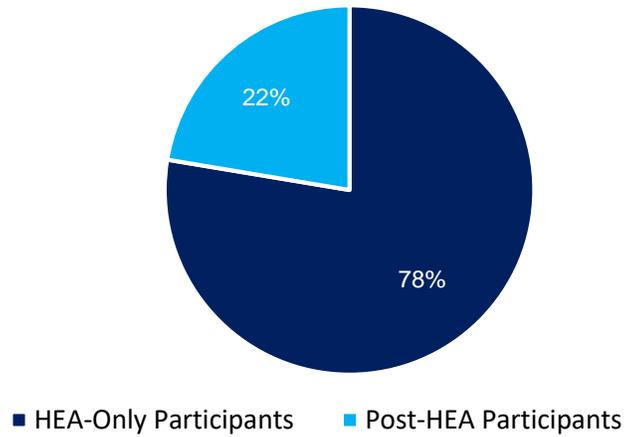
On average, customers participated in three additional programs post-HEA. Figure 3 shows which programs HEA participants enrolled in post-HEA. For example, over two-thirds (69%) of the customers that channeled to other programs participated in the Retail Lighting program.

Figure 3. Enrollment in Residential Programs After Participating in HEA
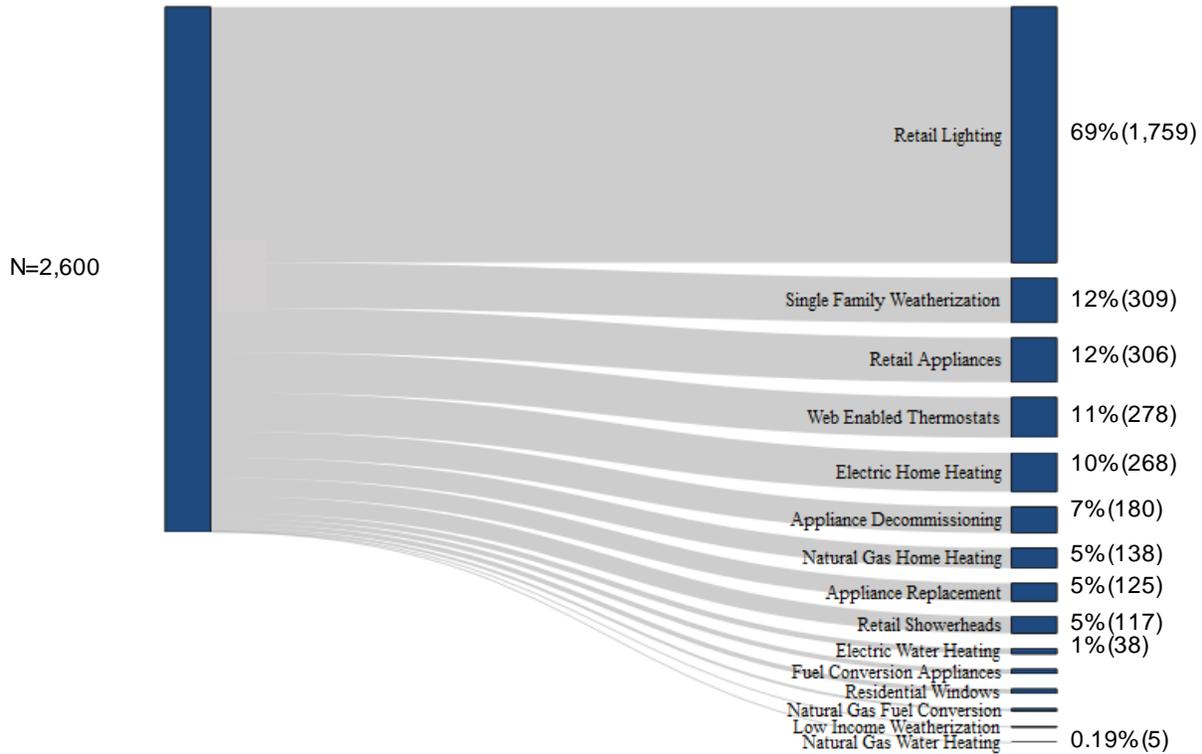
Note: The percentages sum to more than 100% since many 2017 HEA participants enrolled in multiple residential programs post-HEA.
Base: Post-HEA participants from 2017 through March 2018.

Retail Lighting offers lighting through online and retail stores, making it easily and widely accessible for customers to participate. Customers that went on to purchase lamps through the Retail Lighting program post-HEA purchased a small number of bulbs (two LED bulbs on average). Note that the HEA program provided participants with up to 20 bulbs in 2017 (increased to 30 in 2018). The bulbs are intended to largely replace incandescent bulbs in customer homes as the HEA program does not currently replace CFL bulbs. Given the large number of bulbs provided to customers through the HEA program that target incandescent bulbs, it is unlikely that many incandescent bulbs remain in the home post-HEA participation. Thus, when HEA participants purchase additional bulbs through the Retail Lighting program, they are likely replacing CFLs or burnt-out LEDs, which reduces the energy savings potential from channeling HEA participants to additional discounted lighting measures.

While Retail Lighting was dominant in post-HEA participation, close to a third of post-HEA participants (31%) went on to participate in other programs with deeper savings. Notably, besides the Retail Lighting program, there is not a large difference in post-HEA participation between programs despite large differences in cost to the customer. For example, buying a new washing machine through the Retail Appliance program can cost over a $1,000 while purchasing a smart thermostat through the Web-Enabled Thermostats program can cost $200. This suggests that many HEA participants are inherently willing to make investments in improving their energy efficiency and that HEA may be seizing opportunities by increasing their awareness of other programs.

Average Time Between HEA and Other Program Participation

Next, the evaluation team analyzed the average time lapse between HEA participation and enrolling in another residential program (based on installation or purchase date on program tracking records). A shorter time lapse between programs suggests a strong connection between HEA and the savings from the larger portfolio. The average time lapse between HEA and other program participation was four months. This is a short period of time considering that many of these programs require finding a contractor, potentially finding financing, and time to install the measures. Figure 4 shows the average length of time, in months, between customers participating in the HEA program and other programs.

Figure 4. Average Time between Participating in HEA and Another Residential Program
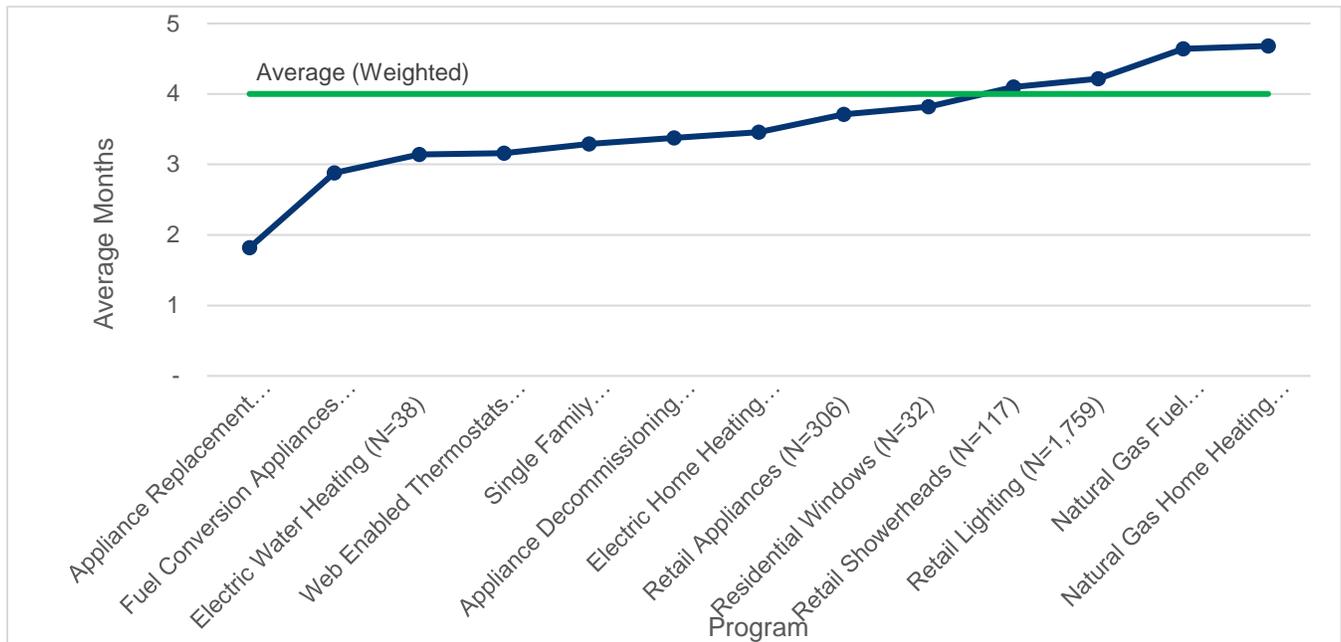
Note: The cross-program average is weighted by number of participants per program. Natural Gas Water Heating and Low Income Weatherization programs were not included due to the low number of post-HEA participants (less than ten).
Base: Post-HEA participants from 2017 through March 2018.

Shorter time lapses may also indicate program and operational efficiency. Specifically, this finding suggests that HEA specialists are recommending solutions that best fit customer needs and that PSE has streamlined processes and resources for customers to find and participate in programs.

Program Savings Associated with HEA Participants

The team next analyzed the contributions to portfolio savings from post-HEA participants. This provides context for understanding the maximum gross savings that HEA is providing to the portfolio. In total, the post-HEA participants saved around 1.2 GWh and 52,000 therms by participating in other residential programs. This represents 5% of the electric savings and 3% of the gas savings of the portfolio. Figure 5 provides a representation of the portfolio savings from post-HEA participants.

Figure 5. Total Residential Portfolio Savings from Post-HEA Participants

Electric Savings (GWh)

5%

95%

Gas Savings (Therms)

3%

97%

■ Not Post-HEA Participants   ■ Post-HEA Participants
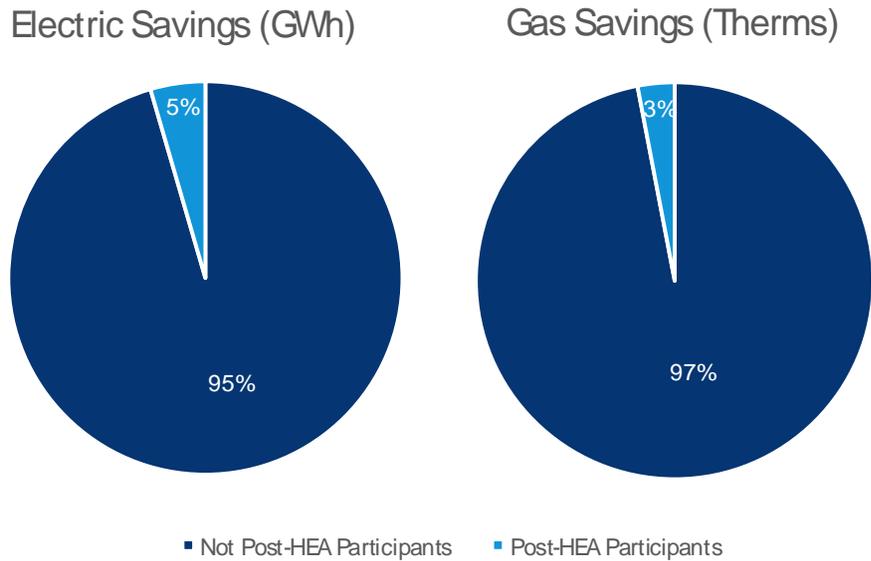
Base: Total residential portfolio savings includes kWh and gas savings for all programs, except HEA, from 2017 through March 2018.

Figure 6 and Figure 7 display where these savings were generated throughout the portfolio of programs. The percentages next to each program name represent the contribution of total post-HEA savings generated from that program, while the numbers in the parentheses are the number of participants who enrolled in those programs post-HEA. Notably, this analysis shows that larger numbers of post-HEA participants in other programs do not correlate to larger savings contributions. Over 1,700 post-HEA participants enrolled in Retail Lighting and yet these participants generated only 3% of the total post-HEA electric savings. Electric Home Heating and Single Family Weatherization had relatively fewer post-HEA participants but represent the largest shares of post-HEA electric and gas savings, respectively. Specifically, Electric Home Heating had 268 post-participants and represents 45% of total post-HEA electric savings, and Single Family Weatherization had 309 post-participants and represents 50% of total post-HEA gas savings.

Figure 6. Electric Savings from Residential Programs Post HEA Participation

Total = 1.2 GWh

Electric Home Heating — 45% (268)

Single Family Weatherization — 11% (309)

Appliance Replacement — 10% (125)

Natural Gas Fuel Conversion — 9% (18)

Appliance Decommissioning — 8% (180)

Electric Water Heating — 5% (38)

Web Enabled Thermostats — 4% (278)

Retail Lighting — 3% (1,759)

Fuel Conversion Appliances — 2% (33)

Retail Appliances — 2% (306)

Residential Windows — 1% (32)

Low Income Weatherization — 0.5% (7)

Retail Showerheads — 1% (117)
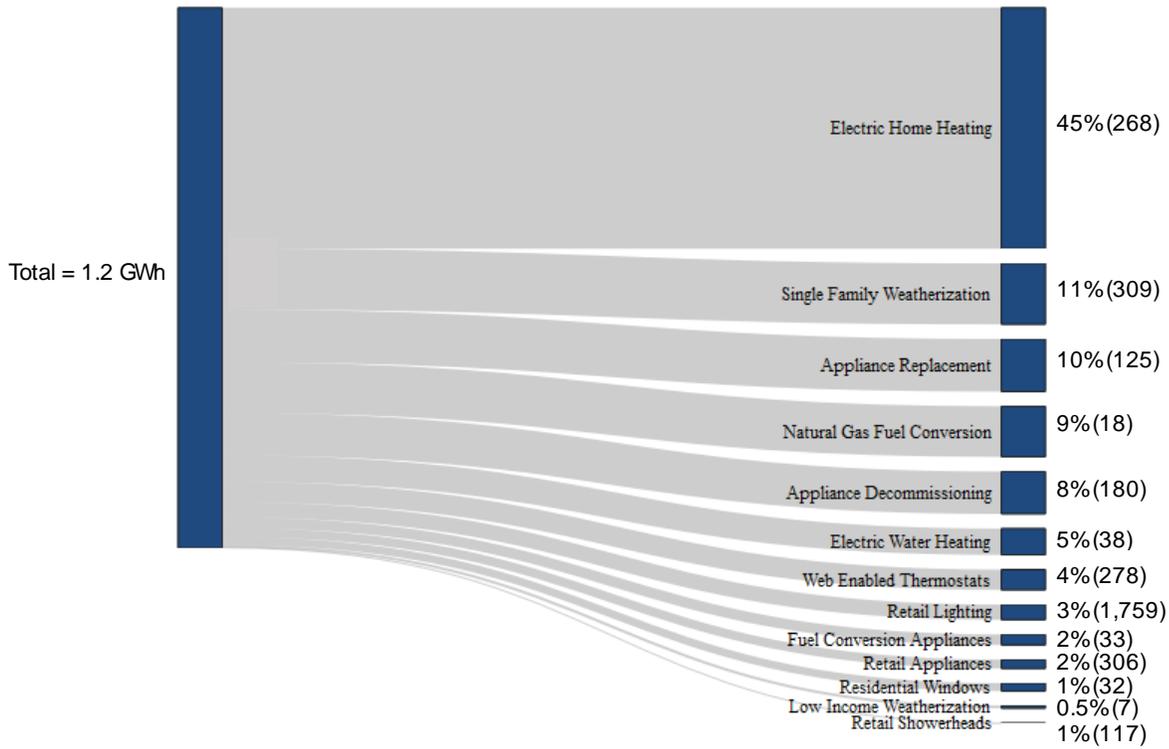
Figure 7. Gas Savings from Residential Programs Post HEA Participation
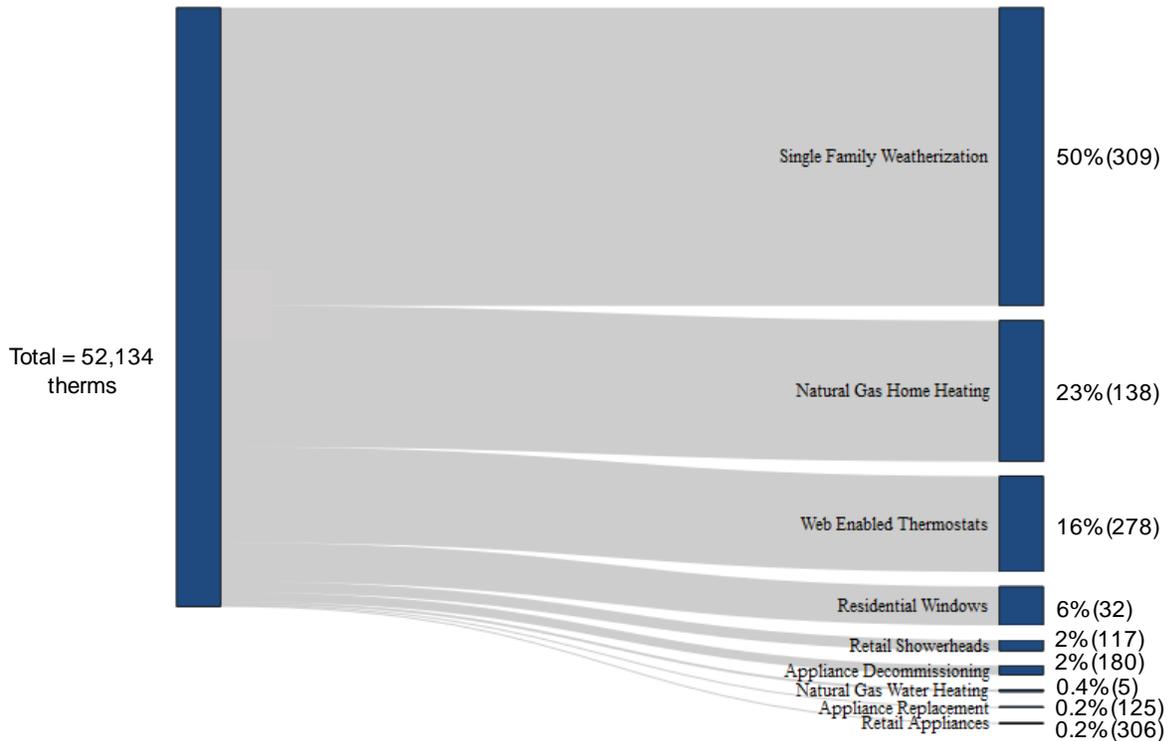
Participation and Electric and Gas Savings from HEA Referrals

After analyzing participation rates, electric savings, and gas savings for other residential programs from post-HEA participants, the evaluation team analyzed the contribution to total program electric and gas savings from HEA participants that received a program-specific referral (e.g., they participated in the Weatherization program after getting a recommendation to install insulation).

Overall, about 3% of portfolio electric savings (nearly 800 MWh) and 2% of portfolio therm savings (nearly 40,000 therms) occurred from projects connected to an HEA referral. Specifically, as shown in Figure 8 and Figure 9, the potential channeled savings would represent up to a 13% increase in HEA energy savings and a 45% increase in HEA therms savings.

Figure 8. Potential Additional Electric Savings
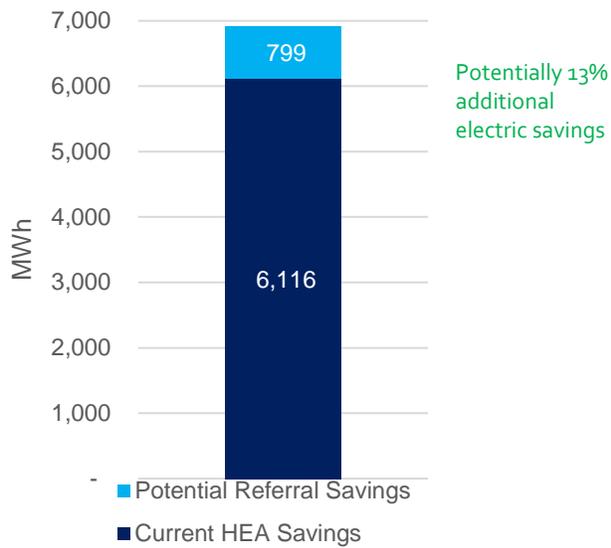
Figure 9. Potential Additional Gas Savings

Potentially 13% additional electric savings

Potentially 45% additional gas savings
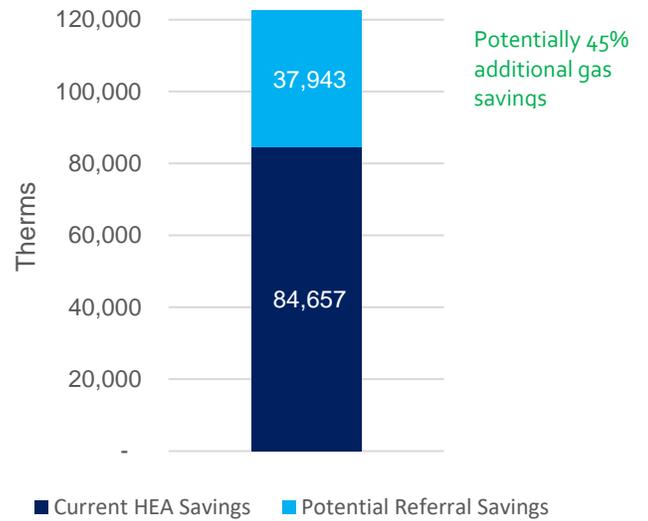
Base: HEA participation and post-HEA participation from 2017 through March 2018

Table 5 shows, by program, the percentage of post-HEA program participants who received a related HEA program referral, the total savings represented by those participants, and the percentage of total program savings represented by those participants.

Table 5. Percent of Total Program Savings from Program Referrals

Program	Referred Post-HEA Participants	% Post-HEA Participants	Potential Referral kWh Savings	% Program kWh Savings[a]	Potential Referral Therm Savings	% Program Therm Savings[a]
Single Family Weatherization	288	93%	123,196	10.68%	24,707	8.10%
Electric Water Heating	29	76%	45,553	4.52%	N/A	N/A
Electric Home Heating	178	66%	426,351	4.85%	N/A	N/A
Appliance Replacement	77	62%	74,593	5.73%	79	3.92%
Fuel Conversion Appliances	18	55%	13,050	3.34%	N/A	N/A
Natural Gas Home Heating	71	51%	N/A	N/A	7,521	0.94%
Natural Gas Fuel Conversion	9	50%	48,629	3.01%	N/A	N/A
Residential Windows	15	47%	3,287	0.39%	1,428	1.08%
Web Enabled Thermostats	127	46%	17,746	1.18%	3,947	1.12%
Low Income Weatherization	3	43%	2,262	0.15%	0	0.00%
Appliance Decommissioning	55	31%	30,819	1.24%	215	1.16%
Retail Appliances	92	30%	6,143	0.41%	24	0.34%
Retail Lighting	396	23%	7,777	0.38%	N/A	N/A
Retail Showerheads	2	2%	-	0.00%	22	0.02%
Total Residential Portfolio	**1,222[b]**	**47%**	**799,406**	**2.94%[c]**	**37,943**	**2.19%[d]**

Notes: [a] The denominator for this percentage is the total ex-ante fuel savings (e.g., electric or gas) from 2017 through March 2018 for each program.

[b] Since many 2017 HEA participants enrolled in multiple residential programs post-HEA, this represents the number of unique referred post-HEA participants rather than the sum of the column.

[c] The denominator for this value is 27,201,652 kWh, which is the total kWh savings for all programs, except HEA, from 2017 through March 2018.

[d] The denominator for this value is 1,735,316 therms, which is the total therm savings for all programs, except HEA, from 2017 through March 2018.

Since the evaluation team could not conclude that each participant who went on to participate in another residential program did so because of HEA recommendations, a participant survey was conducted to help provide a greater understanding of the various ways customers were influenced to participate in subsequent programs (Section 6.2.7). In the survey, customers were specifically asked how influential the HEA program was in their decision to participate in another PSE energy efficiency program. Further research is needed to quantify the portfolio savings lift that is attributable to the HEA experience, which could enable PSE to swap these claimed savings from other programs to HEA, or perhaps shift certain costs (e.g., marketing costs) from HEA to other programs.

Limitations

Although the residential program tracking and referral databases were valuable in conducting the channeling analysis, there were a few limitations when using these files.

- Because not all the 2017 HEA participants were included in the referral tracking database, this analysis does not include all participants in the program. Although it is ideal to include all participants in the analysis, the referral tracking database is missing less than 2% of participants. Thus, the evaluation team is confident that these results are representative of the participant population.

- These files did not have all the information needed to truly understand if participation and savings for the other residential programs were directly attributable to the HEA program. Specifically, the evaluation team made assumptions about the potential connection between a recommendation and another PSE program. Table 20 in Appendix C provides a crosswalk of assumed connections between recommendations and programs.

- The analysis captured post-HEA participation through March 2018. While this analysis was limited to 2017 HEA participants, it is possible that participants in late 2017 had not yet participated in another program though they planned to do so (note: the analysis found that, across all programs, it took, on average, 4 months on average for customers to participate in another program).

5.2.2 Consumption Analysis

This section provides consumption analysis results and savings estimates for the PSE HEA program evaluation period. Appendix D contains the detailed methodology for data cleaning and analysis, as well as complete results of the models. Table 6 shows the results of the model for HEA program participants for both electric and natural gas savings. The "Post: treat interaction" coefficient represents the interaction between the post period and the treatment flag, and shows the difference in the treatment group's usage as compared to the matched comparison group's change in usage, controlled for weather, months and day of week.

Table 6. Summary Results of Consumption Analysis Models

Variable	Coefficient - kWh	Coefficient - Therms
Post (HEA program participation)	-0.48066[a]	0.19036[a]
Cooling Degree-Days (CDD)[b]	1.163385[a]	0.035848[a]
Heating Degree-Days (HDD)	0.622855[a]	0.067061[a]
Post: treat interaction	-0.46161[a]	0.019047[a]
Constant	30.40805	1.030567
R-squared	0.615709	0.70936
Additional Terms	**Included**	**Included**
Monthly effects included	YES	YES
Weekday effects included	YES	YES

Notes: [a] p<0.01.
[b] A "degree-day" is a unit of measure for recording how hot or cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 (HDD) and 75 (CDD) degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.) If the mean temperature for the day is 5 degrees higher than 75, then there have been five CDD. On the other hand, if the weather has been cool, and the mean temperature is, say, 55 degrees, then there have been 10 HDD (65 minus 55). http://www.srh.noaa.gov/ffc/?n=degdays.

Table 7 shows the per-home and program-level savings for the program for electricity. Overall, customers saved 1.5% of their baseline electricity use, a per-home annual savings of 168.5 kWh. During the evaluation period, the program realized approximately 2,031 MWh of electricity savings in 2017. When we examine the gas models, we found they could not do a good job of extracting the treatment effect from other sources of variation. Therefore, the team was unable to detect therm savings.

Table 7. Annual Program Savings for 2017 from Consumption Analysis

Annual Savings	
January 1 – December 31, 2017 participants	12,051
Per-home daily savings (kWh)	0.46[a]
Per-home annual savings (kWh)	168.5
Program savings (MWh)	**2,030.4 MWh**

Note: [a] Rounded from 0.4616

Though the consumption analysis estimated the per-home annual savings based on participants from 2017, the evaluation team used this information to also estimate program savings for program year 2018. The team used the per-home annual savings value estimated from the model and applied it to the number of participants in the 2018 program year. The annual savings for 2018 are equal to 2,095 MWh as shown in Table 8.

Table 8. Annual Program Savings for 2018 based on Consumption Analysis

Annual Savings	
January 1 – December 31, 2018 participants	12,435
Program savings (MWh)	**2,095.3 MWh**

Note: [a] Rounded from 0.4616

5.2.3   Engineering Analysis

This section provides the results of the engineering analysis, including web-based survey ISRs, evaluated deemed savings values, and total evaluated savings and respective realization rates.

Installation and Persistence

Table 9 summarizes measure-level installation rates (IR), persistence rates (PR), and in-service rates (ISR) for measures claimed in 2017 and 2018. Aside from the direct install LEDs, the evaluation found relatively lower ISRs for leave-behind measures. This is not surprising as participants may receive these measures and later choose not to make the effort to install them on their own.

