Evaluation Report Response

Program: Home Energy Reports

Program Manager: Dane Tomalin

Study Report Name: Puget Sound Energy's Home Energy Reports: 2013 Impact Evaluation

Report Date: April 2014

Evaluation Analyst: Bobbi Wilhelm

Date ERR Provided to Program Manager: 4/18/14

Date of Program Manger Response: 5/9/14

Please describe in detail, action plans to address the evaluation study's key findings and recommendations.

Overview: Home Energy Report evaluation shows "joint savings" for both electric and gas fuels in households that continue to receive reports and households that had the report service discontinued.

Action Plan: Based on the results in the evaluation report, Program Management will adopt the key findings as savings for the program. Program Management will continue to review the savings performance of the households that had report service discontinued in order to evaluate the persistence of this measure.

Date of Program Action: Home Energy Report program management has approved of the findings in the HER Evaluation and require no corrections or additional actions. The findings in the evaluation will be used for our ex-post savings claim for 2013. This evaluation and the methodologies within should be used for future HER evaluations.

DNV·GL

HOME ENERGY REPORT PROGRAM

2013 Impact Evaluation

Puget Sound Energy

Report No.: 5, Rev. 1
Date: April 2014

Project name:	Home Energy Report Program	DNV GL Energy
Report title:	2013 Impact Evaluation	SUS PAR
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Reference to part of this report which may lead to misinterpretation is not permissible.

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1 EXECUTIVE SUMMARY

Puget Sound Energy (PSE) implemented the Home Energy Reports (HER) Program in 2008. The HER Program delivers customized information on energy consumption to participating households and compares the household's energy consumption to that of similar neighbouring homes. In addition, the report provides personalized tips on how to save energy based on the energy usage and house profile. The HER Program was designed to motivate households to reduce energy consumption through behavioural changes and participation on other PSE energy efficiency programs.

The program was structured as a randomized controlled trial wherein the initial eligible population was randomly assigned to the treatment and control groups. Around 40,000 dual-fuel, single family homes were randomly selected to receive the Report while 44,000 dual fuel, single family homes did not receive the report and were assigned as the control group. All households in the treatment group received the report either monthly or quarterly for two years. At the start of the third year of the HER Program, approximately 10,000 treatment group households were randomly selected to stop receiving the reports. This created a second treatment group designed to test the persistence of report-based savings after the cessation of reports.

1.1 Evaluation Overview

The main goal of this impact evaluation was