Table 9. Measure-Level IR, PR, and ISRs

Measure	IR	PR	ISR
LEDs	98.5%	93.8%	92.5%
Low-flow Showerheads	70.9%	83.2%	79.6%
Faucet Aerators	73.5%	82.7%	80.5%

Note: Due to the fallibility of participant recollection, the evaluation asked participants if they removed "any" of the installed quantities for each measure. It was assumed that half of the LEDs were taken out if participants removed any, that all of the showerheads were taken out if participants removed any and all of the faucet aerators were taken out if participants removed any, respectively.

The evaluation team calculated evaluated measure quantities by applying ISRs (from Table 9) to the measure quantities provided in the program tracking database. Table 10 shows the resulting evaluated measure quantities by program year. The in-service rate across both years evaluated for impacts is 91%.

Table 10. Reported and Evaluated Measure Quantities

Measure	Reported Measure Quantity	ISR	Evaluated Measure Quantity
Program Year 2017 (PY2017)			
LEDs	156,336	92.5%	144,689
Low-flow Showerhead (Elec WH)	3,865	79.6%	3,075
Low-flow Showerhead (Gas WH)	6,230	79.6%	4,956
Faucet Aerator (Elec WH)	2,997	80.5%	2,412
Faucet Aerator (Gas WH)	4,094	80.5%	3,295
Subtotal	*173,522*	*91.3%*	*158,427*
Program Year 2018 (PY2018)			
LEDs	149,519	92.5%	138,380
Low-flow Showerhead (Elec WH)	4,782	79.6%	3,804
Low-flow Showerhead (Gas WH)	8,526	79.6%	6,783
Faucet Aerator (Elec WH)	4,625	80.5%	3,723
Faucet Aerator (Gas WH)	7,099	80.5%	5,714

Subtotal	*174,551*	*90.7%*	*158,403*
Total	**348,073**	**91.0%**	**316,831**

Deemed Savings Review

As part of the deemed savings review, the evaluation team found that PSE applied deemed savings that were either PSE-derived or from the RTF in effect at the time measures were installed. However, for consistency with other PSE program evaluations (e.g., Multifamily Retrofit), the evaluation team applied deemed savings based on the reported savings date presented in the program tracking data.

Additionally, the evaluation team identified an error in the deemed savings for showerheads with gas water heating. There are two sources of energy savings from the adoption of low-flow showerheads. The first comes from the reduced need for heated water due to the lower water flow. This results in either a reduction of kWh or therms, depending on the fuel type used by the water heater. The second source of energy savings comes from reduced waste-water, thus leading to a decrease in pump energy consumption. This leads to a reduction in electricity use regardless of water heater fuel type because waste-water pump motors run on electricity.

Given the RTF does not provide gas savings, PSE converted the kWh savings for showerheads to therms. However, the kWh savings from the RTF embeds additional savings from waste-water reduction (i.e., both sources of energy savings are incorporated in the kWh savings for showerheads). To correct for this, the evaluation team removed the additional waste-water savings prior to converting to therms, resulting in a lower deemed therm savings value compared to the reported value. The team then made sure to include the waste-water savings for showerheads with gas water heating in the electric savings as these savings are due to a decrease in pump energy consumption.

Table 11 and Table 12 compare the reported and evaluated measure-specific electric and gas deemed savings by program year, respectively. There are some minor differences in the reported and evaluated kWh savings values because PSE applied the per measure energy savings values that were in effect when the measures were *installed* and for evaluation purposes, the evaluation team relied on per measure energy savings values that were in effect when the savings were *claimed*. The team made this adjustment to ensure consistency with the impact evaluation conducted for the PSE Multifamily Retrofit Program. A review of the tables shows that in 2017, the evaluated kWh savings values are generally equal to or slightly higher than the reported values. In 2018, however, evaluated kWh values tend to equal or be much lower than the reported values where the team noticed differences in them. The evaluated therm savings values for 2017 are slightly higher than the reported savings values for faucet aerators, but the opposite case exists for low-flow showerheads. For 2018, the evaluated therm savings values tend to be slightly lower than the reported values.

Table 11. Reported and Evaluated Deemed Savings Comparison – Electric

Measure	2017 kWh Savings per Measure			2018 kWh Savings per Measure		
	Reported[a]	Evaluated[b]	Difference	Reported[a]	Evaluated[b]	Difference
Low-Flow Faucet Aerator 1.0 gpm	53.00	53.25	+0.25	53.00	50.28	-2.72
				50.28	50.28	0
Low-Flow Faucet Aerator 1.5 gpm	31.00	31.02	+0.02	31.00	29.29	-1.71
				29.29	29.29	0

Measure	2017 kWh Savings per Measure			2018 kWh Savings per Measure		
	Reported[a]	Evaluated[b]	Difference	Reported[a]	Evaluated[b]	Difference
LED - Standard A-Lamp	20.67	20.67	0	20.67	20.67	0
LED - Candelabra	-----	-----	------	18.54	16.01	-2.53
LED - Globe	18.09	18.09	0	18.09	18.09	0
LED - Reflector	39.41	39.41	0	39.41	39.41	0
Low-Flow Showerhead – Fixed	238.00	238.00	0	238.00	166.00	-72.00
				260.00	166.00	-94.00
	260.00	238.00	0	166.00	166.00	0
				187.00	187.00	0
Low-Flow Showerhead – Handheld	238.00	238.00	0	238.00	166.00	-72.00
	260.00	238.00	-22.00	166.00	166.00	0
				187.00	187.00	0
Waste Water - Low-Flow Showerhead - Fixed & Handheld (Gas WH)	7.00	7.03	+0.03	7.00	4.72	-2.28
				4.72	4.72	0

Notes: a Based on Installation Date
b Based on Reported Savings Date

Table 12. Reported and Evaluated Deemed Savings Comparison – Gas

Measure	2017 kWh Savings per Measure			2018 kWh Savings per Measure		
	Reported[a]	Evaluated[b]	Difference	Reported[a]	Evaluated[b]	Difference
Low-Flow Faucet Aerator 1.0 gpm	2.15	2.37	+0.22	2.37	2.24	-0.13
	2.37	2.37	0	2.15	2.24	+0.09
				2.24	2.24	0
Low-Flow Faucet Aerator 1.5 gpm	1.38	1.38	0	1.38	1.31	-0.07
	1.26	1.38	+0.12	1.31	1.31	0
Low-Flow Showerhead – Fixed	16.00	10.30	-5.70	10.61	7.19	-3.42
	10.61	10.30	-0.31	7.40	7.19	-0.21
				8.34	8.13	-0.21
Low-Flow Showerhead – Handheld	10.61	10.30	-0.31	10.61	7.19	-3.42
	16.00	10.30	-5.70	7.40	7.19	-0.21
				8.34	8.13	-0.21

Notes: [a] Based on Installation Date
[b] Based on Reported Savings Date

Table 13 and Table 14 show the program reported and evaluated electric and gas savings, respectively. Based on the engineering analysis the program achieved 8,929 MWh in electric energy savings and 119,131 therms in gas energy savings, with realization rates of 90% (Table 13) and 76% (Table 14), respectively.

Table 13. Total Reported and Evaluated Savings – Electric

Measure	Total kWh Savings		Realization Rate
	Reported	Evaluated	
Program Year 2017			
Low-Flow Faucet Aerator	142,869	115,456	81%
Low-Flow Showerhead[a]	923,346	731,826	79%
LEDs	4,008,430	3,709,495	93%
Waste Water - Low-Flow Showerhead[b]	25,123	34,853	139%
Subtotal	*5,099,768*	*4,591,630*	*90%*
Program Year 2018			
Low-Flow Faucet Aerator	207,117	166,265	80%
Low-Flow Showerhead	831,935	644,184	77%
LEDs	3,795,255	3,495,224	92%
Waste Water - Low-Flow Showerhead	27,169	32,024	118%
Subtotal	*4,861,476*	*4,337,697*	*89%*
Total	**9,961,243**	**8,929,327**	**90%**

Notes: [a] Reported and evaluated savings include those coming from reduced hot water needs from electric water heaters and from the waste-water reduction.
[b] Additional electric waste-water savings from the participants from gas water heaters.

Table 14. Total Reported and Evaluated Savings – Gas

Measure	Total Therm Savings		Realization Rate
	Reported	Evaluated	
Program Year 2017 (PY2017)			
Low-Flow Faucet Aerator	8,959	7,278	81%
Low-Flow Showerhead	68,380	51,040	75%
Subtotal	*77,339*	*58,318*	*75%*
Program Year 2018 (PY2018)			
Low-Flow Faucet Aerator	14,946	12,008	80%
Low-Flow Showerhead	64,520	48,805	76%
Subtotal	*79,466*	*60,813*	*77%*
Total	**156,805**	**119,131**	**76%**

5.2.4   Behavioral Savings Beyond Direct Install Equipment and Program Channeling

A comparison of the electric and therm program savings values from the consumption analysis to the engineering analysis shows a sizable difference (see Table 15). Though the consumption analysis provided ex-post net energy savings values and the engineering analysis provided ex-post gross values, the savings from the engineering savings are more than two times larger, which likely is not due to the absence of applying a net-to-gross ratio to the engineering estimates of savings. Additionally the consumption analysis is meant to capture not only the

energy savings from the installation of energy efficient equipment through the program but also the reduction in energy usage from changes in behavior, presumably based on recommendations provided by HEA specialists.

While the evaluation team relied on consumption analyses to more holistically capture energy savings, the estimated program savings are far lower for both kWh and therms than they are from the engineering analysis, which is meant to only capture the savings from installed equipment.

Table 15. **Comparison of Program Savings from Consumption and Engineering Analyses**

Fuel	Savings from Consumption Analysis	Savings from Engineering Analysis	Difference in Consumption Analysis Savings and Engineering Analysis Savings
Program Year 2017 (PY2017)			
Electric (MWh)	2,030.4	4,591.6	-2,561.2
Gas (therms)	0	58,318	-58,318
Program Year 2018 (PY2018)			
Electric	2095.3	4,337.7	-2,242.4
Gas	0	60,813	-60,813
Total			
Electric (MWh)	4,125.7	8,929.3	-4,803.6
Gas (therms)	0	119,131	-119,131

6. Process Evaluation

The following section describes the findings for the HEA program's process evaluation activities. The team used this portion of the evaluation to learn how PSE implements the HEA program, track the successes and challenges of program changes, understand the program marketing efforts and identify possible improvements, and investigate possible opportunities to enhance referrals to other programs.

6.1 Methodology

Our process evaluation relied primarily on interviews with program staff and the implementer; a review of program materials, the program theory logic model, and program-tracking data; a channeling analysis to determine in what programs HEA participants subsequently participate; and an analysis of the participant survey results.

6.1.1 Interviews

The evaluation team first performed in-depth interviews with the HEA program staff manager. The questions were designed to better understand program implementation and design, identify changes that have occurred or are planned for the program, review marketing efforts, understand the data tracking methods and inventory the available data, discuss the goals of the evaluation, and identify sources of deemed savings values. The team then conducted an in-depth interview with FES staff about the implementation of the HEA program. FES is responsible for the training, deployment, and QA/QC of HEA specialists. After learning from PSE and FES that there may be opportunities to improve expectation-setting for a free audit, the evaluation team decided to seek a greater understanding of the implementation process from energy specialists directly. The team conducted in-depth interviews with 10 specialists who provided in-home assessments to participants. The interviews focused on understanding opportunities to increase the value of the program to customers in terms of the direct install measures, assessment services, and the assessment report.

6.1.2 Program Theory Logic Model

The evaluation team has also completed a basic review of the latest version of the PTLM for the HEA program. This review included an assessment of whether all the standard PTLM components (i.e., inputs, activities, outputs, and outcomes) were present and whether the information in the PTLM reflected the evaluation team's understanding of the program's design.

6.1.3 Participant Survey

The following sub-section details the methodology and sampling approach for the participant survey. The evaluation team conducted computer-assisted web interviews (CAWI) with a sample of 2017-2019 HEA participants.

Survey Objectives

The survey focused on impact and process-related topics regarding measure installation, measure retention, additional actions influenced by the program, and satisfaction with program elements. The key goals of the survey were to verify program participation, installation, and persistence rates; gauge the influence of the

assessment recommendations on additional actions taken and participation in other energy efficiency programs; and assess customer satisfaction with the program offerings against expectations. The evaluation team used this data to develop process-related recommendations for program improvement. The full survey document is included in Appendix B.

Sample Design

Given the size of the participant population and length of the full evaluation time period (2017 - 2019), the evaluation team sampled equal numbers of participants by participation year. The team included 2017 and 2018 participants to answer impact evaluation questions involving verification, installation and persistence rates of equipment provided through the program and the amount of influence the program had on subsequent participation in other PSE programs. The team also included participants from 2018 and 2019 to assess the program's influence on participant behaviors related to energy usage, subsequent PSE program participation, and any proposed recommendations for program improvement. The team was particularly interested in program improvement recommendations from this set of participants since the program instituted a number of changes at the end of 2017. Table 16 summarizes the participant counts for the initial population, the resulting sample and the completed surveys. The survey had a 20.1% response rate.

Table 16. HEA Survey Participation Counts

Year of Participation	Population[a]	Sampling Frame	Survey Respondents[b]
2017	12,895 44%	2,500 33%	365 26%
2018	13,349 46%	2,500 33%	456 33%
2019	2,906 10%	2,500 33%	570 59%
Total	**29,150**	**7,500**	**1,391**

Notes: a The number of participants is based on those who had measures installed in that particular year and does not reflect the year in which savings for these participants were reported or "counted"
b The number of responses totaled 1,394. A total of 3 participants had unknown participation year data.

6.2   Key Findings

This section provides the results and analysis of the specialist interviews, the PTLM, the program materials review, the channeling analysis, and the participant survey responses.

6.2.1   Specialist Interviews

The HEA specialists who performed the in-home assessments for participants provided the evaluation team with some key insights about the program during the fall of 2018. Generally speaking, they noted that the program is considered valuable by participants, training allows them to provide consistent implementation, but that high customer expectations sometimes cause issues when they provide assessments.

Customer Value

Overall, the energy assessment specialists reported that the program seemed to provide value to PSE customers. The valued elements they mentioned most included knowledge gained through the program (mentioned by 5 of 10 specialists), satisfaction with free LEDs (mentioned by 3 of 10 specialists), and tips on how to save money (mentioned by 2 of 10 specialists). The specialists suggested that the customers who report being the least satisfied by the program were those who are already well informed about their home's energy usage, cannot afford to perform the recommended upgrades, and those in new homes that are already energy efficient.

Implementation Consistency

Eight out of 10 specialists reported high satisfaction with the training they received about conducting energy assessments. They also reported that the program process itself was streamlined with little variation. Specialists followed a consistent assessment process that started with assessing major energy-use appliances and followed by checking attics, ducts, and crawl spaces for insulation. Most specialists even reported asking customers about their main energy use concerns before the assessment (reported by 7 out of 10 specialists).

Technology Use

The program seemed to suffer from several technology problems, however. Specialists reported both hardware and software issues including poor camera quality, short battery life of tablets, limited memory and processing power of tablets, glitchy software, unreliable recommendation list loading and referral page errors. These technological issues lead to difficulties in providing customers with smooth assessment experiences.

Customer Preparation

Many specialists noted that a majority of customers were not informed or were misinformed about the processes and outcomes of the HEA assessment (reported by 7 out of 10 specialists). In fact, specialists generally agreed that about 60% of customers did not know what to expect from the assessment (n=9) or expected more from the assessment than they could provide. This caused difficulties for the specialists' implementation of the program because a lack of customer preparedness affects the value of the assessment to the customer and detracts from specialists' efficiency in completing the assessments.

Report Presentation

The largest factor in customer's willingness to invest in upgrades, according to specialists, depended on finances and the way information was presented in the report. Some customers were open about their inability to afford any upgrades. Therefore, many of the specialists attempted to emphasize the financial benefits of energy efficiency over time (8 out of 10 specialists). Five specialists noted that the report could do more to reinforce these topics so that participation in PSE's programs could improve.

6.2.2   Program Theory

The evaluation team reviewed the current PTLM, as seen in Figure 10, to see if the model accurately reflected the various inputs, activities, outputs, and outcomes of the program as currently implemented.

Figure 10. HEA PTLM

Home Energy Assessment E/G 214	**PURPOSE –** Increase customer awareness regarding their home's energy consumption and identify cost-effective ways to use less energy. Provide immediate energy savings from the direct installation or distribution of leave-behind high-efficiency products.	

Activities

PSE -
- Train contractors

Contractors – Recruit and schedule customers

Contractors – Conduct Home Energy Assessments:
- Install measures, distribute leave-behind measures.
- Educate residents on use of installed measures, and behavior changes to save energy
- Inform residents about other EE opportunities

PSE – Verifies installation/distribution of measures

PSE – Processes payments to Contractors and to DI vendors

Outputs/Metrics

Number of contractors trained

Scheduled Home Energy Assessments

Completed Home Energy Assessments:
- Measures installed/distributed
- Customers educated on proper use of energy saving devices and on behavior change
- Customers informed about other EE opportunities

Scheduled v. completed

Measure installation/distribution verified

Paid invoices

Documen-tation

Short-Term Outcomes

Increased number of HEA contractors trained in delivering HEA measures and services

- EE measures installed and operating properly;
- HEA – influenced customer behavior change
- Participation in additional programs/offerings
- Change in Customer satisfaction with PSE

Verified program savings

Ongoing contractor participation

Long-Term Out-comes

Energy Savings from HEAs, DI Measures, Leave-behind measures, participating in other programs/offerings

Customer satisfaction with PSE

Ongoing contractor commitment to program delivery

The evaluation team identified the following opportunities for improvement:

- **Add barriers to the PTLM:** Other residential program PTLMs in PSE's portfolio include a "barriers" row that outlines the key barriers to program participation that the target customers face. In addition to ensuring consistent PTLM design, adding this information provides useful context for the rationale behind program interventions.

- **Update language to reflect the new implementation structure**: While the process steps are accurate, the language in the current PTLM appears to be based on past CAN implementation structure. Updating the language in the PTLM to reflect FES' role in the new implementation structure may be beneficial for HEA Specialists during the training process through to program delivery.

- **Add a program referral pathway:** The third activity from the left in the PTLM includes a bulleted sub-activity related to informing customers about other energy efficiency opportunities. Considering the importance of referring customers to other programs, it is recommended that PSE include the following in the PTLM:

- "Informing customers about other energy efficiency opportunities" as a separate activity;

- "CAN and other program referrals" as an output of this activity;

- "Awareness of other programs" as a short-term outcome; and

- "Participation in other PSE programs" as a long-term outcome.

  - **Clarify documentation methods:** The current PTLM contains a placeholder for "documentation" referring to documents or databases that track program outputs. However, the PTLM does not provide specific information on the form of documentation prepared by program staff. Though not a requirement of PTLMs, should PSE want to incorporate this information, it is beneficial for program staff to describe the databases or documents that it uses to track outputs from the program.

6.2.3   Program Implementation

Through conversations with HEA program staff, the evaluation team developed an understanding of the program's key successes and challenges early in the evaluation. Overall, HEA staff reported that the program was performing successfully but had expressed concern over a few key challenges.

Key successes of the program include the quick delivery of program and in FES' delivery of the program across PSE's large service territory. The evaluation also found successes in overall customer satisfaction with the program, and with the number of LEDs specialists offered to participants. Some of the initial challenges that arose during the evaluation involved meeting customer expectations in terms of assessment comprehensiveness and scheduling issues that arose during the sign-up process. The program staff planned to respond to these challenges by setting expectations during marketing efforts and by mitigating scheduling issues with appointment reminders.

The program staff additionally identified the changes to program implementation in the 2017 through 2019 program years. Specifically, the program changed the measure mix by increasing the maximum number of LEDs

from 20 bulbs to 30 bulbs (beginning in mid-2017) and adding specialty LEDs (beginning in 2018). The program also changed its implementation strategy from allowing any qualified CAN contractor to perform audits to mandating that FES staff perform all audits (beginning in late 2017). Notably, FES offered CAN contractors who used to perform assessments an opportunity to continue providing assessment as FES subcontractors.

6.2.4 Satisfaction

Through an analysis of the participant survey data, the evaluation team found that satisfaction was high across various aspects of the program. Seventy-five percent of participants said that they were "very satisfied" or "satisfied" with the program overall (Figure 11). Also, roughly one-third (32%) of participants said they noticed savings on their PSE energy bill since participating in the program. Satisfaction with the program is not directly tied to noticeable energy savings, as only 36% of satisfied or very satisfied participants reported noticing positive savings. In fact, 28% of the participants who said that they were satisfied or very satisfied with the program did not notice savings on their bill and 36% are not sure any savings have or have not occurred.

The survey also asked participants about the number of weeks it took an energy specialist to come and conduct the assessment after the initial scheduling. On average it took 2.4 weeks for the specialists to conduct the assessments. Just under 90% of participants were satisfied or very satisfied with this time frame. As shown in Figure 11, the areas of highest satisfaction associated with the assessment relates to the professionalism and the quality of the work performed by the energy specialist (rated 4.56 and 4.37 out of 5, respectively).

Figure 11. Program Process Satisfaction

	Very Satisfied	Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied	Very Dissatisfied	N/A	Mean
Overall satisfaction with the assessment experience	40%	35%	9%	3%	1%	12%	4.25
The professionalism of energy specialist	65%	28%	5%	2%	0%		4.56
The quality of the work completed by energy specialist	54%	33%	9%	3%	1%		4.37
The length of time it took to complete assessment	50%	41%	7%	1%	1%		4.39
The process of scheduling the assessment	46%	44%	8%	1%	1%		4.33
The length of time to receive the assessment after scheduleding	43%	46%	9%	1%	0%		4.30
The available appointment times for the assessment	43%	47%	9%	1%	0%		4.31
The assessment report in helping understand your home energy usage	41%	40%	14%	4%	1%		4.14
The report in helping understand how to reduce energy usage	38%	39%	17%	4%	2%		4.08
The amount of savings on your electric bill	7%	17%	3%	0%	0%	72%	4.13

n=1,394

Note: N/A, or "Not Applicable", is used to denote questions that were not asked of everyone. The overall satisfaction with the assessment experience was only asked of those who received at least one equipment measure and the satisfaction with the amount of savings on the electric bill was only asked to those that reported noticeable savings.

Figure 12 shows satisfaction ratings related to the equipment provided during the assessment. While satisfaction with the quality of the free LEDs is high, with close to 90% stating they are "very satisfied" or "satisfied", the leave-behind measures are ranked lower. These measures had mean satisfaction ratings of 3.62 and 3.60 out of 5, respectively.

Figure 12. Equipment Satisfaction

Item	Very Satisfied	Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied	Very Dissatisfied	Score
The quality of the free LED light bulb(s) (n=993)	50%	39%	6%	3%	2%	4.33
The quality of the free low-flow showerhead(s) (n=763)	18%	35%	38%	7%	1%	3.62
The quality of the free faucet aerator(s) (n=487)	17%	37%	38%	5%	3%	3.60

■ Very Satisfied   ■ Satisfied   ■ Neither Satisfied nor Dissatisfied   ■ Dissatisfied   ■ Very Dissatisfied

6.2.5   Assessment Recommendations for Behavioral Changes

The participant survey data also provided the team with an understanding of how responsive participants were to the energy efficiency recommendations they received during the assessment. These recommendations focused on changing common behaviors that could lead to an increase in energy savings if taken in the home. Most respondents remember receiving recommendations from the specialist (86%). When asked about specific recommendations, however, participants' recollections vary drastically.

The participants who remember receiving recommendations (86%) were asked about the ones they received from their assessor. The survey followed up by asking which behavioral changes they made since participating in the HEA program. Figure 13 shows the proportion of participant actions based on whether or not they received each recommendation (as indicated by the full bar). Whether the customer took action, plans to take the action, or plans not to take the action is then shown in different colors in each bar in the figure.

A majority of participants (65%) received the recommendation to changing air and/or furnace filters and followed through with high compliance (54% of total respondents have reported taking this action). There were several other recommendations, however, that respondents did not receive and/or take, as the figure below shows. Given that energy specialists have the discretion to provide recommendations, they may not have felt all were applicable and therefore did not provide them. For example, very few participants received the recommendation to change the direction of the ceiling fan blades seasonally (12% of total respondents). It is possible that this recommendation was not applicable to most clients, which explains why specialists did not make this recommendation often.

Figure 13. Behavioral Changes

Behavior	Have taken	Plan to take	Have not taken
Change air/furnace filters regularly	54%	9%	2%
Turn out lights when not in use	50%	1%	1%
Adjust thermostat settings for optimal performance	46%	3%	3%
Repair air leaks	22%	17%	8%
Clean lint filters	36%	2%	1%
Upgrade attic, floor, or wall insulation	12%	14%	12%
Lower water heating temperature settings	25%	4%	8%
Get a pre-season tune-up of heating/cooling systems	21%	12%	4%
Upgrade to a smart thermostat	14%	7%	10%
Run full dishwasher loads	28%	1%	1%
Wash laundry in cold water	24%	2%	3%
Insulate water heater pipes	12%	10%	6%
Upgrade appliances	9%	8%	9%
Shut off/set computer to sleep when not in use	21%	2%	1%
Close fireplace damper	16%	3%	2%
Upgrade windows	4%	7%	7%
Upgrade home ventilation system	5%	3%	7%
Install insulated drapes	6%	3%	4%
Change fan blade direction	8%	2%	2%
Maintain air gap on refrigerator	9%	1%	1%
Plastic window sheeting	1%	1%	4%
Use the right size pots	5%	0%	0%

n=1,394

■ Have taken ■ Plan to take ■ Have not taken

6.2.6   Program Marketing

PSE uses several marketing strategies to generate interest in the HEA program. The marketing efforts for HEA during the evaluation time period included traditional tactics such as e-mails and direct mailers, as well as more innovative means of program promotion such as social media campaigns, partnerships with sports teams, door-to-door "blitzes" and featuring direct program sign-ups in targeted "bonanzas," which offer a suite of PSE programs to a single community over four to six weeks.

As shown in Figure 14, the majority of respondents (38%) reported first hearing about the program via an email from PSE. Other ways customers heard about the program include word of mouth and mailings from PSE.

Figure 14. Sources of Program Awareness

Source	Percent
Received a PSE Email	38%
Word of Mouth	16%
PSE Mailing	16%
At a Community Event	8%
On PSE Website	7%
In Bill insert	5%
Someone Knocked on the Door	4%
Cannot Recall	4%
Saw a Social Media Ad	3%
Personal initiative	2%
Saw a television Ad	2%
Saw a Digital Display Banner	2%
Through a Contractor	2%
Past Participation	1%
Other	2%

n=1,394
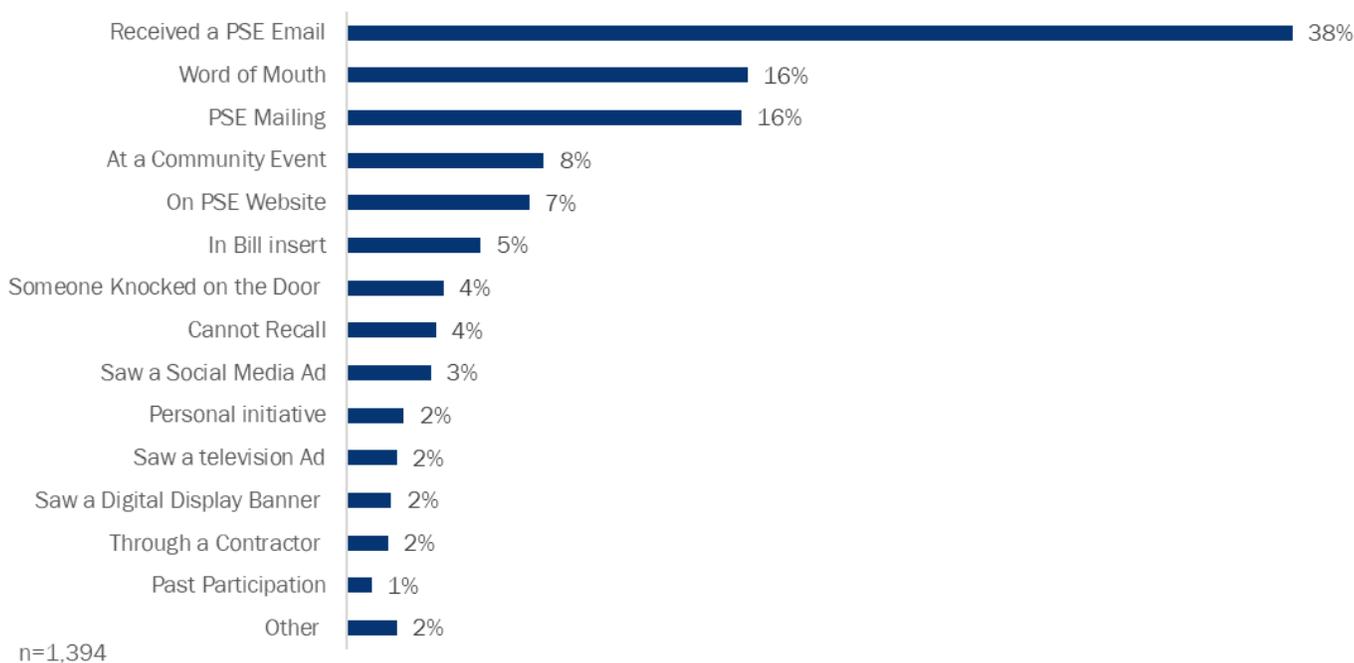
6.2.7   Channeling Analysis

One of the recommendations the evaluation team made following the channeling analysis of participant savings was to assess how influential the HEA program was in the decision to participate in another PSE program. This information provides additional insight about the magnitude of energy savings attributable to the HEA program.

Through an analysis of the survey data, the team found that 14% or 201 of the 1,394 survey respondents, recalled participating in a PSE residential energy efficiency program since participating in HEA (Table 17). Note that the proportion of customers who recollected participating in a subsequent program is slightly lower than the team found through an analysis of the data provided by PSE (described earlier in Section 5.2.1). The participants were then asked to rate how influential their participation in the HEA program was on their decision to participate in a subsequent PSE EE program on the following 1-5-point scale, where 1 means the HEA program was "not at all influential" and 5 means the HEA program was "extremely influential".

On average, respondents said that the HEA program was rated a 3 or was at least "somewhat influential in the decision to participate in the subsequent program". The evaluation team also found that the percentage of HEA participants who are interested in participating in another PSE program in the future (83%) is much higher than the actual participation rates.

Table 17. Channeling to Other PSE Programs

Program	Percent of Participants who Enrolled in Program after HEA	HEA's Influence on Subsequent Participation On a Scale from 1 to 5	Percent of Participants who are Interested in Participating in the Future (n=1,336)
Appliance Rebates/Replacements	4%	3.12	69%
Retail Lighting Rebates	3%	3.15	47%
Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates	3%	3.12	51%
Rebates for Home Weatherization	2%	3.91	45%
Appliance Recycling	2%	3.42	61%
Natural Gas or Electric Programs	2%	3.22	0%
Rebates for Web Enabled Thermostats	1%	3.21	32%
Water Heating Equipment Rebates	1%	2.94	51%
Rebates for Residential Windows	1%	3.00	38%
Solar Choice	1%	2.13	44%
Green Power	1%	1.91	39%
Carbon Balance	0%	4.00	21%

Note: Because participants may participate in multiple programs after HEA, total will not sum to 100%.

6.2.8   Program Value to Participants

To assess participants' perceptions of the value of the HEA program and the value of a premium energy audit that would include additional services such as a blower door test or infrared thermal imaging to detect air leaks, the survey asked how much money participants would be willing to pay for these services. Roughly one-third of participants (30%) reported a willingness to pay for a premium audit, while another third (33%) stated they would not be willing to pay anything. The remainder (37%) reported that they were unsure if they would be willing to pay for a premium audit or not. In total, those participants willing to pay anything for the premium program reported an average value of $78.18 (standard deviation=$72.57).

6.2.9   Participant Characteristics

The demographics of PSE customers who participated in the HEA program are worth considering as supplemental information when reviewing the responses to the survey. Over half of the survey respondents

(58%) reported being 55 years of age or older which is larger than the proportion in that same age category of overall Washington residents (see Figure 15).

Figure 15. Respondents by Age Compared to State Demographics
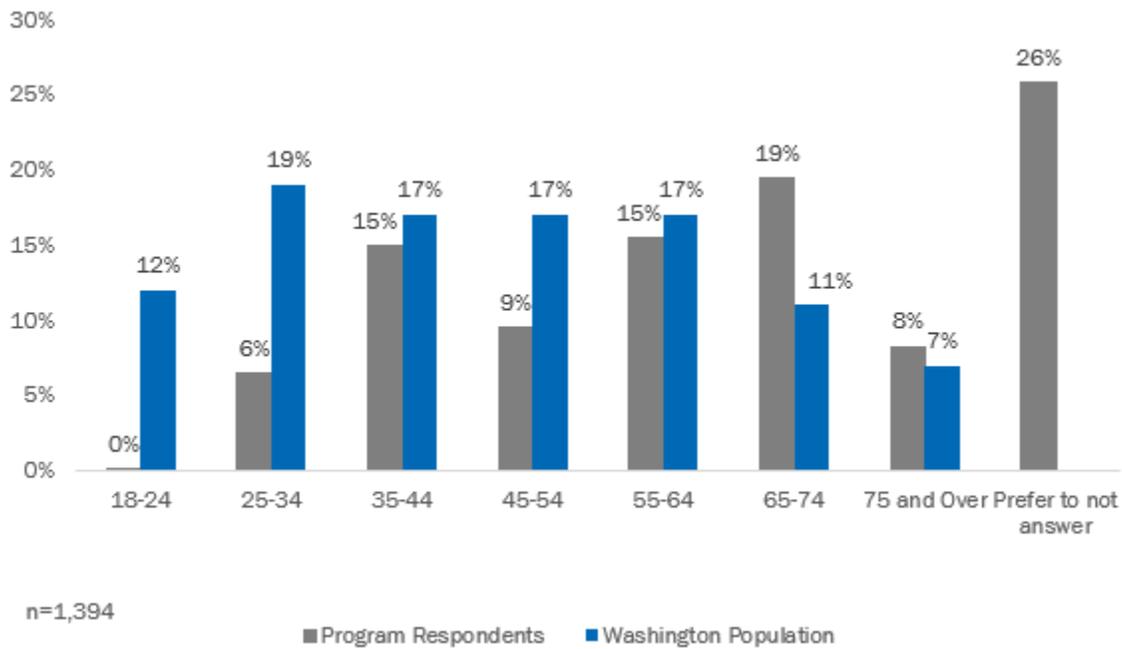
Note: Washington population data is taken from the U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates.

In addition to attracting older residents, the HEA program also tends to attract customers with more education. Figure 16 shows how the proportion of respondents who have earned a bachelor's degree or higher is much greater than that of the Washington population.

Figure 16. Respondents by Education Compared to State Demographics
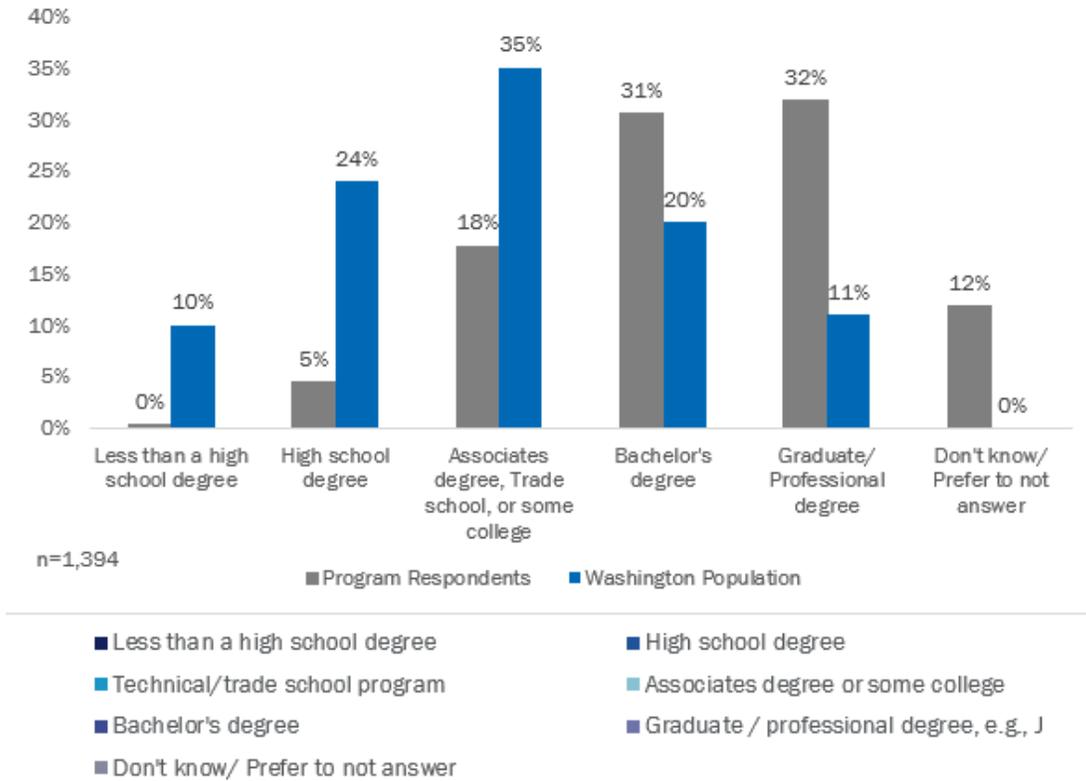
n=1,394

■ Program Respondents ■ Washington Population

■ Less than a high school degree   ■ High school degree
■ Technical/trade school program   ■ Associates degree or some college
■ Bachelor's degree   ■ Graduate / professional degree, e.g., J
■ Don't know/ Prefer to not answer

Note: Washington population data is taken from the U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates.

Lastly, program respondents were more likely to use natural gas as a home-heating fuel type than found in the state's population (see Figure 17).

Figure 17. Respondents by Home Heating Fuel Type Compared to State Demographics

n=1,394

■ Other/Don't know   ■ Natural gas   ■ Electric
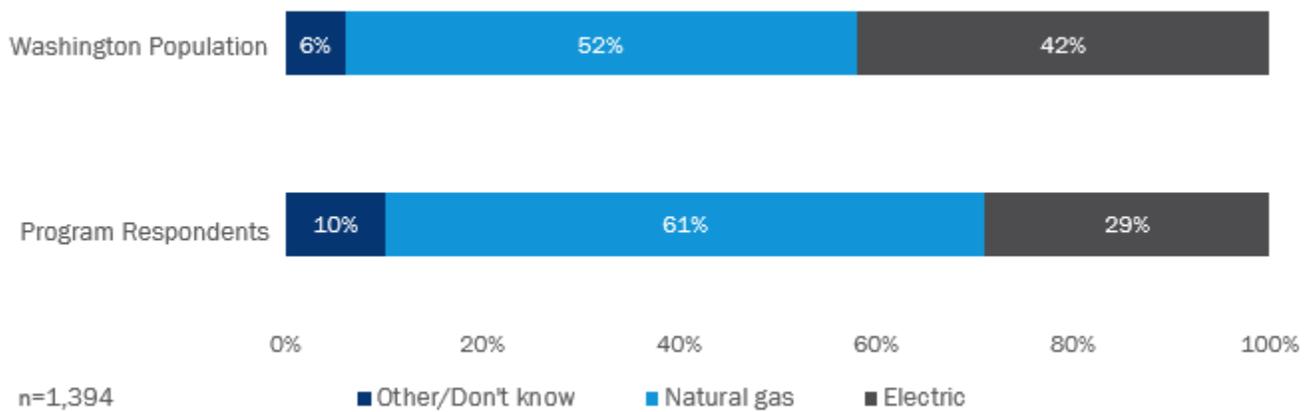
Note: Washington population data is from the Northwest Energy Efficiency Alliance Residential Building Stock Assessment II, 2016-2017.

6.2.10 Program Improvement Suggestions

Given that one of the KPIs for the program is customer satisfaction and PSE staff mentioned having an interest in understanding customer expectations about the program, the evaluation team asked participants to directly provide recommendations through the survey. Participants came up with several reoccurring recommendation themes. Some of the common themes are as follows:

- Include newer tips/recommendations for energy savings, as the current ones are "common sense".

- Provide a specialist follow up after the assessment visit to remind customers about the energy saving recommendations and to answer further questions about upgrade costs/rebates.

- Provide more specific details about where the high home-energy usage is actually coming from to make the assessment more meaningful.

- Offer more equipment in terms of the quantity of each equipment type and the variety of equipment.

Participants also answered a question about examples of other equipment PSE could provide through the program to spur further interest. The main equipment types that participants suggested were:

- Air/furnace filters

- Heat Pumps

- Insulation

- Smart thermostats

- Solar panels

Though not suggested by participants, the evaluation team is familiar with home energy assessment programs offered by other utilities around the country. Lower cost non-lighting measures PSE could also consider include weatherization measures, such as outlet gaskets and weather stripping, pipe wrap/insulation, and/or water heater blankets.

Appendix A. HEA Participant Survey

The following section includes the participant survey instrument. The survey sought to gain feedback on the participant's experience, satisfaction and suggested areas of improvement. The survey focused on impact- and process-related topics regarding measure installation, measure retention, additional actions influenced by the program, and satisfaction with program elements that had not been addressed by PSE's survey evaluation team. To this end, the survey was focused on addressing the following research goals in the evaluation plan for this program:

■ Verify program participation, assessment report receipt, and measure receipt, installation, and persistence;

■ Gauge the influence of the assessment recommendations on additional actions taken and participation in other energy efficiency programs; and

■ Assess customer satisfaction with the program offerings against expectations.

Survey Structure

Table 18 summarizes the survey structure, participant types, and research objectives/topics by section.

Table 18. Survey Sections and Structure

Survey Section	Participation Type by Year	Purpose of Section
Screener	2017 - 2019	• Introduces survey purpose and confirms that the respondent recalls participating in the program at the address on record • Terminates customers who do not recall participation from the survey
Program Awareness	2017 – 2019	• Identifies marketing efforts that are successful in reaching respondents and factors driving program enrollment
Verification	2017 – 2019	• Verifies that the respondent received an assessment, assessment report, and at least some of the following measures: LEDs, low-flow showerheads, and faucet aerators
Persistence of Installed Equipment		• Determines the quantity of each measure type still installed to calculate measure persistence
Verification / Influence of HEA program on Channeled Customers	2017 – 2018 who participated in another PSE program after HEA program	• Verifies participation in another PSE program after HEA program (based on channeling analysis) • Determines if respondent participated in other PSE programs after HEA program that are not on record • Assesses influence of HEA program on decision to participate in other PSE programs

Survey Section	Participation Type by Year	Purpose of Section
Influence of HEA program on Other Customers	2017 – 2018 for whom there is no record of participation in another PSE program after HEA program	• Determines if respondent participated in another PSE program after HEA program • For those who did, assesses influence of HEA program on decision to participate in other PSE programs
Additional or Increased EE actions	2017 - 2019	• Determines which EE actions were recommended by energy specialist • Inquires which recommended EE actions respondent has taken or plans to take in the future • Asks about influence of HEA program on decision to take additional EE actions
Future Participation Plans	2017 - 2019	• Determines if respondent is considering participating in other PSE programs after HEA program

Customer Satisfaction	2017 – 2019	• Gathers data about satisfaction with program and various programmatic elements:
		  o Time it took between scheduling the assessment and when the assessment was completed
		  o Professionalism of energy specialist
		  o Quality of work completed by energy specialist
		  o Time it took to complete assessment
		  o Assessment report in helping understand home energy usage
		  o Assessment report in helping you understand how to reduce your energy usage
		  o Quality of the equipment provided to you during your assessment
		  o Savings noticed on electric bill since assessment was completed
		  o Program overall

Recommendations for Improvement	2017 – 2019	• Asks respondents for recommendations to improve program elements including:
		  o Scheduling the assessment
		  o Assessment visit
		  o Assessment report
		  o Quality of equipment provided
		  o Types of equipment provided

Demographics	2017 – 2019	• Respondent characteristics related to:
		  o Home type
		  o Year home built
		  o Number of occupants
		  o Home heating type

Survey Section	Participation Type by Year	Purpose of Section
		o Home water heat type o Cooling equipment type (if any)

Survey Instrument

Sample Variables and Read-Ins

YEAR   Year of program participation
BILLINGADDRESS   Billing address
BILLINGCITY   Billing city
BILLINGSTATE   Billing state
BILLINGPOSTALCODE Billing postal code
EQ_FL   Flag = 0 or 1 indicating whether customer received free equipment
LED_FL   Flag = 0 or 1 indicating whether customer received free LEDs
SH_FL   Flag = 0 or 1 indicating whether customer received low-flow showerheads
FA_FL   Flag = 0 or 1 indicating whether customer received faucet aerators
LED_QTY   Program tracking data quantity of LEDs provided to respondent
SH_QTY   Program tracking data quantity of low-flow showerheads provided to respondent
FA_QTY   Program tracking data quantity of faucet aerators provided to respondent
PGM_FL   Flag = 0 or 1 indicating whether customer participated in another PSE program after the HEA program
PGM1   Name of 1st program customer participated in after HEA program according to program tracking data (if applicable)
PGM2   Name of 2nd program customer participated in after the HEA program according to program tracking data (if applicable)
PGM3   Name of 3rd program customer participated in after the HEA program according to program tracking data (if applicable)

Variables Calculated in Survey

LED_CQTY   Received number of LEDs according to respondent
SH_CQTY   Received number of showerheads according to respondent
FA_CQTY   Received number of faucet aerators according to respondent
CPGM_FL   Flag = 0 or 1 indicating whether customer reportedly participated in another PSE program after the HEA program according to respondent
CPGM1   Name of 1st program customer participated in after HEA program according to respondent
CPGM2   Name of 2nd program customer participated in after the HEA program according to respondent
CPGM3   Name of 3rd program customer participated in after the HEA program according to respondent

Introduction

Thank you for your participation in this survey. Your responses will help Puget Sound Energy (PSE) improve its energy efficiency programs for residential customers. Your answers will remain strictly confidential. If you have

only a short amount of time right now, you may complete part of the survey and come back to it where you left off when you have more time.

Please click the arrows below to start the survey.

Screener

S1.   Our records show that you participated in PSE's Home Energy Assessment (HEA) program in **<YEAR>**. As part of the program, someone came to your residence at <BILLINGADDRESS> <BILLINGCITY> <BILLINGSTATE> <BILLINGPOSTALCODE> and completed a home energy assessment, recommended additional ways to save energy, and possibly provided you with some LED light bulbs, low-flow showerheads, and/or faucet aerators.

Do you remember participating in this program?
    1.   Yes
    2.   Yes, but in a year other than **<YEAR>**
    3.   No **[TERMINATE]**

[TERMINATE TEXT: "Thank you for your time, but this study is focused on customers who participated in PSE's program. Unfortunately, you do not qualify for the survey. Have a great day."]

[ASK S2 IF S1 = 2]

S2.   In what year did you participate?

2017 (1)	2018 (2)	2019 (3)	Do not recall (98)
⬚	⬚	⬚	⬚

[CALCULATE/REPLACE <YEAR>
IF S2 =1, then YEAR= 2017
IF S2= 2, then YEAR= 2018
IF S2 =3, then YEAR= 2019]

Program Awareness

PA1.   How did you learn that you could receive a free assessment? Select all that apply. **[MULTIPLE RESPONSE]**

	Select all that apply (1)
a. Someone knocked on my door and told me about the opportunity	⬚
b. Received a postcard	⬚
c. Saw a social media ad	⬚
d. Saw a digital display banner	⬚

	Select all that apply (1)
e. Received an email	☐
f. Saw a television ad	☐
g. Heard about it through friend/family	☐
h. A contractor told me about it	☐
j. At a community event	☐
k. Mail	☐
l. Bill insert	☐
m. PSE Website	☐
n. Can't Recall	☐
o. Word of mouth	☐
p. My initiative	☐
q. Past participation	☐
o. Other, specify	**[OPEN END]**

PA2.   Originally, how did you sign up for the Home Energy Assessment?

	Select (1)
a. Through Puget Sound Energy's website	☐
b. By phone	☐
e. Signed up at an event	☐
c. Other, specify	**[OPEN END]**
d. Do not recall	☐

Verification

V1.   Our records show that you received a home assessment that provided you with energy saving items and recommendations to reduce your energy usage. Is this correct?
1.   Yes
2.   No
98.   Do not recall

V2.   Additionally, our records show that you received the following items during your home energy assessment. Please indicate whether this information is correct or not.

Equipment Received During Assessment	Correct (1)	Correct Equipment but Incorrect Quantity (2)	Did not receive any (3)
a. **[ASK IF LED_FL = 1] <LED_QTY>** LED light bulbs	☐	☐	☐
b. **[ASK IF SH_FL=1] <SH_QTY>** Low-flow showerheads	☐	☐	☐
c. **[ASK IF FA_FL =1] <FA_QTY>** Faucet aerators	☐	☐	☐

[ASK V3 IF ANY V2a – V2c = 2]

V3.   Since our records have the incorrect quantity of some of the items you received during your assessment, please provide the correct quantity.

What is the correct quantity you received during the assessment?	Quantity Received [NUMERIC OPEN END]
a. **[ASK IF V2a = 2]** LED light bulbs	<Range from 1 – 30>
b. **[ASK IF V2b = 2]** Low-flow showerheads	<Range from 1 – 10>
c. **[ASK IF V2c = 2]** Faucet aerators	<Range from 1 – 4>

[CALCULATE CORRECT QUANTITIES OF EQUIPMENT
IF V2a = 1, then LED_CQTY = LED_QTY
IF V2a = 2, then LED_CQTY = response to V3a
IF V2a = 3, then LED_CQTY = 0

IF V2b = 1, then SH_CQTY = SH_QTY
IF V2b = 2, then SH_CQTY = response to V3b
IF V2b = 3, then SH_CQTY = 0

IF V2c = 1, then FA_CQTY = FA_QTY
IF V2c = 2, then FA_CQTY = response to V3c
IF V2c = 3, then FA_CQTY = 0]

[ASK IF LED_CQTY > 0]

V30.   How many of the <LED_CQTY> LEDs were installed in your home? **[NUMERICAL OPEN END 0 - 99, 998 = DO NOT RECALL]**

[IF RESPONSE TO V30 = 0 THEN LED_IQTY = 0
IF 0 < RESPONSE TO V30 < LED_CQTY THEN RESPONSE TO V30 = LED_IQTY
IF RESPONSE TO V30 = 998 OR = LED_CQTY, THEN LED_CQTY = LED_IQTY]

[ASK V4a IF 0 < LED_IQTY < LED_CQTY]

V4a.   What did you do with the LEDs that weren't installed? Select all that apply. **[MULTIPLE RESPONSE]**
    1.   Put the LEDs in storage
    2.   Threw the LEDs away
    00. Other, specify **[OPEN END]**
    98. Do not recall

V4b.   What is the main reason you did not install all the free LEDs you received?
    1.   Did not need as many as energy specialist provided/waiting for light bulbs to burn out
    2.   Don't have a light socket where I use that wattage or type
    3.   Don't like LEDs
    00.   Other, specify **[OPEN END]**
    98.   Do not recall

[ASK V5 IF ANY <SH_CQTY>, <FA_CQTY> > 0]

V5. Did you install the following items?

	Yes (1)	No (2)	Do not recall (98)
a. **[ASK IF <SH_CQTY> > 0]** <SH_CQTY> Low-flow showerheads	☐	☐	☐
b. **[ASK IF <FA_CQTY> > 0]** <FA_CQTY> Faucet aerators	☐	☐	☐

[ASK V6a, V6aa AND V7a IF V5a = 2]
V6a. How many of the <SH_CQTY> low-flow showerheads were installed in your home? **[NUMERICAL OPEN END 0 – 20, 98 = DO NOT RECALL]**

[IF RESPONSE TO V6a = 0 THEN SH_IQTY = 0
IF 0 < RESPONSE TO V6a < SH_CQTY THEN RESPONSE TO V6a = SH_IQTY
IF RESPONSE TO V6a = 98 OR = SH_CQTY, THEN SH_CQTY = SH_IQTY]

V6aa. What is the main reason you did not install all of the low-flow showerheads you received?
1. Did not need as many as energy specialist provided
2. I didn't like how they looked
3. They didn't fit
4. I haven't gotten around to it
5. I like my current shower head and didn't want to replace it.
6. Already had them installed
7. I don't like low flow showers
00. Other, specify **[OPEN END]**
98. Do not recall

[ASK V7a IF SH_IQTY < SH_CQTY]
V7a. What did you do with the low-flow showerheads that weren't installed? Select all that apply. **[MULTIPLE RESPONSE]**
1. Put in storage
2. Threw away
3. Gave it away/ Donated
4. Installed somewhere else
00. Other, specify **[OPEN END]**
98. Do not recall

[ASK V6b, V6bb AND V7b IF V5b = 2]
V6b. How many of the <FAC_CQTY> faucet aerators were installed in your home? **[NUMERICAL OPEN END 0 – 10, 98 = DO NOT RECALL]**

[IF RESPONSE TO V6b = 0 THEN FA_IQTY = 0
IF 0 < RESPONSE TO VFA < FA_CQTY THEN RESPONSE TO V6b = FA_IQTY
IF RESPONSE TO V6b = 98 OR = FA_CQTY, THEN FA_CQTY = FA_IQTY

IF V5a=1 THEN FA_CQTY= FA_IQTY]

V6bb.   What is the main reason you did not install all of the faucet aerators you received?
      1.   Did not need as many as energy specialist provided
      2.   I already had aerators installed
      3.   They did not fit my faucet(s)
      4.   I don't like faucet aerators
      00.   Other, specify **[OPEN END]**
      98.   Do not recall

[ASK V7b IF FA_IQTY < FA_CQTY]

V7b.   What did you do with the faucet aerators that weren't installed? Select all that apply. **[MULTIPLE RESPONSE]**
      1. Put in storage
      2. Threw away
      3. Gave away/donated
      00. Other, specify **[OPEN END]**
      98. Do not recall

[ASK VLED1 IF LED_CQTY > 0]
Please answer the following questions about the LEDs that were installed in your home.

VLED1**.** What types of lamps or bulbs were replaced with the LEDs you received from PSE?

The LEDs …	Select all that apply [MULTIPLE RESPONSE] (1)
a. Replaced incandescent or halogen bulbs	☐
b. Replaced CFLs	☐
c. Replaced other LEDs	☐
d. Were installed in empty sockets	☐
e. Replaced other types of bulbs (not sure of type)	☐
f. Do not recall	☐

[ASK VLED2 IF ANY VLED1a, VLED1b, VLED1c, VLED1e = 1]
VLED2. Were the lights or bulbs that were replaced with free LEDs still working?
      1.   Some of them were working
      2.   None of them were working
      3.   All of them were working
      98.   Do not recall

[ASK VFA1 IF FA_IQTY > 0]

Now please think about the faucet aerators you received and installed through the program.

VFA1.   Where are the free faucet aerators you received installed? Select all that apply. **[MULTIPLE RESPONSE]**

Location of Faucet Aerator Installation	Installed here
a. Kitchen	⬜
b. Bathroom	⬜
c. Other, specify	**[OPEN END]**
d. Do not recall	⬜
e. Laundry room	⬜
f. Haven't Installed yet	⬜

Persistence of Installed Equipment

P1. Have you removed any of the items since they were first installed by either you or the energy specialist?

Assessment Items Installed	Yes (1)	No (2)	Do not recall (98)
a. **[ASK IF LED_ IQTY> 0]** Any of the LED light bulbs	⬜	⬜	⬜
b. **[ASK IF SH_ IQTY> 0]** Any of the low-flow showerheads	⬜	⬜	⬜
c. **[ASK IF FA_ IQTY> 0]** Any of the faucet aerators	⬜	⬜	⬜

[ASK IF P1a = 1]

P2a. Why did you remove the LED(s)? Select all that apply. **[MULTIPLE RESPONSE]**
1. I do not like light quality (It's not bright enough or it's too bright)
2. I do not like appearance of bulb(s)
3. Stopped working or burned out
4. Never worked properly
00. Other, specify
98. Do not recall

[ASK IF P2b = 1]

P2b. Why did you remove the high efficiency showerhead(s)? Select all that apply. **[MULTIPLE RESPONSE]**
1. The showerhead(s) broke or started to leak
2. The showerhead(s) had low water pressure
3. I disliked the look of the showerhead(s)
5. I purchased a better showerhead
6. Remodeled Bathroom
7. They were never installed
00. Other **[OPEN END]**
98. Do not recall

[ASK IF P1c = 1]

P2c. Why did you remove the faucet aerator(s)? Select all that apply. **[MULTIPLE RESPONSE]**
1. Faucet aerator(s) broke
2. Faucet aerator(s) stopped working properly

3.   Faucet aerators(s) never worked properly
4.   Did not like faucet aerators
5.   Bought a new faucet fixture
00.   Other **[OPEN END]**
98.   Do not recall

[ASK IF ANY P1a, P1b, P1c = 1]

P3.   What did you do with the equipment you removed? Select all that apply. **[MULTIPLE RESPONSE]**

Removed Equipment	I put them in storage (1)	I threw them away (2)	I gave them away (3)	I installed them somewhere else (4)	Do not recall (98)
a. **[ASK IF P1a = 1]** LED light bulbs	⬚	⬚	⬚	⬚	⬚
b. **[ASK IF P1b = 1]** Low-flow showerheads	⬚	⬚	⬚	⬚	⬚
c. **[ASK IF P1c = 1]** Faucet aerators	⬚	⬚	⬚	⬚	⬚

[ASK IF LED_ IQTY> 0]

P4.   Of the free LEDs from PSE that you installed, are any still working?
1.   Yes
2.   No
98.   Do not recall

Influence of HEA Program on Channeled Customers

[ASK CH1 IF <PGM_FL> = 1]

CH1.   Program records show that you participated in the following PSE programs <u>since your participation</u> in the HEA program. Is this correct?

Did you participate in…	Yes (1)	No (2)	Do not recall (98)
a. **<PGM1>**	⬚	⬚	⬚
b. **[ASK IF PGM2 <> NULL] <PGM2>**	⬚	⬚	⬚
c. **[ASK IF PGM3 <> NULL] <PGM3>**	⬚	⬚	⬚

[CALCULATE NUMBER OF RESPONSES PERMITTED TO CH1a
<REMAINING> = 3 - # OF YES RESPONSES PROVIDED TO CH1]

[ASK CH1a IF REMAINING > 0]
CH1a.   Are there other programs you have participated in since your participation in the HEA program? Please select up to **<REMAINING>** program(s) from the list below.

Program Options	Select
a. **[ASK IF ANY PGM1 TO PGM3 <> "Appliance Rebates"]** Appliance Rebates	☐
b. **[ASK IF ANY PGM1 TO PGM3 <> "Appliance Recycling"]** Appliance Recycling	☐
c. **[ASK IF ANY PGM1 TO PGM3 <> "Retail Lighting Rebates"]** Retail Lighting Rebates	☐
d. **[ASK IF ANY PGM1 TO PGM3 <> "Rebates for Web Enabled Thermostats"]** Rebates for Web Enabled Thermostats	☐
e. **[ASK IF ANY PGM1 TO PGM3 <> "Rebates for Home Weatherization"]** Rebates for Home Weatherization	☐
f. **[ASK IF ANY PGM1 TO PGM3 <> "HVAC"]** Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates	☐
g. **[ASK IF ANY PGM1 TO PGM3 <> "Water Heating Equipment Rebates"]** Water Heating Equipment Rebates	☐
h. **[ASK IF ANY PGM1 TO PGM3 <> "Rebates for Residential Windows"]** Rebates for Residential Windows	☐
i. Green Power	☐
j. Solar Choice	☐
k. Carbon Balance	☐
l. No other programs	☐
m. Other, specify	[OPEN END]

[INSERT CORRECT PROGRAM NAMES IN WHICH CUSTOMER PARTICIPATED
IF CH1a = 1, then CPGM1= PGM1
IF CH1b = 1, then CPGM2= PGM2
IF CH1c = 1, then CPGM3= PGM3

IF CH1a = 2 AND CH1a <> l, then CPGM1 = first response to CH1a
IF CH1b = 2 AND CH1a <> l, then CPGM2 = second response to CH1a
IF CH1c = 2 AND CH1a <> l, then CPGM3 = third response to CH1a

IF CH1a = 2 AND CH1a = l, then CPGM1 = NULL
IF CH1b = 2 AND CH1a = l, then CPGM2 = NULL
IF CH1c = 2 AND CH1a = l, then CPGM3 = NULL

IF ANY CPGM1 - CPGM3 <> NULL, then CPGM_FL = 1]

[ASK CH2 AND CH3 IF CPGM_FL = 1]

CH2.   How much influence did the HEA program have on your decision to participate in…

	1 Not at all influential	2 Slightly influential	3 Somewhat influential	4 Very influential	5 Extremely influential
1. **[Ask if CPGM1 <> NULL]** the <**CPGM1**> program	☐	☐	☐	☐	☐

	1 Not at all influential	2 Slightly influential	3 Somewhat influential	4 Very influential	5 Extremely influential
2. **[Ask if CPGM2 <> NULL]** the <**CPGM2**> program	☐	☐	☐	☐	☐
3. **[Ask if CPGM3 <> NULL]** the <**CPGM3**> program	☐	☐	☐	☐	☐

[ASK NCH1 THROUGH NCH3c IF <PGM_FL> = 0]

Influence of HEA Program on Other Participants

NCH1.   Have you participated in other Puget Sound Energy (PSE) programs since your participation in the HEA program?

  1. Yes
  2. No **[go to INTRO_AA0]**
  98. Do not recall **[go to INTRO_AA0]**

[ASK NCH1a AND NCH2 if NCH1 = 1]

NCH1a. What other programs have you participated in since your participation in the HEA program? Please select up to three options.

Program Options	Select
a. Appliance Rebates	☐
b. Appliance Recycling	☐
c. Retail Lighting Rebates	☐
d. Rebates for Web Enabled Thermostats	☐
e. Rebates for Home Weatherization	☐
f. Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates	☐
g. Water Heating Equipment Rebates	☐
h. Rebates for Residential Windows	☐
i. Green Power	☐
j. Solar Choice	☐
k. Carbon Balance	☐
l. Other	**[OPEN END]**

[LET CPGM1 = first response to NCH1a
LET CPGM2 = second response to NCH1a, if selected, else NULL
LET CPGM3 = third response to NCH1a, if selected, else NULL]

NCH2.   How much influence did the HEA program have on your decision to participate in…

	1 Not at all influential	2 Slightly influential	3 Somewhat influential	4 Very influential	5 Extremely influential
[Ask if CPGM1 <> NULL] the <CPGM1> program	☐	☐	☐	☐	☐
[Ask if CPGM2 <> NULL] the <CPGM2> program	☐	☐	☐	☐	☐
[Ask if CPGM3 <> NULL] the <CPGM3> program	☐	☐	☐	☐	☐

Additional or Increased Energy Efficiency Actions

INTRO_AA0. Please answer the following questions about recommendations your energy specialist may have suggested to you to further reduce your energy usage.

AA0.   Do you recall receiving an assessment report after your Home Energy Assessment?

1.   Yes
2.   No
98.   Do not recall

[ASK AA0a if AA0 = 1, ELSE SKIP TO AA1]

AA0a.   How did you receive the assessment report after your Home Energy Assessment? Select all that apply. **[MULTIPLE RESPONSE]**

By mail (1)	By email (2)	In-person (3)	Did not receive one (4)	Don't Recall (98)
☐	☐	☐	☐	☐

AA1.   Do you recall receiving recommendations directly from your energy specialist or in an assessment report about ways to save energy in your home?

1.   Yes
2.   No
98.   Do not recall

[ASK AA2 IF AA1 = 1, ELSE SKIP TO PA1]

[ASK AA2 IF AA1 = 1, ELSE SKIP TO PA1]

AA2.   Please indicate whether the energy specialist or assessment report provided you with the following recommendations:

Recommendations	Yes (1)	No (2)	Don't Recall (98)
a. Turn out lights when not in use	☐	☐	☐
b. Change air/furnace filters regularly	☐	☐	☐
c. Repair air leaks	☐	☐	☐
d. Upgrade attic, floor, or wall insulation	☐	☐	☐
e. Upgrade windows	☐	☐	☐
f. Upgrade home ventilation system	☐	☐	☐
g. Adjust thermostat settings for optimal performance	☐	☐	☐
h. Upgrade to a smart thermostat	☐	☐	☐
i. Get a pre-season tune-up of heating/cooling systems	☐	☐	☐
j. Shut off/set computer to sleep when not in use	☐	☐	☐
k. Upgrade appliances	☐	☐	☐
l. Lower water heating temperature settings	☐	☐	☐
m. Insulate water heater pipes	☐	☐	☐
n. Run full dishwasher loads	☐	☐	☐
o. Wash laundry in cold water	☐	☐	☐
q. Clean lint filters	☐	☐	☐
r. Close fireplace damper	☐	☐	☐
s. Change fan blade direction	☐	☐	☐
t. Install insulated drapes	☐	☐	☐
u. Plastic window sheeting	☐	☐	☐
v. Use the right size pots	☐	☐	☐
w. Maintain air gap on refrigerator	☐	☐	☐
p. Other	**[OPEN END]**		

[ASK IF ANY AA2a – AA2p = 1]

AA3.   Please indicate which recommendations you have taken or have taken more of <u>since you received your assessment</u>, which recommendations you plan to take or take more of, and which you do not plan to take:

Recommendations	Have taken (1)	Plan to take (2)	Do not plan to take (3)	Have not decided (4)
a. **[ASK IF AA2a = 1]** Turn out lights when not in use	☐	☐	☐	☐
b. **[ASK IF AA2b = 1]** Change air filters regularly	☐	☐	☐	☐
c. **[ASK IF AA2c = 1]** Repair air leaks	☐	☐	☐	☐
d. **[ASK IF AA2d = 1]** Upgrade attic, floor, or wall insulation	☐	☐	☐	☐
e. **[ASK IF AA2e = 1]** Upgrade windows	☐	☐	☐	☐
f. **[ASK IF AA2f = 1]** Upgrade home ventilation system	☐	☐	☐	☐
g. **[ASK IF AA2g = 1]** Adjust thermostat settings for optimal performance	☐	☐	☐	☐
h. **[ASK IF AA2h = 1]** Upgrade to a smart thermostat	☐	☐	☐	☐
i. **[ASK IF AA2i = 1]** Get a pre-season tune-up of heating/cooling systems	☐	☐	☐	☐

Recommendations	Have taken (1)	Plan to take (2)	Do not plan to take (3)	Have not decided (4)
j. **[ASK IF AA2j= 1]** Shut off/set computer to sleep when not in use	☐	☐	☐	☐
k. **[ASK IF AA2k = 1]** Upgrade appliances	☐	☐	☐	☐
l. **[ASK IF AA2l = 1]** Adjust water heating settings	☐	☐	☐	☐
m. **[ASK IF AA2m = 1]** Insulate water heater pipes	☐	☐	☐	☐
n. **[ASK IF AA2n = 1]** Run full dishwasher loads	☐	☐	☐	☐
o. **[ASK IF AA2o = 1]** Wash laundry in cold water	☐	☐	☐	☐
q. **[ASK IF AA2q = 1]** Clean lint filters	☐	☐	☐	☐
r. **[ASK IF AA2r = 1]** Close fireplace damper	☐	☐	☐	☐
s. **[ASK IF AA2s = 1]** Change fan blade direction	☐	☐	☐	☐
t. **[ASK IF AA2t = 1]** Install insulated drapes	☐	☐	☐	☐
u. **[ASK IF AA2u = 1]** Plastic window sheeting	☐	☐	☐	☐
v. **[ASK IF AA2v = 1]** Use the right size pots	☐	☐	☐	☐
w. **[ASK IF AA2w = 1]** Maintain air gap on refrigerator	☐	☐	☐	☐
p. **[ASK IF AA2p = 1]** [List Open End Response]	☐	☐	☐	☐

[ASK IF AA3d = 1]

AA4. You indicated upgrading attic, floor, or wall insulation. Please identify all areas where you upgraded insulation and whether the upgrade was major or minor:

Area of Insulation Upgrade	1 Minor	2 Major
Attic	☐	☐
Floor	☐	☐
Wall	☐	☐

[ASK IF AA3e = 1]

AA4a. You indicated that you upgraded windows. How many windows did you upgrade? **[NUMERICAL OPEN END, 1 – 99, 998 = DO NOT RECALL]**

[ASK IF AA3k = 1]

AA4b. You indicated that you upgraded appliances. Please indicate whether you upgraded to the following appliances **[MULTIPLE RESPONSE]**

1. ENERGY STAR Refrigerator
2. ENERGY STAR Freezer
3. ENERGY STAR Clothes Washer
4. ENERGY STAR Clothes Dryer
8. ENERGY STAR Dishwasher
9. ENERGY STAR Water heater
5. Other ENERGY STAR Appliance, please specify **[OPEN END]**
6. Upgraded appliances but they were not ENERGY STAR rated
7. Do not recall

[ASK FOR ANY AA3a – AA3n = 3]

AA5.   Why do you not plan on taking the following energy efficiency actions?

a. **[ASK IF AA3a = 3]** Turn out lights when not in use
b. **[ASK IF AA3b = 3]** Change air filters regularly
c. **[ASK IF AA3c = 3]** Repair air leaks
d. **[ASK IF AA3d = 3]** Upgrade attic, floor, or wall insulation
e. **[ASK IF AA3e = 3]** Upgrade windows
f. **[ASK IF AA3f = 3]** Upgrade home ventilation system
g. **[ASK IF AA3g = 3]** Adjust thermostat settings for optimal performance
h. **[ASK IF AA3h = 3]** Upgrade to a smart thermostat
i. **[ASK IF AA3i = 3]** Get a pre-season tune-up of heating/cooling systems
j. **[ASK IF AA3j = 3]** Shut off/set computer to sleep when not in use
k. **[ASK IF AA3k = 3]** Upgrade appliances
l. **[ASK IF AA3l = 3]** Adjust water heating settings
m. **[ASK IF AA3m = 3]** Insulate water heater pipes
n. **[ASK IF AA3n = 3]** Run full dishwasher loads
o. **[ASK IF AA3o = 3]** Wash laundry in cold water
q. **[ASK IF AAq=3]** Clean lint filters
r. **[ASK IF AAr=3]** Close fireplace damper
s. **[ASK IF AAs=3]** Change fan blade direction
t. **[ASK IF AAt=3]** Install insulated drapes
u. **[ASK IF AAu=3]** Plastic window sheeting
v. **[ASK IF AAv=3]** Use the right size pots
w. **[ASK IF AAw=3]** Maintain air gap on refrigerator
p. **[ASK IF AAp=3] [LIST OPEN END RESPONSE]**
    [OPEN END RESPONSE]
    98 Do not recall / Not sure

[ASK IF ANY OF AA3a – AA3m=1]

AA6.   On a scale from 1 to 5 where 1 is not at all influential and 5 is extremely influential, how influential was the HEA program on your decision to carry out energy efficiency actions since the assessment?

1 Not at all influential	2 Slightly influential	3 Somewhat influential	4 Very influential	5 Extremely influential
☐	☐	☐	☐	☐

Future Participation Plans

PL1.   Would you consider participating in other PSE programs in the future?
    1.   Yes
    2.   No
    98.   Not sure

[ASK PL1a if PL1=2]

PL1a. What might prevent you from participating in the future?
        [OPEN END]
        98.   Not sure

[ASK PL2 IF PL1 <> 2]

[ASK PL2 IF PL1 <> 2]

PL2.   Which programs would you consider participating in?

Program Options	Select
a. Appliance Rebates	☐
b. Appliance Recycling	☐
c. Retail Lighting Rebates	☐
d. Rebates for Web Enabled Thermostats	☐
e. Rebates for Home Weatherization Equipment	☐
f. Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates	☐
g. Water Heating Equipment Rebates	☐
h. Rebates for Residential Windows	☐
i. Green Power	☐
j. Solar Choice	☐
k. Carbon Balance	☐
l. Other	**[OPEN END]**
m. None of these	☐
n. Electric Vehicle Charging	
o. Don't Know	

Customer Satisfaction/ Suggestions for Improvement

I'd like to ask you a few more questions about your experience while participating in this program.
CS1.   From the time you scheduled your **<YEAR>** energy assessment, about how many weeks did it take for an energy specialist to come conduct the assessment?
[NUMERIC OPEN END 0-100, 998 = DO NOT RECALL]

[ASK CS1a AND CS2 IF EQ_FL = 1]

CS1a.   Have you noticed any savings on your electric bill since participating in the HEA program?
        1.   Yes
        2.   No
        98.   Do not know

CS2. Please indicate how satisfied you are with the assessment and the equipment installed.

		1 Very Dissatisfied	2 Dissatisfied	3 Neither Satisfied nor Dissatisfied	4 Satisfied	5 Very Satisfied
a.	Overall satisfaction with the assessment experience	☐	☐	☐	☐	☐
b.	**[ASK IF CS1a = 1]** The amount of savings on your electric bill since participating the HEA program	☐	☐	☐	☐	☐
c.	**[ASK IF LED_CQTY > 0]** The quality of the free LED light bulb(s)	☐	☐	☐	☐	☐
d.	**[ASK IF SH_CQTY > 0]** The quality of the free low-flow showerhead(s)	☐	☐	☐	☐	☐
e.	**[ASK IF FA_CQTY > 0]** The quality of the free faucet aerator(s)	☐	☐	☐	☐	☐

CS3. Now please indicate how satisfied you are with various elements of the assessment and the energy specialist who came to your home and conducted the assessment.

		1 Very Dissatisfied	2 Dissatisfied	3 Neither Satisfied nor Dissatisfied	4 Satisfied	5 Very Satisfied
a.	The process of scheduling the assessment	☐	☐	☐	☐	☐
b.	The available appointment times for the assessment	☐	☐	☐	☐	☐
c.	The length of time it took to receive the assessment from when you scheduled it	☐	☐	☐	☐	☐
d.	The professionalism of energy specialist	☐	☐	☐	☐	☐

	1 Very Dissatisfied	2 Dissatisfied	3 Neither Satisfied nor Dissatisfied	4 Satisfied	5 Very Satisfied
e. The quality of the work completed by energy specialist	☐	☐	☐	☐	☐
f. The length of time it took to complete assessment after it started	☐	☐	☐	☐	☐
g. The assessment report in helping understand your home energy usage	☐	☐	☐	☐	☐
h. The assessment report in helping you understand how to reduce your energy usage	☐	☐	☐	☐	☐

[ASK CS4 IF CS2a < 3 OR ANY CS3<3]
CS4. Why were you less than satisfied with the following?
    [LIST IF CS2a < 3] assessment experience
    [LIST IF CS3a<3] process of scheduling the assessment
    [LIST IF CS3b<3] available times the assessment could be
    [LIST IF CS3c<3] length of time it took to receive the assessment from when you scheduled it
    [LIST IF CS3d<3] professionalism of energy specialist
    [LIST IF CS3e<3] quality of the work completed by energy specialist
    [LIST IF CS3f<3] length of time it took to complete assessment after it started
    [LIST IF CS3g<3] assessment report in helping understand your home energy usage
    [LIST IF CS3h<3] assessment report in helping you understand how to reduce your energy usage
[OPEN END]
98. Do not recall/ Not sure

CS5. What suggestions do you have for improving the assessment stage of the program?
[OPEN RESPONSE]
98. Do not recall/ Not sure

CS5a. What other types of equipment would you like to see provided through the HEA program? **[OPEN RESPONSE]**
98. Do not recall/ Not sure

[Ask CS6a IF ANY CS2d - CS2f <3]
CS6a. Why were you less than satisfied with the free products you received through the program? Select all that apply. **[MULTIPLE RESPONSE]**
    01   They don't look good/Poor aesthetics
    02   They don't save energy

03   They are lower quality than the products I used to have
04   They broke/don't function properly
05   I don't like the way that the device/installation functions
00   Other, please describe **[OPEN RESPONSE]**
98   Don't know / Can't recall

CS7. If offered by the energy specialist, would you have been willing to pay for any premium audit testing and/or services, such as a blower door test to check for your home's air tightness or minor fixes to appliances to reduce energy use?
1.   Yes
2.   No
8.   Don't know/ Not sure

[ASK CS8 IF CS7=1]

CS8. How much in dollars would you have been willing to pay for premium audit testing?
[NUMERIC OPEN END]
9998   Don't know/ Not sure

Fuel Type Questions

H1.   What type of fuel do you use primarily to heat your home?
1.   Natural gas
2.   Bottled, tank or LP gas
3.   Electric
4.   Oil, kerosene
5.   Coal
6.   Wood
7.   Solar
00.   Other, please specify **[OPEN RESPONSE]**
96.   No fuel
98.   Don't know

[ASK IF H1 = 3]

H2.   What type of electric heating equipment is in your home?
1.   Furnace
2.   Boiler
3.   Heat Pump
4.   Baseboard or wall heater (Also known as electric resistance heating)
00.   Other **[OPEN RESPONSE]**
98.   Don't Know

H3.   Do you have a central air conditioning system in your home?
1.   Yes
2.   No

8.   Don't know

H4.   What is the main type of fuel your home uses for water heating?
1.   Electric
2.   Gas
3.   Propane
00. Other **[OPEN RESPONSE]**
98. Don't know

Demographics

These last few questions you will see are about your home and your household.

D1.   Which of the following best describes your home or residence?
1.   Single-family detached home
2.   Single family attached home
3.   Mobile home
4.   Apartment or condominium
00.   Other, specify **[OPEN RESPONSE]**
98.   Don't know/ Prefer to not answer

[ASK IF D1 = 1]

D1a.   Is your home a factory manufactured or modular home?
1.   Yes, factory manufactured or modular
2.   No, conventionally built
8.   Don't know/ Prefer to not answer

[ASK IF D1 = 4]

D1b.   How many housing units or apartments are in your building?
1.   1
2.   2-3
3.   4-9
4.   10 or more
8.   Don't know/ Prefer to not answer

D2.   Do you own or rent this residence?
1.   Own
2.   Rent
8.   Don't know/ Prefer to not answer

[ASK IF D2 = 2]

D2a.   Do you pay your own electric bill or is it included in your rent?
1.   Pay bill
2.   Included in rent

8.   Don't know/ Prefer to not answer

D3.   How long have you lived in this residence?
1.   **[SHOW THIS RESPONSE ONLY IF <YEAR> = 2019>** Less than 1 year
2.   1-3 years
3.   4-10 years
4.   11-20 years
5.   More than 20 years
8.   Don't know/ Prefer to not answer

D4.   Including yourself, how many people currently live in your residence year-round?
[NUMERIC OPEN END 1-97]
98 Don't know/ Prefer to not answer

D5.   How many people under the age of 18 live in your residence?
[NUMERIC OPEN END 0-97]

98 Don't know/ Prefer to not answer

D6.   Approximately when was your residence first built?
1.   Before 1950
2.   1950-1969
4.   1970-1989
5.   1990-1999
7.   2000-2005
8.   2006-2009
9.   2010 or later
98.   Don't know/ Prefer to not answer

D7.   Would you estimate the square footage of your residence?
1.   Less than 1,001 sq. ft.
2.   Between 1,001 and 2,000 sq. ft.
3.   Between 2,001 and 3,000 sq. ft.
4.   Between 3,001 and 4,000 sq. ft.
5.   Between 4,001 and 5,000 sq. ft.
6.   Greater than 5,000 sq. ft.
8.   Don't know/ Prefer to not answer

D8.   In what year were you born**? [NUMERIC OPEN END 1900-2010]**
8.   Don't know/ Prefer to not answer

D9.   What is your highest level of education?
1.   Less than a high school degree
2.   High school degree
3.   Technical/trade school program
4.   Associates degree or some college
5.   Bachelor's degree
6.   Graduate / professional degree, e.g., J.D., MBA, MD, Ph.D.
8.   Don't know/ Prefer to not answer

D10.   What best describes your current employment status?
1.   Employed full-time
2.   Employed part-time
3.   Retired
4.   Not employed, but actively looking
5.   Not employed, and not looking
8   Don't know/ Prefer to not answer
9.   Other, please specify **[OPEN END]**

Those are all the questions I have. Thank you so much for your participation in this important survey.

[DIRECT RESPONDENT TO PSE's HOME PAGE: https://www.pse.com/]

Appendix B.   HEA Process Evaluation: Detailed Survey Results

In partnership with Puget Sound Energy (PSE), Opinion Dynamics conducted a survey of participants in PSE's Home Energy Assessment (HEA) program. The survey was fielded from August 19th, 2019 - September 15th, 2019 and resulted in completes from 1,394 participants.

Survey Results Topline

S1: Our records show that you participated in PSE's Home Energy Assessment (HEA) program in 20XX. As part of the program, someone came to your residence at , XXXX,   and completed a home energy assessment, recommended additional ways to save energy, and possibly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1355	97.2	97.2	97.2
	Yes, but in a year other than	39	2.8	2.8	100.0
	Total	1394	100.0	100.0	

REPLACE_YEAR:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2017	366	26.3	26.3	26.3
	2018	464	33.3	33.3	59.5
	2019	557	40.0	40.0	99.5
	Do not recall	7	.5	.5	100.0
	Total	1394	100.0	100.0	

PA1_a: Someone knocked on my door and told me about the opportunity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1340	96.1	96.1	96.1
	Yes	54	3.9	3.9	100.0
	Total	1394	100.0	100.0	

PA1_b: Received a postcard

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1191	85.4	85.4	85.4

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	203	14.6	14.6	100.0
	Total	1394	100.0	100.0	

PA1_c: Saw a social media ad

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1347	96.6	96.6	96.6
	Yes	47	3.4	3.4	100.0
	Total	1394	100.0	100.0	

PA1_d: Saw a digital display banner

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1369	98.2	98.2	98.2
	Yes	25	1.8	1.8	100.0
	Total	1394	100.0	100.0	

PA1_e: Received an email

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	865	62.1	62.1	62.1
	Yes	529	38.0	38.0	100.0
	Total	1394	100.0	100.0	

PA1_f: Saw a television ad

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1366	98.0	98.0	98.0
	Yes	28	2.0	2.0	100.0
	Total	1394	100.0	100.0	

PA1_g: Heard about it through friend/family

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1185	85.0	85.0	85.0
	Yes	209	15.0	15.0	100.0
	Total	1394	100.0	100.0	

PA1_h: A contractor told me about it

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1371	98.4	98.4	98.4
	Yes	23	1.6	1.6	100.0
	Total	1394	100.0	100.0	

PA1_j: At a community event

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1284	92.1	92.1	92.1
	Yes	110	7.9	7.9	100.0
	Total	1394	100.0	100.0	

PA1_k: Mailing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1,173	84.2	84.2	84.2
	Yes	221	15.9	15.9	100.0
	Total	1394	100.0	100.0	

PA1_l: Bill insert

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1319	94.6	94.6	94.6
	Yes	75	5.4	5.4	100.0
	Total	1394	100.0	100.0	

PA1_m: Website

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1291	92.7	92.7	92.7

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	102	7.3	7.3	100.0
	Total	1394	100.0	100.0	

PA1_n: Can't Recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1344	96.4	96.4	96.4
	Yes	50	3.6	3.6	100.0
	Total	1394	100.0	100.0	

PA1_o: Word of mouth

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1,170	83.9	83.9	83.9
	Yes	224	16.1	16.1	100.0
	Total	1394	100.0	100.0	

PA1_p: My initiative

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1,362	97.7	97.7	97.7
	Yes	32	2.3	2.3	100.0
	Total	1394	100.0	100.0	

PA1_q: Past participation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1380	99.0	99.0	99.0
	Yes	14	1.0	1.0	100.0
	Total	1394	100.0	100.0	

PA1_o: Other

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1366	98.0	98.0	98.0
	Yes	28	2.0	2.0	100.0
	Total	1394	100.0	100.0	

PA2: Originally, how did you sign up for the Home Energy Assessment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Through Puget Sound Energy's website	722	51.8	51.8	51.8
	By phone	408	29.3	29.3	81.1
	Email	3	.2	.2	81.3
	Front door ad	10	.7	.7	82.0
	Do not recall	181	13.0	13.0	95.0
	Signed up at an event	70	5.0	5.0	100.0
	Total	1394	100.0	100.0	

V1: Our records show that you received a home assessment that provided you with energy saving items and recommendations to reduce your energy usage. Is this correct?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1364	97.8	97.8	97.8
	No	17	1.2	1.2	99.1
	Do not recall	13	.9	.9	100.0
	Total	1394	100.0	100.0	

V2_a: LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Correct	944	67.7	94.0	94.0
	Correct Equipment but Incorrect Quantity	49	3.5	4.9	98.9
	Did not receive any	11	.8	1.1	100.0
	Total	1004	72.0	100.0	
Missing	System	390	28.0		
	Total	1394	100.0		

V2_b: Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Correct	585	42.0	71.8	71.8
	Correct Equipment but Incorrect Quantity	178	12.8	21.8	93.6
	Did not receive any	52	3.7	6.4	100.0
	Total	815	58.5	100.0	
Missing	System	579	41.5		
Total		1394	100.0		

V2_c: Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Correct	467	33.5	87.3	87.3
	Correct Equipment but Incorrect Quantity	20	1.4	3.7	91.0
	Did not receive any	48	3.4	9.0	100.0
	Total	535	38.4	100.0	
Missing	System	859	61.6		
Total		1394	100.0		

V3_a: LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	.3	8.2	8.2
	3	2	.1	4.1	12.2
	4	9	.6	18.4	30.6
	5	3	.2	6.1	36.7
	6	3	.2	6.1	42.9
	8	2	.1	4.1	46.9
	9	1	.1	2.0	49.0
	10	6	.4	12.2	61.2
	12	2	.1	4.1	65.3
	14	1	.1	2.0	67.3
	15	5	.4	10.2	77.6
	18	1	.1	2.0	79.6

		Frequency	Percent	Valid Percent	Cumulative Percent
	20	4	.3	8.2	87.8
	22	1	.1	2.0	89.8
	25	1	.1	2.0	91.8
	26	1	.1	2.0	93.9
	27	1	.1	2.0	95.9
	30	2	.1	4.1	100.0
	Total	49	3.5	100.0	
Missing	System	1345	96.5		
Total		1394	100.0		

V3_b: Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	67	4.8	37.6	37.6
	2	102	7.3	57.3	94.9
	3	9	.6	5.1	100.0
	Total	178	12.8	100.0	
Missing	System	1216	87.2		
Total		1394	100.0		

V3_c: Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	1.0	70.0	70.0
	2	6	.4	30.0	100.0
	Total	20	1.4	100.0	
Missing	System	1374	98.6		
Total		1394	100.0		

V30_1: How many of the LEDs were installed in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	.1	.2	.2
	1	20	1.4	2.5	2.7
	2	23	1.6	2.9	5.6
	3	27	1.9	3.4	9.0

4	41	2.9	5.1	14.1
5	22	1.6	2.7	16.8
6	23	1.6	2.9	19.7
7	26	1.9	3.2	22.9
8	26	1.9	3.2	26.1
9	22	1.6	2.7	28.9
10	23	1.6	2.9	31.7
11	17	1.2	2.1	33.8
12	29	2.1	3.6	37.4
13	18	1.3	2.2	39.7
14	20	1.4	2.5	42.2
15	24	1.7	3.0	45.1
16	21	1.5	2.6	47.8
17	11	.8	1.4	49.1
18	15	1.1	1.9	51.0
19	23	1.6	2.9	53.9
20	95	6.8	11.8	65.7
21	14	1.0	1.7	67.4
22	13	.9	1.6	69.0
23	15	1.1	1.9	70.9
24	14	1.0	1.7	72.6
25	8	.6	1.0	73.6
26	13	.9	1.6	75.2
27	7	.5	.9	76.1
28	16	1.1	2.0	78.1
29	16	1.1	2.0	80.1
30	160	11.5	19.9	100.0
Total	804	57.7	100.0	
Missing System	590	42.3		
Total	1394	100.0		

V30_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	804	57.7	81.0	81.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	189	13.6	19.0	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

V4a_1: Put the LEDs in storage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	7	.5	13.7	13.7
	Yes	44	3.2	86.3	100.0
	Total	51	3.7	100.0	
Missing	System	1343	96.3		
Total		1394	100.0		

V4a_2: Threw the LEDs away

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	51	3.7	100.0	100.0
Missing	System	1343	96.3		
Total		1394	100.0		

V4a_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	48	3.4	92.3	92.3
	Yes	4	.3	7.7	100.0
	Total	52	3.7	100.0	
Missing	System	1342	96.3		
Total		1394	100.0		

V4b: What is the main reason you did not install all the free LEDs you received?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1343	96.3	96.3	96.3

Did not need as many as energy specialist provided/ waiting for light bulbs to burn out	37	2.6	2.6	98.9
Do not recall	5	.4	.4	98.3
Don't have a light socket	5	.4	.4	99.7
Other, specify	4	.3	.3	100.0
Total	1394	100.0	100.0	

V5_a: Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	461	33.1	60.4	60.4
	No	266	19.1	34.9	95.3
	Do not recall	36	2.6	4.7	100.0
	Total	763	54.7	100.0	
Missing	System	631	45.3		
Total		1394	100.0		

V5_b: Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	303	21.7	62.2	62.2
	No	144	10.3	29.6	91.8
	Do not recall	40	2.9	8.2	100.0
	Total	487	34.9	100.0	
Missing	System	907	65.1		
Total		1394	100.0		

V6a_1: How many of the low-flow showerheads were installed in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	131	9.4	72.0	72.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	1	40	2.9	22.0	94.0
	2	10	.7	5.5	99.5
	3	1	.1	.5	100.0
	Total	182	13.1	100.0	
Missing	System	1212	86.9		
Total		1394	100.0		

V6a_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	182	13.1	91.5	91.5
	Yes	17	1.2	8.5	100.0
	Total	199	14.3	100.0	
Missing	System	1195	85.7		
Total		1394	100.0		

V6aa: What is the main reason you did not install all of the low-flow showerheads you received?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other, specify	10	0.7	4.0	4.0
	Did not need as many as energy specialist provided	18	1.3	7.3	11.3
	I didn't like how they looked	21	1.5	8.5	19.8
	They didn't fit	25	1.8	10.1	29.8
	I haven't gotten around to it	104	7.5	41.9	71.8
	I like my current showerhead	29	2.1	11.7	83.5
	Already had them installed	18	1.3	7.3	90.7
	I don't like low flow showerheads	3	0.2	1.2	91.9
	Do not recall	20	1.4	8.1	100.0
	Total	248	17.8	100.0	
Missing	System	1146	82.2		
Total		1394	1394		

V7a_1: Put in storage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	57	4.1	21.4	21.4
	Yes	209	15.0	78.6	100.0
	Total	266	19.1	100.0	
Missing	System	1128	80.9		
Total		1394	100.0		

V7a_2: Threw away

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	265	19.0	99.6	99.6
	Yes	1	.1	.4	100.0
	Total	266	19.1	100.0	
Missing	System	1128	80.9		
Total		1394	100.0		

V7a_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	254	18.2	95.5	95.5
	Yes	12	.9	4.5	100.0
	Total	266	19.1	100.0	
Missing	System	1128	80.9		
Total		1394	100.0		

V6b_1: How many of the faucet aerators were installed in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	92	6.6	78.6	78.6
	1	18	1.3	15.4	94.0
	2	7	.5	6.0	100.0
	Total	117	8.4	100.0	
Missing	System	1277	91.6		
Total		1394	100.0		

V6b_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	117	8.4	92.1	92.1
	Yes	10	.7	7.9	100.0
	Total	127	9.1	100.0	
Missing	System	1267	90.9		
Total		1394	100.0		

V6bb: What is the main reason you did not install all of the faucet aerators you received?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other, specify	27	1.9	18.8	18.8
	Did not need as many as energy specialist provided	5	.4	3.5	22.2
	I already had aerators installed	29	2.1	20.1	42.4
	They did not fit my faucet(s)	58	4.2	40.3	82.6
	I don't like faucet aerators	11	.8	7.6	90.3
	Do not recall	14	1.0	9.7	100.0
	Total	144	10.3	100.0	
Missing	System	1250	89.7		
Total		1394	100.0		

V7b_1: Put in storage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	40	2.9	27.8	27.8
	Yes	104	7.5	72.2	100.0
	Total	144	10.4	100.0	
Missing	System	1250	89.7		
Total		1394	100.0		

V7b_2: Threw away

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	143	10.3	99.3	99.3
	Yes	1	.1	.7	100.0
	Total	144	10.3	100.0	
Missing	System	1250	89.7		
Total		1394	100.0		

V7b_3: Gave away/Donated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	126	9.0	87.5	87.5
	Yes	18	1.3	12.5	100.0
	Total	144	10.3	100.0	
Missing	System	1250	89.7		
Total		1394	100.0		

V7b_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	127	9.1	88.2	88.2
	Yes	17	1.2	11.8	100.0
	Total	144	10.3	100.0	
Missing	System	1250	89.7		
Total		1394	100.0		

VLED1_a: Replaced incandescent or halogen bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	334	24.0	33.6	33.6
	Yes	659	47.3	66.4	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED1_b: Replaced CFLs

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	739	53.0	74.4	74.4
	Yes	254	18.2	25.6	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED1_c: Replaced other LEDs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	943	67.6	95.0	95.0
	Yes	50	3.6	5.0	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED1_d: Were installed in empty sockets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	938	67.3	94.5	94.5
	Yes	55	3.9	5.5	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED1_e: Replaced other types of bulbs (not sure of type)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	753	54.0	75.8	75.8
	Yes	240	17.2	24.2	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED1_f: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	No	932	66.9	93.9	93.9
	Yes	61	4.4	6.1	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

VLED2: Were the lights or bulbs that were replaced with free LEDs still working?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Some of them were working	218	15.6	23.4	23.4
	None of them were working	11	.8	1.2	24.6
	All of them were working	682	48.9	73.2	97.7
	Do not recall	21	1.5	2.3	100.0
	Total	932	66.9	100.0	
Missing	System	462	33.1		
Total		1394	100.0		

VFA1_a: Kitchen

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	233	16.7	64.7	64.7
	Yes	136	9.8	35.3	100.0
	Total	369	26.5	100.0	
Missing	System	1025	73.5		
Total		1394	100.0		

VFA1_b: Bathroom

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	96	6.9	26.0	26.0
	Yes	273	19.6	74.0	100.0
	Total	369	26.5	100.0	
Missing	System	1025	73.5		
Total		1394	100.0		

VFA1_d: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	326	23.4	88.3	88.3
	Yes	43	3.1	11.7	100.0
	Total	369	26.5	100.0	
Missing	System	1025	73.5		
Total		1394	100.0		

VFA1_e: Laundry Room

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	354	25.4	95.9	95.9
	Yes	15	1.1	4.1	100.0
	Total	369	26.5	100.0	
Missing	System	1025	73.5		
Total		1394	100.0		

VFA1_f: Haven't installed them yet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	367	26.3	99.5	99.5
	Yes	2	.1	.5	100.0
	Total	369	26.5	100.0	
Missing	System	1025	73.5		
Total		1394	100.0		

P1_a: Any of the LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	82	5.9	8.3	8.3
	No	869	62.3	87.5	95.8
	Do not recall	42	3.0	4.2	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

P1_b: Any of the low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	74	5.3	9.7	9.7
	No	638	45.8	83.6	93.3
	Do not recall	51	3.7	6.7	100.0
	Total	763	54.7	100.0	
Missing	System	631	45.3		
Total		1394	100.0		

P1_c: Any of the faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	43	3.1	8.8	8.8
	No	408	29.3	83.8	92.6
	Do not recall	36	2.6	7.4	100.0
	Total	487	34.9	100.0	
Missing	System	907	65.1		
Total		1394	100.0		

P2a_1: I do not like light quality (It's not bright enough or it's too bright)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	70	5.0	85.4	85.4
	Yes	12	.9	14.6	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P2a_2: I do not like appearance of bulb(s)

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	79	5.7	96.3	96.3
	Yes	3	.2	3.7	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P2a_3: Stopped working or burned out

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	37	2.7	45.1	45.1
	Yes	45	3.2	54.9	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P2a_4: Never worked properly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	78	5.6	95.1	95.1
	Yes	4	.3	4.9	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P2a_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	77	5.5	93.9	93.9
	Yes	5	.4	6.1	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P2b_1: The showerhead(s) broke or started to leak

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	63	4.5	85.1	85.1
	Yes	11	.8	14.9	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2b_2: The showerhead(s) had low water pressure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	38	2.7	51.4	51.4
	Yes	36	2.6	48.6	100.0
	Total	74	5.5	100.0	
Missing	System	1320	94.5		
Total		1394	100.0		

P2b_3: I disliked the look of the showerhead(s)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	68	4.9	91.9	91.9
	Yes	6	.4	8.1	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2b_5: I purchased a better showerhead

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	54	3.9	73.0	73.0
	Yes	20	1.4	27.0	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2b_6: Remodeled

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	No	68	4.9	91.9	91.9
	Yes	6	.4	8.1	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2b_7: Never Installed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	72	5.6	97.3	97.3
	Yes	2	.14	2.7	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2b_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	71	5.1	95.9	95.9
	Yes	3	.2	4.1	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P2c_1: Faucet aerator(s) broke

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	42	3.0	97.7	97.7
	Yes	1	.1	2.3	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P2c_2: Faucet aerator(s) stopped working properly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	40	2.9	93.0	93.0
	Yes	3	.2	7.0	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P2c_3: Faucet aerators(s) never worked properly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	35	2.5	81.4	81.4
	Yes	8	.6	18.6	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P2c_4: Did not like faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	28	2.0	65.1	65.1
	Yes	15	1.1	34.9	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P2c_5: Bought a new faucet fixture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	30	2.2	69.8	69.8
	Yes	13	.9	30.2	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P2c_98: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	37	2.7	86.0	86.0
	Yes	6	.4	14.0	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P3_a_1: I put them in storage::LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	58	4.2	70.7	70.7
	Yes	24	1.7	29.3	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P3_a_2: I threw them away::LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	48	3.4	58.5	58.5
	Yes	34	2.4	41.5	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P3_a_3: I gave them away::LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	75	5.4	91.5	91.5
	Yes	7	.5	8.5	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P3_a_4: I installed them somewhere else::LED light bulbs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	70	5.0	85.4	85.4
	Yes	12	.9	14.6	100.0
	Total	82	5.9	100.0	
Missing	System	1312	94.1		
Total		1394	100.0		

P3_b_1: I put them in storage::Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	41	2.9	55.4	55.4
	Yes	33	2.4	44.6	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P3_b_2: I threw them away::Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	60	4.3	81.1	81.1
	Yes	14	1.0	18.9	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P3_b_3: I gave them away::Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	55	3.9	74.3	74.3
	Yes	19	1.4	25.7	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P3_b_4: I installed them somewhere else::Low-flow showerheads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	72	5.2	97.3	97.3
	Yes	2	.1	2.7	100.0
	Total	74	5.3	100.0	
Missing	System	1320	94.7		
Total		1394	100.0		

P3_c_1: I put them in storage::Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	21	1.5	48.8	48.8
	Yes	22	1.6	51.2	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P3_c_2: I threw them away::Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	33	2.4	76.7	76.7
	Yes	10	.7	23.3	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P3_c_3: I gave them away::Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	38	2.7	88.4	88.4
	Yes	5	.4	11.6	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P3_c_4: I installed them somewhere else::Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	43	3.1	100.0	100.0
Missing	System	1351	96.9		
Total		1394	100.0		

P3_c_98: Do not recall::Faucet aerators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	37	2.7	86.0	86.0
	Yes	6	.4	14.0	100.0
	Total	43	3.1	100.0	
Missing	System	1351	96.9		
Total		1394	100.0		

P4: Of the free LEDs from PSE that you installed, are any still working?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	959	68.8	96.6	96.6
	No	5	.4	.5	97.1
	Do not recall	29	2.1	2.9	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
Total		1394	100.0		

CH1_a: Program records show that you participated in the following PSE programs since your participation in the HEA program. Is this correct?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	62	4.4	60.2	60.2
	No	10	.7	9.7	69.9
	Do not recall	31	2.2	30.1	100.0
	Total	103	7.4	100.0	
Missing	System	1291	92.6		
Total		1394	100.0		

CH1_b: Program records show that you participated in the following PSE programs since your participation in the HEA program. Is this correct?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	1.2	51.5	51.5
	No	5	.4	15.2	66.7
	Do not recall	11	.8	33.3	100.0
	Total	33	2.4	100.0	
Missing	System	1361	97.6		
	Total	1394	100.0		

CH1_c: Program records show that you participated in the following PSE programs since your participation in the HEA program. Is this correct?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	2	.1	25.0	25.0
	No	1	.1	12.5	37.5
	Do not recall	5	.4	62.5	100.0
	Total	8	.6	100.0	
Missing	System	1386	99.4		
	Total	1394	100.0		

CH1a_a: Appliance Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	82	5.9	81.2	81.2
	Yes	19	1.4	18.8	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
	Total	1394	100.0		

CH1a_b: Appliance Recycling

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	90	6.5	89.1	89.1
	Yes	11	.8	10.9	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_c: Retail Lighting Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	91	6.5	90.1	90.1
	Yes	10	.7	9.9	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_d: Rebates for Web Enabled Thermostats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	98	7.0	97.0	97.0
	Yes	3	.2	3.0	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_e: Rebates for Home Weatherization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	97	7.0	96.0	96.0
	Yes	4	.3	4.0	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_f: Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	90	6.5	89.1	89.1
	Yes	11	.8	10.9	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_g: Water Heating Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	95	6.8	94.1	94.1
	Yes	6	.4	5.9	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_h: Rebates for Residential Windows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	97	7.0	96.0	96.0
	Yes	4	.3	4.0	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_i: Green Power

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	99	7.1	98.0	98.0
	Yes	2	.1	2.0	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_j: Solar Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	96	6.9	95.0	95.0
	Yes	5	.4	5.0	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_k: Carbon Balance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	101	7.2	100.0	100.0
Missing	System	1293	92.8		
Total		1394	100.0		

CH1a_l: No other programs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	53	3.8	52.5	52.5
	Yes	48	3.4	47.5	100.0
	Total	101	7.2	100.0	
Missing	System	1293	92.8		
Total		1394	100.0		

CH2_1: How much influence did the HEA program have on your decision to participate in *XXX*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	18	1.3	21.2	21.2
	Slightly influential	7	.5	8.2	29.4
	Somewhat influential	19	1.4	22.4	51.8
	Very influential	29	2.1	34.1	85.9
	Extremely influential	12	.9	14.1	100.0
	Total	85	6.1	100.0	
Missing	System	1309	93.9		
Total		1394	100.0		

CH2_2: How much influence did the HEA program have on your decision to participate in XXX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	6	.4	12.8	12.8
	Slightly influential	7	.5	14.9	27.7
	Somewhat influential	7	.5	14.9	42.6
	Very influential	18	1.3	38.3	80.9
	Extremely influential	9	.6	19.1	100.0
	Total	47	3.4	100.0	
Missing	System	1347	96.6		
	Total	1394	100.0		

CH2_3: How much influence did the HEA program have on your decision to participate in XXX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	4	.3	16.7	16.7
	Slightly influential	3	.2	12.5	29.2
	Somewhat influential	5	.4	20.8	50.0
	Very influential	7	.5	29.2	79.2
	Extremely influential	5	.4	20.8	100.0
	Total	24	1.7	100.0	
Missing	System	1370	98.3		
	Total	1394	100.0		

NCH1: Have you participated in other Puget Sound Energy (PSE) programs since your participation in the HEA program?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	116	8.3	9.0	9.0
	No	1118	80.2	86.8	95.8
	Do not recall	54	3.9	4.2	100.0
	Total	1288	92.4	100.0	
Missing	System	106	7.6		
	Total	1394	100.0		

NCH1a_a: Appliance Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	94	6.7	81.0	81.0
	Yes	22	1.6	19.0	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_b: Appliance Recycling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	107	7.7	92.2	92.2
	Yes	9	.6	7.8	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_c: Retail Lighting Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	103	7.4	88.8	88.8
	Yes	13	.9	11.2	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_d: Rebates for Web Enabled Thermostats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	104	7.5	89.7	89.7
	Yes	12	.9	10.3	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_e: Rebates for Home Weatherization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	99	7.1	85.3	85.3
	Yes	17	1.2	14.7	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_f: Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	85	6.1	73.3	73.3
	Yes	31	2.2	26.7	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_g: Water Heating Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	104	7.5	89.7	89.7
	Yes	12	.9	10.3	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_h: Rebates for Residential Windows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	108	7.7	93.1	93.1
	Yes	8	.6	6.9	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_i: Green Power

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	107	7.7	92.2	92.2
	Yes	9	.6	7.8	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_j: Solar Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	106	7.6	91.4	91.4
	Yes	10	.7	8.6	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH1a_k: Carbon Balance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	115	8.2	99.1	99.1
	Yes	1	.1	.9	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
Total		1394	100.0		

NCH2_1: How much influence did the HEA program have on your decision to participate in XXX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	25	1.8	21.6	21.6
	Slightly influential	15	1.1	12.9	34.5
	Somewhat influential	25	1.8	21.6	56.0
	Very influential	36	2.6	31.0	87.1

		Frequency	Percent	Valid Percent	Cumulative Percent
	Extremely influential	15	1.1	12.9	100.0
	Total	116	8.3	100.0	
Missing	System	1278	91.7		
	Total	1394	100.0		

NCH2_2: How much influence did the HEA program have on your decision to participate in XXX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	6	.4	15.8	15.8
	Slightly influential	5	.4	13.2	28.9
	Somewhat influential	6	.4	15.8	44.7
	Very influential	12	.9	31.6	76.3
	Extremely influential	9	.6	23.7	100.0
	Total	38	2.7	100.0	
Missing	System	1356	97.3		
	Total	1394	100.0		

NCH2_3: How much influence did the HEA program have on your decision to participate in XXX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all influential	1	.1	8.3	8.3
	Slightly influential	2	.1	16.7	25.0
	Somewhat influential	3	.2	25.0	50.0
	Very influential	6	.4	50.0	100.0
	Total	12	.9	100.0	
Missing	System	1382	99.1		
	Total	1394	100.0		

AA0: Do you recall receiving an assessment report after your Home Energy Assessment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1154	82.8	83.9	83.9
	No	65	4.7	4.7	88.7

		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not recall	156	11.2	11.3	100.0
	Total	1375	98.6	100.0	
Missing	System	19	1.4		
	Total	1394	100.0		

AAoa_1: By mail

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1052	75.5	91.2	91.2
	Yes	102	7.3	8.8	100.0
	Total	1154	82.8	100.0	
Missing	System	240	17.2		
	Total	1394	100.0		

AAoa_2: By email

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	437	31.3	37.9	37.9
	Yes	717	51.4	62.1	100.0
	Total	1154	82.8	100.0	
Missing	System	240	17.2		
	Total	1394	100.0		

AAoa_3: In-person

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	856	61.4	74.2	74.2
	Yes	298	21.4	25.8	100.0
	Total	1154	82.8	100.0	
Missing	System	240	17.2		
	Total	1394	100.0		

AAoa_4: Did not receive one

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1151	82.6	99.7	99.7

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	3	.2	.3	100.0
	Total	1154	82.8	100.0	
Missing	System	240	17.2		
Total		1394	100.0		

AA0a_98: Don't Recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1005	72.1	87.1	87.1
	Yes	149	10.7	12.9	100.0
	Total	1154	82.8	100.0	
Missing	System	240	17.2		
Total		1394	100.0		

AA1: Do you recall receiving recommendations directly from your energy specialist or in an assessment report about ways to save energy in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1199	86.0	86.0	86.0
	No	79	5.7	5.7	91.7
	Do not recall	116	8.3	8.3	100.0
	Total	1394	100.0	100.0	

AA2_a: Turn out lights when not in use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	725	52.0	60.5	60.5
	No	138	9.9	11.5	72.0
	Do not recall	336	24.1	28.0	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
Total		1394	100.0		

AA2_b: Change air/furnace filters regularly

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	903	64.8	75.3	75.3
	No	134	9.6	11.2	86.5
	Do not recall	162	11.6	13.5	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_c: Repair air leaks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	646	46.3	53.9	53.9
	No	289	20.7	24.1	78.0
	Do not recall	264	18.9	22.0	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_d: Upgrade attic, floor, or wall insulation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	538	38.6	44.9	44.9
	No	498	35.7	41.5	86.4
	Do not recall	163	11.7	13.6	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_e: Upgrade windows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	252	18.1	21.0	21.0
	No	772	55.4	64.4	85.4
	Do not recall	175	12.6	14.6	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_f: Upgrade home ventilation system

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	206	14.8	17.2	17.2
	No	741	53.2	61.8	79.0
	Do not recall	252	18.1	21.0	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_g: Adjust thermostat settings for optimal performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	708	50.8	59.0	59.0
	No	295	21.2	24.6	83.7
	Do not recall	196	14.1	16.3	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_h: Upgrade to a smart thermostat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	424	30.4	35.4	35.4
	No	517	37.1	43.1	78.5
	Do not recall	258	18.5	21.5	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_i: Get a pre-season tune-up of heating/cooling systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	504	36.2	42.0	42.0
	No	347	24.9	28.9	70.9

		Frequency	Percent	Valid Percent	Cumulative Percent
	Do not recall	348	25.0	29.0	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_j: Shut off/set computer to sleep when not in use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	343	24.6	28.6	28.6
	No	458	32.9	38.2	66.8
	Do not recall	398	28.6	33.2	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_k: Upgrade appliances

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	354	25.4	29.5	29.5
	No	610	43.8	50.9	80.4
	Do not recall	235	16.9	19.6	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_l: Lower water heating temperature settings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	512	36.7	42.7	42.7
	No	443	31.8	36.9	79.6
	Do not recall	244	17.5	20.4	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_m: Insulate water heater pipes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	394	28.3	32.9	32.9
	No	518	37.2	43.2	76.1
	Do not recall	287	20.6	23.9	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_n: Run full dishwasher loads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	416	29.8	34.7	34.7
	No	433	31.1	36.1	70.8
	Do not recall	350	25.1	29.2	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_o: Wash laundry in cold water

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	410	29.4	34.2	34.2
	No	415	29.8	34.6	68.8
	Do not recall	374	26.8	31.2	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_q: Clean lint filters

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	547	39.2	45.6	45.6
	No	339	24.3	28.3	73.9
	Do not recall	313	22.5	26.1	100.0
	Total	1199	86.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_r: Close fireplace damper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	288	20.7	24.0	24.0
	No	588	42.2	49.0	73.1
	Do not recall	323	23.2	26.9	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_s: Change fan blade direction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	163	11.7	13.6	13.6
	No	667	47.8	55.6	69.2
	Do not recall	369	26.5	30.8	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_t: Install insulated drapes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	183	13.1	15.3	15.3
	No	668	47.9	55.7	71.0
	Do not recall	348	25.0	29.0	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_u: Plastic window sheeting

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	89	6.4	7.4	7.4
	No	794	57.0	66.2	73.6
	Do not recall	316	22.7	26.4	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_v: Use the right size pots

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	79	5.7	6.6	6.6
	No	704	50.5	58.7	65.3
	Do not recall	416	29.8	34.7	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA2_w: Maintain air gap on refrigerator

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	157	11.3	13.1	13.1
	No	633	45.4	52.8	65.9
	Do not recall	409	29.3	34.1	100.0
	Total	1199	86.0	100.0	
Missing	System	195	14.0		
	Total	1394	100.0		

AA3_a: Turn out lights when not in use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	704	50.5	97.1	97.1
	Plan to take	8	.6	1.1	98.2
	Do not plan to take	6	.4	.8	99.0
	Have not decided	7	.5	1.0	100.0
	Total	725	52.0	100.0	
Missing	System	669	48.0		

		Frequency	Percent	Valid Percent	Cumulative Percent
	Total	1394	100.0		

AA3_b: Change air filters regularly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	747	53.6	82.7	82.7
	Plan to take	122	8.8	13.5	96.2
	Do not plan to take	16	1.1	1.8	98.0
	Have not decided	18	1.3	2.0	100.0
	Total	903	64.8	100.0	
Missing	System	491	35.2		
	Total	1394	100.0		

AA3_c: Repair air leaks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	302	21.7	46.7	46.7
	Plan to take	235	16.9	36.4	83.1
	Do not plan to take	36	2.6	5.6	88.7
	Have not decided	73	5.2	11.3	100.0
	Total	646	46.3	100.0	
Missing	System	748	53.7		
	Total	1394	100.0		

AA3_d: Upgrade attic, floor, or wall insulation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	169	12.1	31.4	31.4
	Plan to take	199	14.3	37.0	68.4
	Do not plan to take	92	6.6	17.1	85.5
	Have not decided	78	5.6	14.5	100.0
	Total	538	38.6	100.0	
Missing	System	856	61.4		
	Total	1394	100.0		

AA3_e: Upgrade windows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	56	4.0	22.2	22.2
	Plan to take	92	6.6	36.5	58.7
	Do not plan to take	66	4.7	26.2	84.9
	Have not decided	38	2.7	15.1	100.0
	Total	252	18.1	100.0	
Missing	System	1142	81.9		
	Total	1394	100.0		

AA3_f: Upgrade home ventilation system

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	67	4.8	32.5	32.5
	Plan to take	48	3.4	23.3	55.8
	Do not plan to take	48	3.4	23.3	79.1
	Have not decided	43	3.1	20.9	100.0
	Total	206	14.8	100.0	
Missing	System	1188	85.2		
	Total	1394	100.0		

AA3_g: Adjust thermostat settings for optimal performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	637	45.7	90.0	90.0
	Plan to take	36	2.6	5.1	95.1
	Do not plan to take	23	1.6	3.2	98.3
	Have not decided	12	.9	1.7	100.0
	Total	708	50.8	100.0	
Missing	System	686	49.2		
	Total	1394	100.0		

AA3_h: Upgrade to a smart thermostat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	195	14.0	46.0	46.0
	Plan to take	95	6.8	22.4	68.4
	Do not plan to take	75	5.4	17.7	86.1
	Have not decided	59	4.2	13.9	100.0
	Total	424	30.4	100.0	
Missing	System	970	69.6		
	Total	1394	100.0		

AA3_i: Get a pre-season tune-up of heating/cooling systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	287	20.6	57.1	57.1
	Plan to take	161	11.5	32.0	89.1
	Do not plan to take	26	1.9	5.2	94.2
	Have not decided	29	2.1	5.8	100.0
	Total	503	36.1	100.0	
Missing	System	891	63.9		
	Total	1394	100.0		

AA3_j: Shut off/set computer to sleep when not in use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	298	21.4	86.9	86.9
	Plan to take	25	1.8	7.3	94.2
	Do not plan to take	15	1.1	4.4	98.5
	Have not decided	5	.4	1.5	100.0
	Total	343	24.6	100.0	
Missing	System	1051	75.4		
	Total	1394	100.0		

AA3_k: Upgrade appliances

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	120	8.6	33.9	33.9

		Frequency	Percent	Valid Percent	Cumulative Percent
	Plan to take	112	8.0	31.6	65.5
	Do not plan to take	66	4.7	18.6	84.2
	Have not decided	56	4.0	15.8	100.0
	Total	354	25.4	100.0	
Missing	System	1040	74.6		
	Total	1394	100.0		

AA3_l: Adjust water heating settings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	344	24.7	67.2	67.2
	Plan to take	57	4.1	11.1	78.3
	Do not plan to take	78	5.6	15.2	93.6
	Have not decided	33	2.4	6.4	100.0
	Total	512	36.7	100.0	
Missing	System	882	63.3		
	Total	1394	100.0		

AA3_m: Insulate water heater pipes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	174	12.5	44.3	44.3
	Plan to take	135	9.7	34.4	78.6
	Do not plan to take	44	3.2	11.2	89.8
	Have not decided	40	2.9	10.2	100.0
	Total	393	28.2	100.0	
Missing	System	1001	71.8		
	Total	1394	100.0		

AA3_n: Run full dishwasher loads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	386	27.7	92.8	92.8
	Plan to take	12	.9	2.9	95.7
	Do not plan to take	13	.9	3.1	98.8
	Have not decided	5	.4	1.2	100.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	Total	416	29.8	100.0	
Missing	System	978	70.2		
	Total	1394	100.0		

AA3_o: Wash laundry in cold water

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	341	24.5	83.2	83.2
	Plan to take	21	1.5	5.1	88.3
	Do not plan to take	30	2.2	7.3	95.6
	Have not decided	18	1.3	4.4	100.0
	Total	410	29.4	100.0	
Missing	System	984	70.6		
	Total	1394	100.0		

AA3_q: Clean lint filters

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	504	36.2	92.1	92.1
	Plan to take	34	2.4	6.2	98.4
	Do not plan to take	5	.4	.9	99.3
	Have not decided	4	.3	.7	100.0
	Total	547	39.2	100.0	
Missing	System	847	60.8		
	Total	1394	100.0		

AA3_r: Close fireplace damper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	228	16.4	79.2	79.2
	Plan to take	35	2.5	12.2	91.3
	Do not plan to take	17	1.2	5.9	97.2
	Have not decided	8	.6	2.8	100.0
	Total	288	20.7	100.0	
Missing	System	1106	79.3		
	Total	1394	100.0		

AA3_s: Change fan blade direction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	112	8.0	68.7	68.7
	Plan to take	28	2.0	17.2	85.9
	Do not plan to take	12	.9	7.4	93.3
	Have not decided	11	.8	6.7	100.0
	Total	163	11.7	100.0	
Missing	System	1231	88.3		
	Total	1394	100.0		

AA3_t: Install insulated drapes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	84	6.0	45.9	45.9
	Plan to take	38	2.7	20.8	66.7
	Do not plan to take	44	3.2	24.0	90.7
	Have not decided	17	1.2	9.3	100.0
	Total	183	13.1	100.0	
Missing	System	1211	86.9		
	Total	1394	100.0		

AA3_u: Plastic window sheeting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	20	1.4	22.5	22.5
	Plan to take	19	1.4	21.3	43.8
	Do not plan to take	33	2.4	37.1	80.9
	Have not decided	17	1.2	19.1	100.0
	Total	89	6.4	100.0	
Missing	System	1305	93.6		
	Total	1394	100.0		

AA3_v: Use the right size pots

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	68	4.9	86.1	86.1
	Plan to take	6	.4	7.6	93.7
	Do not plan to take	2	.1	2.5	96.2
	Have not decided	3	.2	3.8	100.0
	Total	79	5.7	100.0	
Missing	System	1315	94.3		
Total		1394	100.0		

AA3_w: Maintain air gap on refrigerator

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have taken	119	8.5	75.8	75.8
	Plan to take	19	1.4	12.1	87.9
	Do not plan to take	5	.4	3.2	91.1
	Have not decided	14	1.0	8.9	100.0
	Total	157	11.3	100.0	
Missing	System	1237	88.7		
Total		1394	100.0		

AA4_1: Attic

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Minor	78	5.6	46.2	46.2
	Major	91	6.5	53.8	100.0
	Total	169	12.1	100.0	
Missing	System	1225	87.9		
Total		1394	100.0		

AA4_2: Floor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Minor	105	7.5	62.1	62.1
	Major	64	4.6	37.9	100.0
	Total	169	12.1	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Missing	System	1225	87.9		
Total		1394	100.0		

AA4_3: Wall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Minor	153	11.0	90.5	90.5
	Major	16	1.1	9.5	100.0
	Total	169	12.1	100.0	
Missing	System	1225	87.9		
Total		1394	100.0		

AA4a_1: You indicated that you upgraded windows. How many windows did you upgrade?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	.4	12.0	12.0
	2	3	.2	6.0	18.0
	3	4	.3	8.0	26.0
	4	6	.4	12.0	38.0
	5	5	.4	10.0	48.0
	6	2	.1	4.0	52.0
	7	4	.3	8.0	60.0
	8	1	.1	2.0	62.0
	9	2	.1	4.0	66.0
	10	1	.1	2.0	68.0
	11	4	.3	8.0	76.0
	12	2	.1	4.0	80.0
	13	1	.1	2.0	82.0
	17	1	.1	2.0	84.0
	18	1	.1	2.0	86.0
	20	1	.1	2.0	88.0
	22	1	.1	2.0	90.0
	30	1	.1	2.0	92.0
	32	1	.1	2.0	94.0
	33	1	.1	2.0	96.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	37	1	.1	2.0	98.0
	50	1	.1	2.0	100.0
	Total	50	3.6	100.0	
Missing	System	1344	96.4		
Total		1394	100.0		

AA4a_998: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	50	3.6	89.3	89.3
	Yes	6	.4	10.7	100.0
	Total	56	4.0	100.0	
Missing	System	1338	96.0		
Total		1394	100.0		

AA4b_1: ENERGY STAR Refrigerator

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	49	3.5	40.8	40.8
	Yes	71	5.1	59.2	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_2: ENERGY STAR Freezer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	89	6.4	74.2	74.2
	Yes	31	2.2	25.8	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_3: ENERGY STAR Clothes Washer

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	69	4.9	57.5	57.5
	Yes	51	3.7	42.5	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_4: ENERGY STAR Clothes Dryer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	73	5.2	60.8	60.8
	Yes	47	3.4	39.2	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_5: Other ENERGY STAR Appliance, please specify

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	87	6.2	72.5	72.5
	Yes	33	2.4	27.5	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_6: Upgraded appliances but they were not ENERGY STAR rated

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	109	7.8	90.8	90.8
	Yes	11	.8	9.2	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_7: Do not recall

		Frequency	Percent	Valid Percent	Cumulative Percent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	110	7.9	91.7	91.7
	Yes	10	.7	8.3	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_8: ENERGY STAR Dishwasher

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	101	7.2	84.2	84.2
	Yes	19	1.4	15.8	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA4b_9: ENERGY STAR Water heater

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	115	8.2	95.8	95.8
	Yes	5	.4	4.2	100.0
	Total	120	8.6	100.0	
Missing	System	1274	91.4		
Total		1394	100.0		

AA6: On a scale from 1 to 5 where 1 is not at all influential and 5 is extremely influential, how influential was the HEA program on your decision to carry out energy efficiency actions since the assessment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Not at all influential	31	2.2	2.9	2.9
	2 Slightly influential	121	8.7	11.2	14.1
	3 Somewhat influential	321	23.0	29.8	43.9
	4 Very influential	425	30.5	39.4	83.3
	5 Extremely influential	180	12.9	16.7	100.0
	Total	1078	77.3	100.0	

Missing	System	316	22.7		
	Total	1394	100.0		

PL1: Would you consider participating in other PSE programs in the future?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1163	83.4	83.4	83.4
	No	58	4.2	4.2	87.6
	Not sure	173	12.4	12.4	100.0
	Total	1394	100.0	100.0	

PL2_a: Appliance Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	415	29.8	31.1	31.1
	Yes	921	66.1	68.9	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

PL2_b: Appliance Recycling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	527	37.8	39.4	39.4
	Yes	809	58.0	60.6	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

PL2_c: Retail Lighting Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	707	50.7	52.9	52.9
	Yes	629	45.1	47.1	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		

		Frequency	Percent	Valid Percent	Cumulative Percent
	Total	1394	100.0		

PL2_d: Rebates for Web Enabled Thermostats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	914	65.6	68.4	68.4
	Yes	422	30.3	31.6	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_e: Rebates for Home Weatherization Equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	740	53.1	55.5	55.5
	Yes	596	42.8	44.5	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_f: Heating, Ventilation and Air Conditioning (HVAC) Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	654	46.9	49.0	49.0
	Yes	682	48.9	51.0	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_g: Water Heating Equipment Rebates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	648	46.5	48.5	48.5
	Yes	688	49.4	51.5	100.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_h: Rebates for Residential Windows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	835	59.9	62.5	62.5
	Yes	501	35.9	37.5	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_i: Green Power

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	812	58.2	60.8	60.7
	Yes	524	37.6	39.2	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_j: Solar Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	746	53.5	55.8	55.8
	Yes	590	42.3	44.2	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
Total		1394	100.0		

PL2_k: Carbon Balance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1054	75.6	78.9	78.9
	Yes	282	20.2	21.1	100.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

PL2_m: None of these

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1264	90.7	94.6	94.6
	Yes	72	5.2	5.4	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

PL2_n: Electric Vehicles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1333	95.6	99.8	94.8
	Yes	3	.2	.2	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

PL2_o: Do not know

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1328	95.3	99.4	99.4
	Yes	8	.6	.6	100.0
	Total	1336	95.8	100.0	
Missing	System	58	4.2		
	Total	1394	100.0		

CS1_1: From the time you scheduled your energy assessment, about how many weeks did it take for an energy specialist to come conduct the assessment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	.4	1.0	1.0
	1	145	10.4	27.9	28.9
	2	209	15.0	40.3	69.2
	3	85	6.1	16.4	85.5
	4	40	2.9	7.7	93.3
	5	11	.8	2.1	95.4
	6	8	.6	1.5	96.9
	7	2	.1	.4	97.3
	8	8	.6	1.5	98.8
	10	1	.1	.2	99.0
	12	4	.3	.8	99.8
	30	1	.1	.2	100.0
	Total	519	37.2	100.0	
Missing	System	875	62.8		
Total		1394	100.0		

CS1a: Have you noticed any savings on your electric bill since participating in the HEA program?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	390	28.0	31.9	31.9
	No	414	29.7	33.8	65.7
	Do not know	420	30.1	34.3	100.0
	Total	1224	87.8	100.0	
Missing	System	170	12.2		
Total		1394	100.0		

CS2_a: Overall satisfaction with the assessment experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	17	1.2	1.4	1.4
	Dissatisfied	38	2.7	3.1	4.5
	Neither Satisfied nor Dissatisfied	130	9.3	10.6	15.1

		Frequency	Percent	Valid Percent	Cumulative Percent
	Satisfied	481	34.5	39.3	54.4
	Very Satisfied	558	40.0	45.6	100.0
	Total	1224	87.8	100.0	
Missing	System	170	12.2		
	Total	1394	100.0		

CS2_b: The amount of savings on your electric bill since participating the HEA program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	3	.2	.8	.8
	Dissatisfied	1	.1	.3	1.0
	Neither Satisfied nor Dissatisfied	42	3.0	10.8	11.8
	Satisfied	242	17.4	62.1	73.8
	Very Satisfied	102	7.3	26.2	100.0
	Total	390	28.0	100.0	
Missing	System	1004	72.0		
	Total	1394	100.0		

CS2_c: The quality of the free LED light bulb(s)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	17	1.2	1.7	1.7
	Dissatisfied	29	2.1	2.9	4.6
	Neither Satisfied nor Dissatisfied	59	4.2	5.9	10.6
	Satisfied	391	28.0	39.4	49.9
	Very Satisfied	497	35.7	50.1	100.0
	Total	993	71.2	100.0	
Missing	System	401	28.8		
	Total	1394	100.0		

CS2_d: The quality of the free low-flow showerhead(s)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	10	.7	1.3	1.3

		Frequency	Percent	Valid Percent	Cumulative Percent
	Dissatisfied	52	3.7	6.8	8.1
	Neither Satisfied nor Dissatisfied	293	21.0	38.4	46.5
	Satisfied	269	19.3	35.3	81.8
	Very Satisfied	139	10.0	18.2	100.0
	Total	763	54.7	100.0	
Missing	System	631	45.3		
	Total	1394	100.0		

CS2_e: The quality of the free faucet aerator(s)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	14	1.0	2.9	2.9
	Dissatisfied	25	1.8	5.1	8.0
	Neither Satisfied nor Dissatisfied	185	13.3	38.0	46.0
	Satisfied	180	12.9	37.0	83.0
	Very Satisfied	83	6.0	17.0	100.0
	Total	487	34.9	100.0	
Missing	System	907	65.1		
	Total	1394	100.0		

CS3_a: The process of scheduling the assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	7	.5	.5	.5
	Dissatisfied	19	1.4	1.4	1.9
	Neither Satisfied nor Dissatisfied	116	8.3	8.3	10.2
	Satisfied	612	43.9	43.9	54.1
	Very Satisfied	640	45.9	45.9	100.0
	Total	1394	100.0	100.0	

CS3_b: The available appointment times for the assessment

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid					
Very Dissatisfied	5	.4	.4	.4
Dissatisfied	14	1.0	1.0	1.4
Neither Satisfied nor Dissatisfied	119	8.5	8.5	9.9
Satisfied	660	47.3	47.3	57.2
Very Satisfied	596	42.8	42.8	100.0
Total	1394	100.0	100.0	

CS3_c: The length of time it took to receive the assessment from when you scheduled it

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	5	.4	.4	.4
	Dissatisfied	18	1.3	1.3	1.6
	Neither Satisfied nor Dissatisfied	132	9.5	9.5	11.1
	Satisfied	639	45.8	45.8	57.0
	Very Satisfied	600	43.0	43.0	100.0
	Total	1394	100.0	100.0	

CS3_d: The professionalism of energy specialist

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	6	.4	.4	.4
	Dissatisfied	21	1.5	1.5	1.9
	Neither Satisfied nor Dissatisfied	64	4.6	4.6	6.5
	Satisfied	392	28.1	28.1	34.6
	Very Satisfied	911	65.4	65.4	100.0
	Total	1394	100.0	100.0	

CS3_e: The quality of the work completed by energy specialist

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	13	.9	.9	.9
	Dissatisfied	40	2.9	2.9	3.8

		Frequency	Percent	Valid Percent	Cumulative Percent
	Neither Satisfied nor Dissatisfied	128	9.2	9.2	13.0
	Satisfied	454	32.6	32.6	45.6
	Very Satisfied	759	54.4	54.4	100.0
	Total	1394	100.0	100.0	

CS3_f: The length of time it took to complete assessment after it started

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	9	.6	.6	.6
	Dissatisfied	13	.9	.9	1.6
	Neither Satisfied nor Dissatisfied	104	7.5	7.5	9.0
	Satisfied	569	40.8	40.8	49.9
	Very Satisfied	699	50.1	50.1	100.0
	Total	1394	100.0	100.0	

CS3_g: The assessment report in helping understand your home energy usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	18	1.3	1.3	1.3
	Dissatisfied	56	4.0	4.0	5.3
	Neither Satisfied nor Dissatisfied	198	14.2	14.2	19.5
	Satisfied	556	39.9	39.9	59.4
	Very Satisfied	566	40.6	40.6	100.0
	Total	1394	100.0	100.0	

CS3_h: The assessment report in helping you understand how to reduce your energy usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Dissatisfied	24	1.7	1.7	1.7
	Dissatisfied	59	4.2	4.2	6.0
	Neither Satisfied nor Dissatisfied	231	16.6	16.6	22.5
	Satisfied	550	39.5	39.5	62.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	Very Satisfied	530	38.0	38.0	100.0
	Total	1394	100.0	100.0	

CS6a_1: They don't look good/Poor aesthetics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	75	5.4	86.2	86.2
	Yes	12	.9	13.8	100.0
	Total	87	6.2	100.0	
Missing	System	1307	93.8		
Total		1394	100.0		

CS6a_2: They don't save energy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	84	6.0	96.6	96.6
	Yes	3	.2	3.4	100.0
	Total	87	6.2	100.0	
Missing	System	1307	93.8		
Total		1394	100.0		

CS6a_3: They are lower quality than the products I used to have

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	49	3.6	56.3	56.3
	Yes	38	2.7	43.7	100.0
	Total	87	6.2	100.0	
Missing	System	1307	93.8		
Total		1394	100.0		

CS6a_4: They broke/don't function properly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	61	4.7	70.1	70.1
	Yes	26	1.9	29.9	100.0
	Total	87	6.2	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Missing	System	1307	93.8		
Total		1394	100.0		

CS6a_5: I don't like the way that the device/installation functions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	70	5.0	80.5	80.5
	Yes	17	1.2	19.5	100.0
	Total	87	6.2	100.0	
Missing	System	1307	93.8		
Total		1394	100.0		

CS6a_98: Don't know / Can't recall

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	81	5.8	93.1	93.1
	Yes	6	.4	6.9	100.0
	Total	87	6.2	100.0	
Missing	System	1307	93.8		
Total		1394	100.0		

CS7: If offered by the energy specialist, would you have been willing to pay for any premium audit testing and/or services, such as a blower door test to check for your home's air tightness or minor fixes to appliances to reduce energy use?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	422	30.3	30.3	30.3
	No	461	33.1	33.1	63.3
	Don't know/ Not sure	511	36.7	36.7	100.0
	Total	1394	100.0	100.0	

H1: What type of fuel do you use primarily to heat your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bottled, tank, or LP gas	43	3.1	3.1	3.1
	Don't know	22	1.6	1.6	4.7

		Frequency	Percent	Valid Percent	Cumulative Percent
	Electric	425	30.5	30.5	35.2
	Forced air	1	.1	.1	35.2
	Natural gas	850	60.9	60.9	96.2
	No fuel	4	.3	.3	96.5
	Oil, kerosene	11	.8	.8	97.3
	Other, pleas	3	.2	.2	97.5
	Solar	8	.6	.6	98.1
	Wood	27	1.9	1.9	100.0
	Total	1394	100.0	100.0	

H2: What type of electric heating equipment is in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	6	.4	3.2	3.2
	Furnace	117	8.4	29.0	32.2
	Heat Pump	213	15.3	52.0	84.2
	Baseboard or wall heater (Also known as electric resistance heating)	52	3.7	12.9	97.1
	Ductless Water Heater	3	.2	.7	97.8
	Don't Know	13	1.0	3.2	100.0
	Total	404	29.0	100.0	
Missing	System	990	71.0		
	Total	1394	100.0		

H3: Do you have a central air conditioning system in your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	570	40.9	40.9	40.9
	No	804	57.7	57.7	98.6
	Don't know	20	1.4	1.4	100.0
	Total	1394	100.0	100.0	

H4: What is the main type of fuel your home uses for water heating?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	2	.1	.1	.1
	Electric	505	36.2	36.2	36.3
	Gas	798	57.2	57.2	93.6
	Propane	49	3.5	3.5	97.1
	Electric and Gas	1	.1	.1	97.2
	Don't know	39	2.8	2.8	100.0
	Total	1394	100.0	100.0	

D1: Which of the following best describes your home or residence?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single-family detached home	1089	78.1	78.1	78.1
	Single family attached home	198	14.2	14.2	92.3
	Mobile home	51	3.7	3.7	96.2
	Apartment or condominium	35	2.5	2.4	98.6
	Don't know/ Prefer to not answer	21	1.5	1.4	100.0
	Total	1394	100.0	100.0	

D1a: Is your home a factory manufactured or modular home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, factory manufactured or modular	23	1.6	2.1	2.1
	No, conventionally built	1023	73.4	94.5	96.6
	Don't know/ Prefer to not answer	37	2.7	3.4	100.0
	Total	1083	77.7	100.0	
Missing	System	311	22.3		
	Total	1394	100.0		

D1b: How many housing units or apartments are in your building?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.1	3.0	3.0
	2-3	16	1.1	48.5	51.5
	4-9	14	1.0	42.4	93.9
	10 or more	2	.1	6.1	100.0
	Total	33	2.4	100.0	
Missing	System	1361	97.6		
Total		1394	100.0		

D2: Do you own or rent this residence?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Own	1338	96.0	96.0	96.0
	Rent	36	2.6	2.6	98.6
	Don't know/ Prefer to not answer	20	1.4	1.4	100.0
	Total	1394	100.0	100.0	

D2a: Do you pay your own electric bill or is it included in your rent?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pay bill	35	2.5	97.2	97.2
	Included in rent	1	.1	2.8	100.0
	Total	36	2.6	100.0	
Missing	System	1358	97.4		
Total		1394	100.0		

D3: How long have you lived in this residence?

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Less than 1 year	76	5.5	5.5	5.5
	1-3 years	457	32.8	32.8	38.2
	4-10 years	335	24.0	24.0	62.3
	11-20 years	250	17.9	17.9	80.2
	More than 20 years	257	18.4	18.4	98.6
	Don't know/ Prefer to not answer	19	1.4	1.4	100.0
	Total	1394	100.0	100.0	

D4_1: Including yourself, how many people currently live in your residence year-round?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	200	14.3	15.6	15.6
	2	574	41.2	44.9	60.6
	3	218	15.6	17.1	77.6
	4	182	13.1	14.2	91.9
	5	62	4.4	4.9	96.7
	6	31	2.2	2.4	99.1
	7	4	.3	.3	99.5
	8	4	.3	.3	99.8
	9	2	.1	.2	99.9
	10	1	.1	.1	100.0
	Total	1278	91.7	100.0	
Missing	System	116	8.3		
Total		1394	100.0		

D4_98: Don't know/ Prefer to not answer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1278	91.7	91.7	91.7
	Yes	116	8.3	8.3	100.0
	Total	1394	100.0	100.0	

D5_1: How many people under the age of 18 live in your residence?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	866	62.1	67.9	67.9
	1	151	10.8	11.8	79.8
	2	188	13.5	14.7	94.5
	3	45	3.2	3.5	98.0
	4	15	1.1	1.2	99.2
	5	6	.4	.5	99.7
	6	2	.1	.2	99.8
	9	1	.1	.1	99.9
	10	1	.1	.1	100.0
	Total	1275	91.5	100.0	
Missing	System	119	8.5		
Total		1394	100.0		

D5_98: Don't know/ Prefer to not answer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1275	91.5	91.5	91.5
	Yes	119	8.5	8.5	100.0
	Total	1394	100.0	100.0	

D6: Approximately when was your residence first built?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Before 1950	172	12.3	12.3	12.3
	1950-1969	217	15.6	15.6	27.9
	1970-1989	362	26.0	26.0	53.9
	1990-1999	247	17.7	17.7	71.6
	2000-2005	143	10.3	10.3	81.9
	2006-2009	108	7.7	7.7	89.6
	2010 or later	98	7.0	7.0	96.6
	Don't know/ Prefer to not answer	47	3.4	3.4	100.0
	Total	1394	100.0	100.0	

D7: Would you estimate the square footage of your residence?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1,001 sq. ft.	38	2.7	2.7	2.7
	Between 1,001 and 2,000 sq. ft.	607	43.5	43.5	46.3
	Between 2,001 and 3,000 sq. ft.	481	34.5	34.5	80.8
	Between 3,001 and 4,000 sq. ft.	182	13.1	13.1	93.8
	Between 4,001 and 5,000 sq. ft.	28	2.0	2.0	95.8
	Greater than 5,000 sq. ft.	11	.8	.8	96.6
	Don't know/ Prefer to not answer	47	3.4	3.4	100.0
	Total	1394	100.0	100.0	

D8_8: Don't know/ Prefer to not answer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	1035	74.2	74.2	74.2
	Yes	359	25.8	25.8	100.0
	Total	1394	100.0	100.0	

D9: What is your highest level of education?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than a high school degree	4	.3	.3	.3
	High school degree	63	4.5	4.5	4.8
	Technical/trade school program	45	3.2	3.2	8.0
	Associates degree or some college	247	17.7	17.7	25.8
	Bachelor's degree	426	30.6	30.6	56.3

		Frequency	Percent	Valid Percent	Cumulative Percent
	Graduate / professional degree, e.g., J.D., MBA, MD, Ph.D.	444	31.9	31.9	88.2
	Don't know/ Prefer to not answer	165	11.8	11.8	100.0
	Total	1394	100.0	100.0	

D10: What best describes your current employment status?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed full-time	596	42.8	42.8	42.8
	Employed part-time	75	5.4	5.4	48.1
	Retired	510	36.6	36.6	84.7
	Not employed, but actively looking	9	.6	.6	85.4
	Not employed, and not looking	37	2.7	2.7	88.0
	Don't know/ Prefer to not answer	139	10.0	10.0	98.0
	Other, please specify	28	2.0	2.0	100.0
	Total	1394	100.0	100.0	

Appendix C.   Data Cleaning and Assumptions for Channeling Analysis

This appendix includes information on database cleaning steps and assumptions made for the residential program tracking and referral tracking databases to conduct the channeling analysis.

Program Name Cleaning

In the residential program tracking database, there were some program names that did not match with the referral tracking database. For all the program names to match between the two databases, the evaluation team made a few changes to some of the program names. The details of these changes are provided in the bullets below.

■ For Retail Appliance Kits and Web Enabled Thermostat Kits, participants were placed into another program that had the same name that did not include "Kits" (e.g., Retail Appliance Kits participants were placed into the Retail Appliance program).

■ For Residential Home Heating Kits and Residential Water Heating Kits, participants were placed into the Electric Home Heating, Natural Gas Home Heating, Electric Water Heating, or Natural Gas Water Heat program based on the fuel type and the unit of measurement for each measure installed (e.g., participants in the Residential Home Heating Kits program that installed products measured in kWh were placed within the Electric Home Heating Program).

■ Residential Weatherization Kits participants were placed into the Single Family Weatherization and Residential Windows programs based on their prior participation (e.g., if a participant had previously participated in the Single Family Weatherization program, then these participants were placed into the Single Family Weatherization program).

In addition to the bullets above, Table 19 provides a crosswalk of the original and revised program names.

Table 19. Program Name Cleaning for Residential Program Tracking Database

Original Program Name	Updated Program Name
Residential Home Heating Kits	Electric Home Heating/Natural Gas Home Heating
Residential Water Heating Kits	Electric Water Heating/Natural Gas Water Heating
Residential Weatherization Kits	Single Family Weatherization/Residential Windows
Retail Appliance Kits	Retail Appliances
Web-Enabled Thermostat Kits	Web Enabled Thermostats

Assumptions

The referral tracking database sent to Opinion Dynamics by PSE includes the measures each customer was referred to through the HEA program. Unfortunately, the evaluation team could not match these measure names to the residential program tracking database since the measure names between the two databases did not match. To work around this issue, the team assumed the program(s) each measure in the referral tracking database was connected to. This allowed for the team to match the two databases based on program name.

Table 20 shows which program(s) potentially connected to each recommended measure in the referral tracking database. There are many measures that can be attributed to multiple residential programs. For this analysis, if a customer received a recommended measure from HEA and participated in any of the associated programs, this counted as a potential influence from HEA on program participation and savings from measures installed by the customer within these programs counted as the potential channeled savings.

Table 20. Recommended Measures Potentially Connected to Residential Program(s)

Recommended Measure	Program One	Program Two	Program Three
Upgrade to an ENERGY STAR® refrigerator	Retail Appliances	Appliance Replacement	
Recycle your old refrigerator/freezer	Appliance Decommissioning		
Upgrade to an ENERGY STAR® freezer	Retail Appliances	Appliance Replacement	
Upgrade to a heat pump dryer	Retail Appliances	Appliance Replacement	
Upgrade to an ENERGY STAR® clothes washer	Retail Appliances	Appliance Replacement	
Upgrade your electric clothes dryer to a natural gas	Fuel Conversion Appliances		
Upgrade your central air conditioning system	Natural Gas Home Heating		
Upgrade to a high efficiency air-source heat pump	Electric Home Heating		
Upgrade to a smart thermostat - heating and/or cooling	Web Enabled Thermostats		
Recommend water heater replacement	Electric Water Heating		
Seal and/or insulate the duct system	Low Income Weatherization	Single Family Weatherization	
Upgrade the attic insulation	Low Income Weatherization	Single Family Weatherization	
Seal air leaks throughout the home	Low Income Weatherization	Single Family Weatherization	Residential Windows
Upgrade your whole house ventilation system	Low Income Weatherization	Single Family Weatherization	
Upgrade the wall insulation	Low Income Weatherization	Single Family Weatherization	
Upgrade the floor insulation	Low Income Weatherization	Single Family Weatherization	
Upgrade the existing electric forced-air furnace to a high efficiency air-source heat pump	Electric Home Heating		
Upgrade to a ductless mini-split heat pump	Electric Home Heating		

Recommended Measure	Program One	Program Two	Program Three
Upgrade to an efficient natural gas heating system	Natural Gas Home Heating		
Upgrade the electric forced-air heating system to natural gas	Natural Gas Fuel Conversion		
Consider installing a gas fireplace	Natural Gas Home Heating		
Upgrade your electric forced-air heating system and electric water heater to natural gas	Natural Gas Fuel Conversion		
Upgrade the electric baseboard heating system and electric water heater to natural gas	Natural Gas Fuel Conversion		
Upgrade the electric baseboard heating system to natural gas	Natural Gas Fuel Conversion		
Upgrade the electric water heater to natural gas	Natural Gas Fuel Conversion		
Upgrade to LED lighting inside the home	Retail Lighting		
Upgrade to LED lighting outside the home	Retail Lighting		
Upgrade to a heat pump water heater	Electric Water Heating		
Contractor Alliance Network (CAN) - Air Conditioning Referral	Electric Home Heating	Natural Gas Home Heating	
Upgrade existing single pane windows to high efficiency windows	Residential Windows		
Manufactured Home: Upgrade floor insulation	Low Income Weatherization	Single Family Weatherization	
Single Wide Manufactured Home: Seal or repair leaky ducts	Low Income Weatherization	Single Family Weatherization	
Manufactured Home: Seal or leaky ducts	Low Income Weatherization	Single Family Weatherization	
Manufactured Home: Upgrade the ventilation system	Low Income Weatherization	Single Family Weatherization	
CAN - Ductless Heat Pump Referral	Electric Home Heating		
CAN - Geothermal Heat Pump Referral	Electric Home Heating		
CAN - Heat Pump Replacement Referral	Electric Home Heating		
CAN - Gas Furnace Replacement Referral	Natural Gas Home Heating		
CAN - Electric Tankless Water Heat Referral	Electric Water Heating		
CAN - Furnace Service Referral	Natural Gas Home Heating		
CAN - Boiler Replacement Referral	Natural Gas Home Heating		
CAN - Fireplace Referral	Natural Gas Home Heating		

Recommended Measure	Program One	Program Two	Program Three
CAN - Combined Home and Water Heat Referral	Natural Gas Home Heating		
CAN - Boiler Service Referral	Natural Gas Home Heating		
CAN - Fireplace Service Referral	Natural Gas Home Heating		
CAN - Heat Pump Service Referral	Electric Home Heating		
CAN - Insulation Referral	Low Income Weatherization	Single Family Weatherization	
CAN - Air Sealing Referral	Low Income Weatherization	Single Family Weatherization	
CAN - Duct Sealing Referral	Low Income Weatherization	Single Family Weatherization	
CAN - Window Replacement Referral	Residential Windows		
CAN - Gas Water Heat Replacement Referral	Natural Gas Fuel Conversion		
CAN - Heat Pump Water Heater Referral	Electric Water Heating		
CAN - Gas Tankless Water Heat Referral	Electric Water Heating		
CAN - Water Heat Service Referral	Electric Water Heating	Natural Gas Fuel Conversion	
CAN - Convert from Electric to Gas Referral	Natural Gas Fuel Conversion		
Appliance Recycling	Appliance Decommissioning		
Appliance Replacement	Retail Appliances		
Connected Home: Smart Thermostat	Web Enabled Thermostats		
Shop PSE for lighting, consumer electronics, showerheads, etc.	Retail Lighting	Showerheads	
Recommend sizing and control lockout for air source heat pump	Electric Home Heating		
Are there additional attic areas with variable insulation levels	Low Income Weatherization	Single Family Weatherization	
Are there additional floor areas with variable insulation levels	Low Income Weatherization	Single Family Weatherization	
Upgrade to an ENERGY STAR® boiler	Natural Gas Home Heating		
Upgrade your integrated space and water heating	Natural Gas Home Heating		

Appendix D. Methodology and Results

The evaluation team conducted a consumption analysis using a LFER model, with the goal of determining the overall ex-post net program savings of the PSE HEA program. The fixed effect in the model is at the individual account level, which allows all household factors that do not vary over time to be controlled for by the model.

Data Collection

The evaluation team followed a standard series of steps for data collection, model specification, and analysis for the HEA program evaluation. Section 5.1.1 summarizes our consumption analysis approach, and Figure 18 outlines the steps.

Figure 18. Billing Analysis Approach

Clean and Prepare Data			
Clean Program Tracking Data	Clean Participant Billing Data	Create Matched Comparison Group	Assess Comparison Group Equivalency

Model Program Impacts			
Develop Model Specifications	Test Model Specifications and Fit to Select Best Model	Assess Model and Estimate Net Savings	Calculate Net Realization Rates Based on Ex Ante Savings
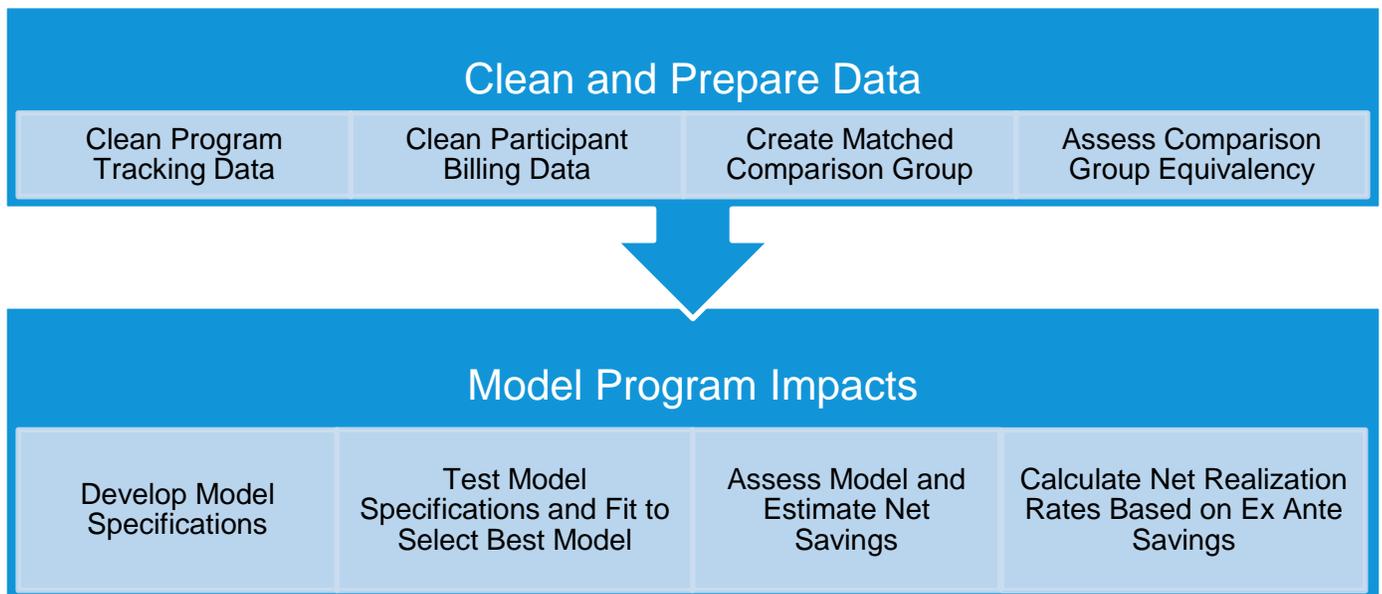
Comparison Group Selection

A key challenge for estimating energy savings through a consumption analysis is the identification of an appropriate comparison group or "counterfactual" to represent a baseline for what participants would have done (and how much energy they would have consumed) in the absence of a program. There are two key considerations in the design of a comparison group. A good comparison group has similar energy usage patterns (compared to participants) before participation (i.e., pre-participation period) and effectively addresses self-selection bias (the correlation between the propensity to participate in a program and energy use). Given this, we aim to use a comparison group that, on average, exhibits very similar usage patterns prior to participation. If there are some differences in energy use patterns between participants and comparison group customers, those differences must be addressed in the model. Achieving this ensures that estimates from our quasi-experiment are representative of the actual effects that the program has on a customer's energy use.

Consumption analyses, when using an appropriate comparison group, incorporate the effects of both free-ridership (FR) and participant spillover (SO), thus providing program net savings. For example, the energy use

patterns of the members of the comparison group, during their pre-participation period, reflect equipment installations and behavioral changes that treatment group participants might have performed in the absence of the program.

Our consumption analysis used participants from the evaluation period as the treatment group and matched from a comparison pool to find the most similar customers to serve as the comparison group. We matched customers after doing data cleaning and preparation on the matched comparison pool and the treatment customers. We will discuss the matching techniques in greater detail below.

Data Cleaning and Preparation

This section summarizes how we cleaned and prepared the program participant databases and billing data for the consumption analysis.

Program-Tracking Data

As a first step, the evaluation team prepared a master participant dataset that combined the program-tracking data from the evaluation period with dates of participation in other PSE programs. This master dataset was composed of customer information that included:

- **Participation date:** The date of participation in the HEA program to ensure that customers participated during the evaluation period.

- **Active and Inactive dates:** The active and inactive dates, so we could establish when the customers entered or left PSE service.

- **General customer and HEA information:** This contextual customer information includes the customer's home type, home heating fuel type, meter units, installed measure names, and installation dates.

- **Participation in other programs:** Customers who participated in multiple energy efficiency programs during the time period being analyzed may skew the observed effect of the HEA program if they are not accounted for or removed. In this case, we removed them.

- **Location:** We used the address and zip code of each customer to incorporate regional weather data.

Participant Billing Data

PSE provided participant daily billing data from 2014 through 2018. To develop the final dataset used for statistical analysis, we used a multistep approach to combine and clean the data. We describe each billing data-cleaning step below.

- **Combined participant data with billing records:** We merged usage data with account-level data, including the HEA dates. We assigned billing periods in 2016 to the pre-participation period, and all bills from January 2017 on as the post-participation period.

- **Removed data outside the analysis date range (2016-2018):** For this analysis, we chose to keep daily billing data from 2016 to 2018 and drop billing data from 2014 and 2015.

■ **Removed billing periods before active date and after inactive date:** We used the earliest rate code for each customer to establish their move in date and the latest rate code as their move out date. We assume that observations outside of this range are from other occupants in the same property and disregard them. Please note, while this step removes records, not customers, some customers were removed from the analysis as a result of this cleaning step.

■ **Extremely high or low ADC:** We removed records with very high (>300 kWh/day on average) or very low (<2 kWh/day on average) pre- or post-participation usage. These data points were removed because their atypical usage patterns were likely due to factors that could not easily be controlled for in the model, and thus could have biased results.

■ **Removed all duplicate billing records:** The first occurrence of a perfectly duplicated observation is kept, and the rest are dropped.

■ **Consolidate daily usage values:** There were some customers that had multiple distinct energy usage values for a day. We interpreted this as showing the usage at different times of the day and summed the values together.

■ **Records with kWh/day values greater than three standard deviations from mean:** This step drops records that have values that are very unlikely to be seen in residential usage. We removed observations that were greater than 250 kWh/day or 22.5 therms/day.

After individual billing records were cleaned and all data were combined, we removed accounts that did not meet certain criteria. We use the following criteria to ensure that all accounts in the final analysis file had sufficient data to allow for robust analysis:

■ **Customers with zero usage in the entire dataset:** There are a few customers, mostly non-participants, that have zero usage in the entire data set.

■ **Customers with average usage greater than three standard deviations from the mean:** Although we'd like to keep as many customers as possible, it is not ideal to retain customers that are extremely different from the rest. We define this as average usage throughout the analysis period that is greater than 1,000 kWh/day or 75 therms/day.

■ **NEM customers:** We checked for customers that also have solar panels on their houses. There were none, so this step did not drop any accounts.

■ **Inadequate billing history before the analysis period:** To be able to assess changes in consumption due to program measures before and after installation, we included participants with a billing history covering, at a minimum, nine billing records during 2016. This is particularly important in this analysis since we are creating a matched comparison group based on energy usage in 2016.

■ **Participated in other PSE programs:** We defined cross-participation as participants who received other program benefits (such as an appliance rebate) from another PSE energy efficiency program. Cross-participants were removed from our analysis to limit the risk of the effects of other programs being confounded with the treatment effect of the HEA program.

There were additional customers we considered to be "missing at random" because they were not present in the billing data, we could not match a comparison customer to them, or we could not secure weather data for them.

The table below shows how many accounts were removed from the billing analysis for each reason.

Table 21. Accounts Removed from Analysis

Reason for Dropping Account	Comparison Pool		Treatment	
	Accounts	Percent of Total	Accounts	Percent of Total
Total Unique Accounts	**200,452**	**100%**	**12,051**	**100%**
Customer missing from usage data	304	0.15%	427	3.5%
Dates Less than Active Date or Greater than Inactive Date	40	0.019%	24	0.1%
Customers with 0 usage in entire dataset	431	0.21%	3	0.02%
Customers with an outlier average usage value	3,327	1.6%	7	0.05%
Usage with an outlier daily usage	21	0.01%	0	0%
NEM customers	0	0%	0	0%
Too few pre-period bills (fewer than nine)	7,269	3.6%	2,969	24.6%
Cross-participation	0	0%	2,409	17%
Merging with Matched Comparison Group[4]	180,539	90%	210	1.7%
Merging with Weather data	1,884	0.939%	1,433	11.9%
Account Remaining for Analysis	**6,637**	**3.3%**	**4,569**	**37.9%**

Comparison Group Matching

The evaluation team used both Propensity Score matching and normalized Euclidean distance to match the treatment customers to the comparison group, and then compared the results based on average daily usage tables and graphs. In this case, the team decided normalized Euclidean distance produced more balanced results for both gas and electricity usage matching.

While participants and non-participants looked very similar in terms of gas usage even before matching, electricity usage differed more greatly, with an average daily consumption (ADC) difference of more than 4 kWh/day during peak winter months. After matching with normalized Euclidean distance, the largest difference in ADC for a single month is less than 0.1 kWh/day for electricity, and for gas usage the largest difference is 0.01 therms/day. See figures below for the final matched groups.

Finally, to ensure the evaluation team achieved a good balance of treatment to comparison group customers, we also examined how home heating fuel type (whether gas or electric) impacts this balance during the heating season (winter months). The team found that while normalized Euclidean matching produced better results than Propensity Score matching, there was still a gap of 0.6 kWh/day for electric home heating participants and the comparison group. For gas home heating participants, the gap was still 0.01 therms/day or less.

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[4] This step is intentionally large, as we drop from the pool of nonparticipating customers to the selected matched comparison group.

Figure 19 and Figure 20 show the final matched comparison group alongside participants.

Figure 19. Participants and Normalized Euclidean Comparison Group, Electricity
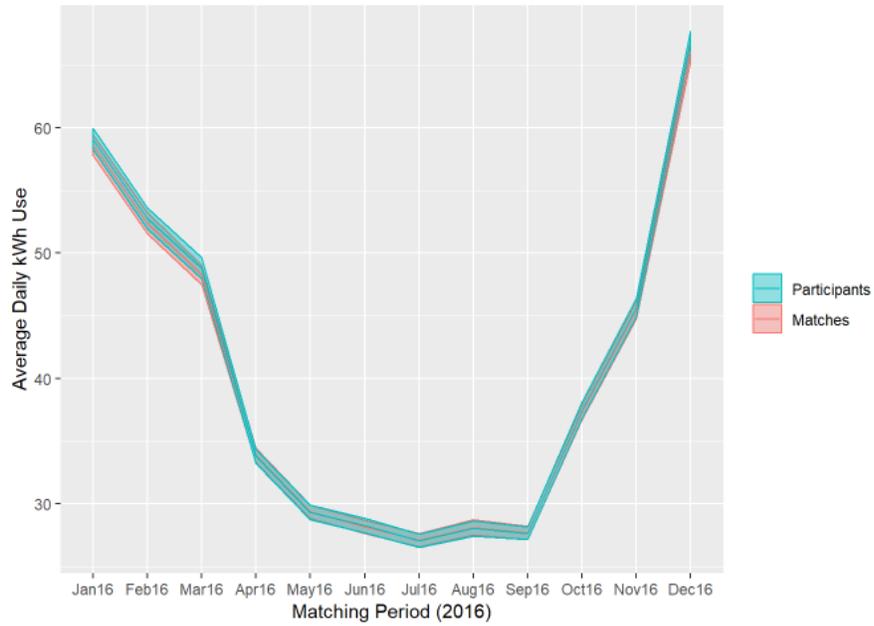
Figure 20. Participants and Normalized Euclidean Comparison Group, Gas
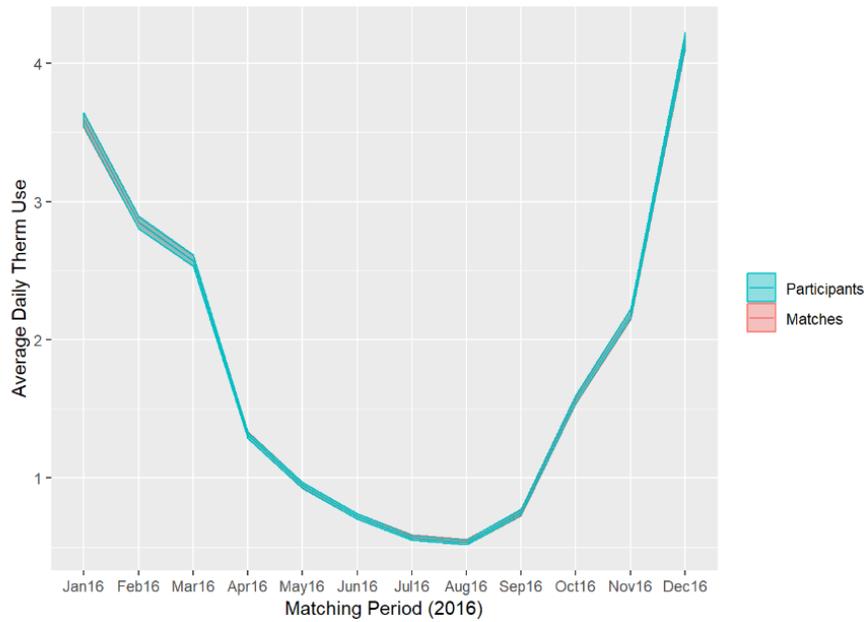
Weather

In order to include weather patterns in our model, we used daily weather data from numerous weather stations across the PSE territory, utilizing the site closest to each account's geographic location. By using multiple sites, we increased the accuracy of the weather data being applied to each account. We obtained these data from the National Climatic Data Center (NCDC).

The daily data were based on hourly average temperature readings from each day. We calculated CDD and HDD for each day (in the analysis and historical periods) based on average daily temperature using the same formula used in weather forecasting. We merged daily weather data into the billing dataset so that each billing period captured the HDD and CDD for each day within that billing period. For analysis purposes, we then calculated average daily HDD and average daily CDD, based on the number of days within each billing period.

Model Specifications

To estimate savings for the HEA program, the evaluation team utilized a LFER model that incorporated weather, monthly and day-of-the-week changes in energy usage, as well as interaction terms to account for baseline differences between the treatment and comparison groups. As described in more detail below, we fit a series of models to the data and settled on our final model based on fit statistics and model diagnostics.

Develop and Test Model Specifications

In the development of our final model, we aimed to explain as much variation in the dependent variable as possible. The most direct measure of this is the overall R-squared, which gives an estimate of how much variability in post-participation period usage is explained by the variables included in the model. An R-squared of 1.0 indicates that a model explains 100% of the variance in the dependent variable, and an R-squared of 0.5 would explain 50%.

As previously mentioned, we did not include customers who participated in other programs, focusing only on customers in the HER program. We considered retaining these customers and entering indicator variables for the other energy efficiency programs. However, this could lead to interference between each program's influence on energy use, making it difficult to draw valid conclusions about the effects of HEA program participation separate of the other programs. The evaluation team decided it was most appropriate to remove these customers from the analysis.

In the development of our model, we investigated average energy consumption before and after participation, how changes in weather affect the amount of energy used, and differences in energy use in each month and on different days of the week. We found a clear relationship between energy use and weather and saw expected fluctuations in energy use through the year.

To control for seasonal changes in energy use, our model includes terms for each month of the year (January–December). This allows a month to be present in both the pre-participation period and the post-participation period, thus capturing the change in usage during said month. Our use of these monthly terms in conjunction with a comparison group creates an improved counterfactual and increases the accuracy of program savings estimates. In addition, by including the days of the week in the model, we control for variability based on usage during the work week and weekends.

We also tested models that included terms that interact the effects of each month with the post-participation period. Additionally, we checked the effect of adding interaction terms of weather and the post-participation period to account for the relationship between weather and consumption following treatment. Failing to account for non-program-related changes that occur during the post-participation period, for example, the warmer summers that have been experienced, could undervalue the treatment effect. We tested different combinations of these potential interaction terms to determine the most representative model corrections across participants.

Final Model for HEA Program Participants

Our final model, shown in Equation 1, had an R-squared of 0.62.

Equation 1. Model Specification

$$ADC_{it} = B_h + B_1 Post_{it} + B_2 Post_{it} \cdot Treat_{it} + B_3 HDD_{it} + B_4 CDD_{it} + B_t DOW_{it} + B_{t1} Month + \varepsilon_{it}$$

Where:

ADC_{it}	= Average daily consumption (in kWh) for the billing period
$Post$	= Indicator for treatment group in post-participation period (coded "0" if treatment group in pre-participation period or comparison group in all periods, coded "1" in post-participation period for treatment group)
$Treat$	= Indicator for treatment and matched comparison group (coded "0" for matched comparison group, coded "1" for treatment group)
HDD	= Average daily HDD from NCDC
CDD	= Average daily CDD from NCDC
DOW	= Day of week indicator
$Month$	= Month indicator
B_h	= Average household-specific constant
B_1	= Difference in usage associated with any differences in the pre and the post-program period, unadjusted by weather, day of week and month
B_2	= Main program effect (change in ADC associated with being a participant in the post-program period)
B_3	= Change in ADC associated with one-unit increase in HDD
B_4	= Change in ADC associated with one-unit increase in CDD
B_t	= Coefficients for each day of the week
B_{t1}	= Coefficients for each month
ε_{it}	= Error term

Estimated Savings and Realization Rate

This section contains the observed net savings and realization rates resulting from our billing analysis. The results account for FR and reflect savings associated with installed measures, participant SO, and behavioral changes from energy efficiency knowledge gained during the assessment.

Estimated Savings

The regression model results presented in Table 22 shows a reduction in electricity use after customers participate in the HEA program, controlling for weather, time, and the household characteristics (reflected in the constant term).

Table 22. Summary Results of Billing Analysis Models

Variable	Coefficient - kWh	Coefficient - Therms
Post (HEA program participation)	-0.48066[a]	0.19036[a]
Cooling Degree-Days (CDD)[b]	1.163385[a]	0.035848[a]
Heating Degree-Days (HDD)	0.622855[a]	0.067061[a]
Post: treat interaction	-0.46161[a]	0.019047[a]
Constant	30.40805	1.030567
R-squared	0.615709	0.70936
Additional Terms	**Included**	**Included**
Monthly effects included	YES	YES
Weekday effects included	YES	YES

Notes: [a] $p < 0.01$.
[b] A "degree-day" is a unit of measure for recording how hot or cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 (HDD) and 75 (CDD) degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.) If the mean temperature for the day is 5 degrees higher than 75, then there have been five CDD. On the other hand, if the weather has been cool, and the mean temperature is, say, 55 degrees, then there have been 10 HDD (65 minus 55). http://www.srh.noaa.gov/ffc/?n=degdays.

Table 23. Estimated Savings from Billing Analysis Compared to Baseline Usage

	Baseline Usage (kWh)	Savings (kWh)	Standard Error	90% Confidence Interval of Savings		Percent Savings
Overall daily savings	31.45	0.4616	0.05	0.38	0.55	1.5%

Based on our analyses, the team found 1.5% savings (see Table 23) and an annual per-home savings of 168.49 kWh annually for HEA program participants (see Table 24). With 12,051 participants in the evaluation period (January 1 – December 31, 2017) the program saved 2,030.5 MWh. When the team examined the gas models, we found they could not do a good job of extracting the treatment effect from other sources of variation. Therefore, the team is not reporting on therm savings.

Table 24. Savings for 2017 HEA Program

Participants	Annual Baseline Usage (kWh)	Percent Savings	Annual Energy Savings (kWh)	
			Per-Home Savings	2017 HEA Program
12,051	31.45	1.5%	168.49	2,030,470

Table 25. Full Model Results

meter_units	Term	estimate	std.error	statistic
kWh	CDD	1.163385	0.016102	72.25292
kWh	HDD	0.622855	0.003246	191.8797
kWh	constant	30.40805		
kWh	Monday	1.518592	0.047781	31.78247
kWh	Saturday	0.148899	0.04762	3.126815
kWh	Sunday	0.579121	0.047659	12.15128
kWh	Thursday	0.310428	0.047686	6.50978
kWh	Tuesday	1.132419	0.047698	23.74128
kWh	Wednesday	0.717568	0.047689	15.04673
kWh	October	-9.50156	0.071723	-132.476
kWh	November	-4.66498	0.066734	-69.9037
kWh	December	0.390416	0.06462	6.04174
kWh	February	-1.52163	0.064415	-23.6222
kWh	March	-3.7565	0.064217	-58.4968
kWh	April	-9.53447	0.069976	-136.253
kWh	May	-13.0931	0.079004	-165.726
kWh	June	-13.3332	0.08449	-157.808
kWh	July	-12.2223	0.090067	-135.702
kWh	August	-12.1586	0.090945	-133.692
kWh	September	-13.216	0.084309	-156.757
kWh	post	-0.48066	0.036869	-13.0369
kWh	post:treat	-0.46161	0.052429	-8.80444
therm	CDD	0.035848	0.001489	24.07752
therm	HDD	0.067061	0.000296	226.2939
therm	constant	1.030567		
therm	Monday	0.046044	0.004445	10.35843
therm	Saturday	0.011135	0.004429	2.513744
therm	Sunday	-0.00052	0.004437	-0.11731
therm	Thursday	0.027688	0.004437	6.240604
therm	Tuesday	0.060217	0.004438	13.5681
therm	Wednesday	0.063426	0.004438	14.29188
therm	October	-0.72571	0.006669	-108.821
therm	November	-0.40633	0.006161	-65.9557
therm	December	-0.06835	0.005834	-11.7164
therm	February	-0.13985	0.005882	-23.7761
therm	March	-0.32771	0.005941	-55.1568

meter_units	Term	estimate	std.error	statistic
therm	April	-0.67172	0.006524	-102.961
therm	May	-0.86502	0.007388	-117.087
therm	June	-0.8833	0.007921	-111.516
therm	July	-0.85801	0.008467	-101.335
therm	August	-0.88115	0.008561	-102.928
therm	September	-0.90564	0.007895	-114.709
therm	post	0.019036	0.003495	5.447302
therm	post:treat	0.019047	0.004884	3.899914

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Evaluation Report Response

Program: Home Energy Assessments

Program Manager: Amit Singh

Study Report Name: Puget Sound Energy 2017-19 Home Energy Assessment Evaluation Report

Report Date: November 2019

Evaluation Analyst: Jim Perich-Anderson

Date Final Report provided to Program Manager: 11/27/2019

Date of Program Manager Response: 12/9/2019

Overview:

The Puget Sound Energy (PSE) Home Energy Assessment (HEA) program provides free assessments of PSE customers' home energy use. PSE-qualified HEA specialists perform the assessments and provide recommendations designed to reduce their energy consumption. Additionally, HEA provides direct installation of LED light bulbs and distribution of leave-behind high-efficiency products such as showerheads and faucet aerators upon request. The measures are prescriptive and are provided at no cost to the customer. The goals of the program are to increase customer awareness regarding their home's energy consumption and identify and encourage cost-effective ways to use less energy.

The HEA program is a mature program having operated for several years, however the program recently added new features such as increasing the potential number of LEDs installed per home from 20 to 30 (beginning in mid-2017) and adding specialty lighting to the measures available for direct installation (beginning in 2018). In 2018, the program also enhanced its outreach to participants by offering exclusive limited-time-offers for customers interested in upgrades after the audit and cross-promoting with the direct-to-consumer (DTC) channel offerings.

Evaluation Objectives and Research Questions

Since PSE last evaluated the program in 2013, and since new features were added in 2017 and 2018, the evaluation team conducted a comprehensive evaluation including a channeling analysis of customers who participated in other PSE programs after participating in the HEA program; an engineering-based impact evaluation of the program's savings for 2017 and 2018; a consumption analysis to determine whether the team could detect savings from behavioral changes; and a process evaluation of the program's efforts throughout 2018-2019.

The HEA program currently claims savings from all direct install (DI) and leave-behind measures and found that the overall program savings primarily came from lighting this biennium. Since this would present a risk to the future cost-effectiveness of the program as residential lighting savings continue to dwindle due to the Energy Independence and Security Act (EISA), PSE expressed interest in identifying ways to increase the value of the HEA program by identifying new direct-install or leave-behind measures to offer, quantifying the indirect savings impact it has on the entire residential portfolio (due to channeling of customers into PSE's other programs), and quantifying the potential additional savings that are not being claimed (e.g., behavior changes or actions taken outside PSE programs).

Impact

This evaluation sought answers to the following impact evaluation questions:

- How many HEA participants enrolled in another residential program after participating in HEA ("post-HEA participants")? What programs have the most post-HEA participants?

- What is the average time-lapse between participants receiving recommendations from HEA and enrolling in another residential program? What does this suggest about potential HEA influence?

- What amount of savings from the other residential programs are potentially attributable to the HEA recommendations?

- Did PSE apply the correct deemed savings values in 2017 and 2018, the years for which the evaluation team estimated program impacts?

- Are the deemed savings values for this program appropriate, or do they require updates? Is there any uncertainty surrounding deemed savings values?

- Does PSE track the data needed to evaluate direct program impacts? Does PSE track data that allows for the evaluation of indirect impacts to the entire residential portfolio?

- How many HEA participants are taking action to save energy outside of the portfolio and what types of actions are they taking?

- How much savings does this program produce outside of what is captured currently in the residential portfolio, i.e. savings from behavioral changes that go beyond the impacts from DI measures and participation in other PSE programs? What is the duration of the savings?

Process

This evaluation sought answers to the following process evaluation questions:

- How is the HEA program currently implemented? What changes have occurred since the last evaluation in 2013? When did those changes happen? What changes are program staff planning for 2019 onward?

- What success and challenges, if any, did PSE encounter as it implemented the HEA program recently?

- What are PSE's marketing efforts for the HEA program? What improvements or strategies might increase the educational value of the program?

- How does the program's theory lead to direct and indirect energy savings? What are the KPIs? What improvements can PSE make, if any, to the program theory and logic model (PTLM) and KPIs to best reflect the program's design?

- How is the process of customer referrals to other PSE programs executed from both the internal operations and the customer's perspective? What opportunities exist to enhance conversion from referral to program participation?

To answer these research questions, the evaluation team completed several data collection and analytic activities, including an interview with the program manager, interviews with energy specialists who conduct the home assessments, a review of program materials, a participant web survey, an analysis of the survey results, an analysis of program-tracking data, a consumption analysis, a deemed savings review, and an engineering analysis. The evaluation team holistically reviewed the results of these analyses to arrive at key findings and provide program recommendations.

High-Level Findings

Table 1 summarizes the key performance indicators (KPIs) used to assess overall program performance. As shown in the "overall program health" column, the evaluation results determined that the program is well-designed to capture significant participation, implemented in a fashion that satisfies PSE's customers, exceeding expectations for the proportion of HEA referrals that go onto participate in other PSE energy efficiency program opportunities, and receiving strong installation and persistence rates for DI and leave-behind measures. As such, the program far exceeded its goal for energy savings based solely on the direct-install and leave behind measure savings.

In addition, the evaluation team found that over three-quarters of participants self-reported taking at least one of the energy efficiency recommendations they received during the home assessment. While this is a substantial proportion, participants gave an average score of 3.0 out of 5 for how much of an influence the HEA experience had on their decision to take additional actions.

Table 26. HEA Key Performance Indicators

KPI	Definition	Goal	Currently Collected by Program (Y/N)	Included in Evaluation Scope (Y/N)	KPI Status	Overall Program Health	KPI Data Source
Participation	Number of participants biennially	None	Y	Y	2017=12,051 2018=12,435 2019=Pending[a]	🚦	Program tracking data
Expenditure	Dollars spent biennially	$5,150,814[b]	Y	Y	$5,088,708 (projected)[c]	🚦	PSE
Customer Satisfaction	Average score on a 1 to 5 scale	4.25 or greater[e]	Y	N	4.25-point average out of 5	🚦	Participant survey
HEA Referrals Conversion or Program Lift[f]	% who converted from HEA referral to program participation	15%	Y	Y	22% of 2017 participants channeled by March 2018	🚦	Program tracking data; Channeling analysis

KPI	Definition	Goal	Currently Collected by Program (Y/N)	Included in Evaluation Scope (Y/N)	KPI Status	Overall Program Health	KPI Data Source
Installation and Persistence Rates[f]	The in-service rates for each measure type	TBD	N	Y	$ISR_{LED}=$ 92.5% $ISR_{SH}=$ 79.6% $ISR_{FA}=$ 80.5%	🟢	Participant survey
Behavioral Transformation [f]	% of HEA participants who do more energy efficient behaviors	TBD	N	Y	77% of participants took at least one recommended action	🟢	Participant survey
Electric Energy Savings[d]	Amount of MWh savings for 2018	5,148 MWh	Y	Y	2018 savings=8,929 MWh	🟢	Program tracking data; Engineering Analysis
Scheduling Wait Time	Days between scheduling and assessment completion	Less than 11 days	Y	N	Average of 16.8 days	🟡	Participant survey
Program Influence[f]	Average score on a 1 to 5 scale	TBD	N	Y	3.00-point average out of 5	🟡	Participant survey

Notes: [a] The evaluation team will work with PSE to finalize these numbers at the end of the program year.

[b] Original biennium goal for 2018-2019 was $5,283,759.

[c] Provided by PSE through email correspondence.

[d] PSE does not have therm savings goals for this program for the biennium.

[e] The original goal was defined as the average score of 8.5 on a 0-10-point scale.

[f] Recommended by the evaluation team.

Program Impact Findings

Overall, the HEA program reaches numerous PSE customers, thereby providing a unique opportunity to directly install equipment and provide education about how customers use energy in their homes and how they can take actions to reduce their usage. Since 2017, the program has served over 12,000 customer a year. While the HEA program garners energy savings in and of itself from DI and leave-behind measures during the assessment, the program has the potential to provide even more value to the overall portfolio of energy savings in multiple ways: (1) It can serve as a key marketing tool for identifying and referring customers to other programs that can help them address energy saving opportunities in their homes, and (2) it can influence savings beyond the PSE program portfolio by encouraging customers to make behavior changes. Two in ten HEA participants participated in other programs post-HEA, most commonly upgrading their lighting, weatherization and retail appliances. These referrals from HEA contributed 5% of the portfolio's electric savings and 3% to the gas savings, which highlight HEA's value to the portfolio beyond the DI and leave-behind measures.

The majority of the savings from this program has traditionally come from DI lighting savings. Given that lighting savings is dwindling due to advancements in lighting technology in the general marketplace, PSE

was interested in exploring whether there are any behavioral savings associated with this program that are not currently captured in the HEA program or other PSE programs. The evaluation team conducted a consumption analysis of participant's energy usage coupled with a channeling analysis (used to remove savings already captured in other programs). The evaluation team was not able to detect any measurable behavioral savings at the meter-level through a pooled consumption analysis approach.

The table below summarizes the impact-related research questions and findings from this evaluation and provides a reference to the section in the main report where further details are available.

Table 27. Program Impact Findings Summary

Impact Research Questions	Evaluation Finding	Section Reference
How many HEA participants enrolled in another residential program after participating in HEA ("post-HEA participants")? What programs have the most post-HEA participants?	The evaluation team found that 22%, or 2,600 participants, of the total 2017 HEA participants enrolled in another residential program by March 2018. The programs with the most post-HEA participants are Retail Lighting (69%), Single Family Weatherization (12%), and Retail Appliances (12%).	5.2.1
What is the average time-lapse between participants receiving recommendations from HEA and enrolling in another residential program? What does this suggest about potential HEA influence?	Opinion Dynamics analyzed the average time lapse between HEA participation and enrolling in another residential program (based on installation or purchase date on program tracking records). A shorter time lapse between programs suggests a strong connection between HEA and the savings from the larger portfolio. The average time lapse between HEA and other program participation was four months, which suggests the HEA program has a reasonably strong influence on the decision to participate in other PSE programs. Additionally, four months is a short period of time considering that many of these programs require finding a contractor, potentially finding financing, and time to install the measures.	5.2.1
What amount of savings from the other residential programs are potentially attributable to the HEA recommendations?	Based on the channeling analysis, post-HEA participants saved around 1.2 GWh and 52,000 therms by participating in other residential programs which represented 5% of the electric savings and 3% of the gas savings of the portfolio.	5.2.1
Did PSE apply the correct deemed savings values in 2017 and 2018, the years for which the evaluation team estimated program impacts?	PSE applied deemed savings values from the Regional Technical Forum (RTF) for low-flow showerheads and PSE-derived values for faucet aerators and LEDs. PSE applied the values applicable to the installation dates as provided in the program tracking database. For consistency with the Multifamily Retrofit Program (MFRT), the evaluation team applied deemed savings that align with the savings reported date. This resulted in a 10% reduction in reported savings compared to evaluated savings but savings were still enough to far exceed the program's planning goal.	5.2.3

Impact Research Questions	Evaluation Finding	Section Reference
Are the deemed savings values for this program appropriate, or do they require updates? Is there any uncertainty surrounding deemed savings values?	The evaluation team identified that the deemed savings for faucet aerators and LEDs are appropriately derived. Showerhead savings for those with gas water heaters were based on a conversion of the deemed electric savings from the RTF. However, this value embeds savings from both the reduction of energy from the water heater as well as waste-water reduction savings. The evaluation team removed the waste-water electric savings prior to converting to therms, resulting in a reduction in gas savings for showerheads.	5.2.3
Does PSE track the data needed to evaluate direct program impacts? Does PSE track data that allows for the evaluation of indirect impacts to the entire residential portfolio?	PSE tracks all necessary data to evaluate program impacts through both an engineering analysis and a consumption analysis. It also tracks all necessary data to calculate indirect impacts to the residential portfolio. PSE provided its residential program participation data, thus allowing the team to identify which PSE programs HEA participants went on to participate in.	4.3 and Section 5
How many HEA participants are taking action to save energy outside of the portfolio and what types of actions are they taking?	Eighty percent (80%) of participants recall energy saving recommendations that were given during the home energy assessment. Seventy-seven percent took at least one recommended action and approximately 50% of participants took recommendations to change air or furnace filters regularly, turn off any lights that are not being used, and adjust thermostats to recommended settings.	6.2.4
How much savings does this program produce outside of what is captured currently in the residential portfolio, i.e. savings from behavioral changes that go beyond the impacts from DI measures and participation in other PSE programs? What is the duration of the savings?	One method to estimate the energy savings from behavioral changes is to subtract the engineering-based annual program savings from the consumption analysis-based savings. Theoretically the difference would represent the savings generated from the program over and above those that result from the installation of LEDs and water saving measures. Unfortunately, the estimated program savings from the consumption analysis are much lower than those estimated using an engineering analysis approach. It is important to recognize that the engineering analysis savings are ex-post gross values while the consumption analysis savings are ex-post net values. Even taking this into consideration, the evaluation team was unable to detect savings from behavioral changes for the HEA program.	5.2.4

Program Process Findings

PSE experienced successes with the HEA program in overall customer satisfaction, the quick delivery of the program after participant sign-up, highly qualified staff interacting with customers, the number of LEDs offered to participants, and the geographic reach of the program. Some challenges of the program included meeting customer expectations about the program, the leave behind measures being of lower quality, and coordination issues between Franklin Energy Services and the subcontractors.

The evaluation team found that most participants first heard about the program through PSE's emails and through previous participant word-of-mouth. There is, however, no current system to encourage customer-to-customer referrals (for example, providing previous participants with an incentive if they refer a friend). To increase the educational value of the program, PSE may want to follow-up with participants after the assessment is completed with recommendation reminders and other program referrals. Participants noted they would prefer follow-ups via email or website channels.

Energy specialists educate and inform HEA participants of other energy efficient opportunities available through PSE. From the participant perspective, however, the HEA program was not rated as highly influential in explaining subsequent participation as they self-reported a moderate average influence rating of 3 (on a scale from 1 to 5) for any subsequent program. Furthermore, over 80% of HEA participants self-reported interest in participating in further PSE programs, while only 22% were successfully channeled into a subsequent program. Seven percent suggested informational follow ups about energy savings tips, offers for rebates, and a hard copy of the assessment report. Offering more information via emails, and the PSE website about other programs should spur more channeled enrollment.

The table below summarizes all of the process-related research questions and findings and references the section in the main report where further details are available.

Table 28. Program Process Findings Summary

Process Research Questions	Evaluation Finding	Section Reference
How is the HEA program currently implemented? What changes have occurred since the last evaluation in 2013? When did those changes happen? What changes are program staff planning for 2019 onward?	The program provides free home assessments of PSE single family customers' home energy use by HEA specialists. Specialists provide participants with reports that include recommended equipment upgrades, information about home energy usage, and tiered recommendations for prioritized energy-saving actions. The assessment also includes direct installation of LEDs and leave-behind water saving measures at no cost to the customer. Beginning in mid-2017, the maximum number of LEDs a customer could receive increased from 20 bulbs to 30 bulbs. In 2018, the program also began to offer specialty LEDs. Lastly, beginning in late 2017, Franklin Energy Services (FES) performed all audits instead of any qualified Contractor Alliance Network (CAN) contractor. Planned changes for the future include possibly adding non-lighting DI measures, making the assessment report more user-friendly, providing follow up emails or calls after assessment visits, and improving the referral tracking process.	6.2.2
What success and challenges, if any, did PSE encounter as it implemented the HEA program recently?	PSE experienced successes with the HEA program in overall customer satisfaction, the quick delivery of the program after participant sign-up, the highly qualified staff, the number of LEDs offered to participants, and the geographic reach of the program. Some challenges of the program included meeting customer expectations about the program, the leave behind measures being of lower quality, and coordination issues between Franklin Energy Services and the subcontractors.	6.2.3
What are PSE's marketing efforts for the HEA program? What improvements	The marketing efforts for HEA include traditional tactics (e.g., e-mails, direct mailers) as well as more innovative means of program promotion. These include social media campaigns, door-to-door "blitzes" occurring in ten communities and featuring direct program sign-ups, targeted "bonanzas,"	6.2.6

Process Research Questions	Evaluation Finding	Section Reference
or strategies might increase the educational value of the program?	which offer a suite of PSE programs to a single community over four to six weeks and include door-to-door tactics and PSE sign-up events, and sports partnerships with major and junior league teams. The evaluation team found that most participants first heard about the program through PSE's emails and through previous participant word-of-mouth. There is, however, no current system to encourage customer-to-customer referrals (for example, providing previous participants with an incentive if they refer a friend). To increase the educational value of the program, PSE may want to follow-up with participants after the assessment is completed with recommendation reminders and other program referrals. Participants noted they would prefer follow-ups via email or website channels.	
How does the program's theory lead to direct and indirect energy savings? What are the KPIs? What improvements can PSE make, if any, to the program theory and logic model (PTLM) and KPIs to best reflect the program's design?	Through the process of scheduling specialists to conduct assessments, PSE directly influenced savings by installing LEDs and/or providing water saving measures. Indirectly, PSE influenced savings by recommending customer behavioral changes to reduce energy consumption and encouraging participation in other PSE energy saving programs. Given the program's goals, the KPIs currently include energy savings, customer participation, program expenditures, wait time between scheduling and receiving assessments, customer satisfaction, conversion of HEA referrals to other programs, and in-service rates of installed equipment. The evaluation team recommended tracking program lift (% of HEA participants who go on to participate in another PSE program) and participant ratings of HEA's influence. PSE could improve the HEA PTLM by adding potential barriers, updating the implementation structure, including program referral pathways, and clarifying documentation methods.	6.2.2
How is the process of customer referrals to other PSE programs executed from both internal operations and the customer's perspective? What opportunities exist to enhance conversion from referral to program participation?	As described by the PTLM, the program's process included educating and informing HEA participants of other energy efficient opportunities available through PSE. From the participant perspective, however, the HEA program was not rated as highly influential in explaining subsequent participation as it did not exceed a self-reported influence rating of 3 (on a scale from 1 to 5) for any subsequent program. Furthermore, over 80% of HEA participants reported interest in participating in further PSE programs while only around 22% of participants were successfully channeled into a subsequent program. Offering more information via emails, and the PSE website about other programs should spur more channeled enrollment.	6.2.5

Evaluation Recommendations and Program Responses

Program recommendations are found in the Program Overview section, as well as the following sections of the report:

- Specialist Interviews
- Program Theory Review
- Customer Surveys

Recommendations and program responses are below.

Overall Recommendations (p. 13)

The report's overall conclusions and recommendations based on the impact and process related findings and HEA program staff responses to those recommendations, are presented below.

Deemed Savings Values for Direct Install and Leave-Behind Measures

- ■ **PSE converts electric showerhead savings to gas with embedded waste-water reduction savings.** The RTF does not provide gas savings; therefore, PSE converted the kWh savings for showerheads to therms for those with gas water heating. However, the kWh savings from the RTF embeds additional savings from waste-water reduction. We recommend removing the additional waste-water savings prior to converting from electric to therm savings. Though this will reduce the deemed gas savings for this measure, it provides a more accurate estimate of savings. The waste-water savings for showerheads with gas water heating are counted toward electric savings as these savings are due to a decrease in pump energy consumption.

HEA Program Response: This recommendation has been incorporated into the most recent HEA measure case update.

- ■ **Not all showerheads in homes with gas water heating were given electric savings toward waste-water.** Waste-water savings are additional savings for showerheads and are embedded in the electric energy savings for homes with electric water heating. However, homes with gas water heating should receive waste-water savings counted toward electric savings. We recommend ensuring that waste-water savings for all homes receiving showerheads with gas water heating receive the additional electric waste-water savings. Making this change led to an increase in reported electric savings.

HEA Program Response: In 2020, we will not be claiming any electric savings for showerheads installed in homes with gas water heating. The administrative costs to administer this small savings, was not worth the benefit.

Increasing Energy Saving Potential from HEA and Value to Entire Portfolio

- ■ **When the program is no longer able to claim lighting savings, it will greatly reduce the energy savings directly from HEA.** However, HEA will still have an opportunity to contribute savings to the portfolio overall through a number of options including: (1) enhancing efforts to refer more customers to other program opportunities (2) adding different DI and leave-behind measures; and (3) finding ways to boost and measure behavioral savings.

HEA Program Response: We will continue to use HEA to refer customers to other program opportunities, and in 2020 will be allocating some of the marketing budget for other programs into HEA's budget. Regarding in-home measures, we will no longer be doing leave behind, only direct install. This should lead to higher persistence and realization rates, as well as potentially better customer satisfaction. We will also be adding water heater pipe wrap to the measures that we install during HEA. Finally, we will be undergoing a pilot in 2020/2021 to investigate non-DI savings associated with additional in-home assessment "energy actions."

■ **Per referrals to other programs, more efforts to follow-up with participants on recommendations could further boost savings in the portfolio.** One of the common recommendations for program improvement that participants mentioned was to provide follow-up from PSE or the energy specialists to remind them about the energy saving recommendations and to answer further questions about upgrade costs/rebates. Further, portfolio and HEA-specific energy savings would likely improve if PSE upgraded program technological equipment. Energy specialists reported both hardware and software issues that led to difficulties in providing customers with smooth assessment experiences and complete lists of recommendations.

HEA Program Response: We are investigating ways to incorporate follow-up recommendations (aka "nurturing") into the HEA. This may be done by the implementer, or internally through emails sent by PSE.

■ **Per DI measures, PSE should consider the energy saving potential from adding measures such as pipe wrap or water heating blankets to those with electric water heating or "light touch" weatherization measures such as air sealing or attic-hatch insulation.**

HEA Program Response: Pipe wrap is being added to the HEA measure mix. Other measures are not considered feasible at this time. We considered the idea of "light touch" weatherization, but determined that it would add too much time to the assessment to maintain program cost-effectiveness. However, we will consider using "light touch" weatherization, water heating blankets, and attic-hatch insulation as follow-on nurturing recommendations.

■ **Behavioral savings is a more challenging one to address and may require a multi-pronged approach.** While 88% recall receiving any energy saving recommendations, 54% recalled recommendations to change air filters and 50% recalled recommendations to turn off lights when not in use. The majority of participants did not recall receiving any of the other 20 behavioral recommendations provided. Some participants additionally reported not recalling the recommendations due to the overwhelming amount of information given during the assessment itself. Responding to these suggestions by providing follow-ups should increase engagement with the participants and may increase the program's behavioral saving potential if the potential is there. While this evaluation did not detect any via consumption analysis, it is possible the behavioral savings are too small to pick up in the statistical model and other engineering-based approaches can measure those savings. Regardless of method, it is also possible that the baseline consumption of participants is not high enough, on average, to capture behavioral savings. The evaluation conducted the same analytical approach for the evaluation of a similar program in another jurisdiction and found substantial behavioral savings beyond DI measures, however one major difference was the baseline consumption level of participants in comparison to PSE's program.

HEA Program Response: As mentioned above, we are investigating ways to incorporate a nurturing campaign into the HEA. That would include the various recommendations discussed above.

Increasing Program Participation and Setting Customer Expectations

■ **PSE could improve marketing efforts that encourage word-of-mouth advertising.** Initial HEA marketing had the greatest success through email. The evaluation team found that most participants first heard about the program through PSE's emails, and through previous participant word-of-mouth. There is currently no system to encourage customer-to-customer referrals even though hearing about the program from friends and family was the second most common way for participants to initially learn about the program. Additionally, since it is the evaluation team's understanding that the program implementer and specialists have not taken much of a role advertising the program, PSE could benefit from allowing the program implementers and specialists to distribute referral cards to participants to spur greater awareness and enrollment in the HEA program.

HEA Program Response: We piloted referral cards this year, but did not see much success. In 2020/2021, we're considering transitioning this to a digital referral campaign whereby customers would email or text a digital referral card to friends/family.

■ **Participants should receive additional information leading up to the assessment.** Specialists generally agreed that most customers did not know what to expect from the assessment or expected to receive more from the assessment than could be provided. Though customer satisfaction with the program is high, providing more information prior to participation may improve the process and allow specialists more time to focus on behavioral and subsequent program recommendations.

HEA Program Response: We will review this further and develop messaging with the program implementer.

Specialist interviews (p.42)

■ Technology Use - The program seemed to suffer from several technology problems, however. Specialists reported both hardware and software issues including poor camera quality, short battery life of tablets, limited memory and processing power of tablets, 'glitchy' software, unreliable recommendation list loading and referral page errors. These technological issues lead to difficulties in providing customers with smooth assessment experiences.

HEA Program Response: All software (memory, processing, etc.) have been resolved since the program implementer's system upgrade in April. We've spoken with all Energy Specialists and they've been very happy with the improvements including processing speed.

■ Regarding hardware concerns, battery life issues are very minimal with improved chargers and settings. We regularly update tablets to newer models. The camera quality of the tablet and flash ability is still lacking but most Specialists use their phone (for high photo quality and better safety.

- The recommendation/rebate list was updated in the summer of 2019. PSE and the implementer will coordinate on updates before annual changes and ad hoc as programs change.

- The referral page/time out errors via pse.com have been resolved with the transition to a new referral platform.

- Report Presentation - The largest factor in customer's willingness to invest in upgrades, according to specialists, depended on finances and the way information was presented in the report. Some customers were open about their inability to afford any upgrades. Therefore, many of the specialists attempted to emphasize the financial benefits of energy efficiency over time (8 out of 10 specialists). Five specialists noted that the report could do more to reinforce these topics so that participation in PSE's programs could improve.

HEA Program Response: This result has been brought to the attention of the implementer as a training topic for the energy specialists.

Additional Recommendations – Program Theory (p. 43)

The evaluation team identified the following opportunities for improvement:

- **Add barriers to the PTLM:** Other residential program PTLMs in PSE's portfolio include a "barriers" row that outlines the key barriers to program participation that the target customers face. In addition to ensuring consistent PTLM design, adding this information provides useful context for the rationale behind program interventions.

- **Update language to reflect the new implementation structure**: While the process steps are accurate, the language in the current PTLM appears to be based on past CAN implementation structure. Updating the language in the PTLM to reflect FES' role in the new implementation structure may be beneficial for HEA Specialists during the training process through to program delivery.

- **Add a program referral pathway:** The third activity from the left in the PTLM includes a bulleted sub-activity related to informing customers about other energy efficiency opportunities. Considering the importance of referring customers to other programs, it is recommended that PSE include the following in the PTLM:

    - "Informing customers about other energy efficiency opportunities" as a separate activity;

    - "CAN and other program referrals" as an output of this activity;

    - "Awareness of other programs" as a short-term outcome; and

    - "Participation in other PSE programs" as a long-term outcome.

- **Clarify documentation methods:** The current PTLM contains a placeholder for "documentation" referring to documents or databases that track program outputs. However, the PTLM does not provide specific information on the form of documentation prepared by program staff. Though not a requirement of PTLMs, should PSE want to incorporate this information, it is beneficial for program staff to describe the databases or documents that it uses to track outputs from the program.

HEA Program Response: The PTLM has been updated to incorporate these recommendations.

Program Improvement Suggestions – Customers (p. 54)

Given that one of the KPIs for the program is customer satisfaction and PSE staff mentioned having an interest in understanding customer expectations about the program, the evaluation team asked participants to directly provide recommendations through the survey. Participants came up with several reoccurring recommendation themes. Some of the common themes are as follows:

- Include newer tips/recommendations for energy savings, as the current ones are "common sense".
- Provide a specialist follow up after the assessment visit to remind customers about the energy saving recommendations and to answer further questions about upgrade costs/rebates.
- Provide more specific details about where the high home-energy usage is actually coming from to make the assessment more meaningful.
- Offer more equipment in terms of the quantity of each equipment type and the variety of equipment.

Participants also answered a question about examples of other equipment PSE could provide through the program to spur further interest. The main equipment types that participants suggested were:

- Air/furnace filters
- Heat Pumps
- Insulation
- Smart thermostats
- Solar panels

  Though not suggested by participants, the evaluation team is familiar with home energy assessment programs offered by other utilities around the country. Lower cost non-lighting measures PSE could also consider include weatherization measures, such as outlet gaskets and weather stripping, pipe wrap/insulation, and/or water heater blankets.

HEA Program Response: There are a number of changes to HEA in 2020/2021 that address these recommendations. Several energy actions, including those listed below, will be offered in 2020 in addition to the direct install and recommendations that HEA already offers.

- Water heater turn down
- Thermostat reprogramming
- Refrigerator turn down
- Refrigerator coil cleaning
- DHP filter cleaning

- HEA energy specialists will be offering the direct install of smart thermostats to customers who are willing to pay a copay.

- We have rebates for heat pumps and insulation that the energy specialists are trained to recommend to eligible customers. Energy specialists can also refer customers to our in-network solar installers.

- A nurturing campaign is being planned for 2020/2021 that will provide reminders to customers of tips and recommendations that we made during the HEA.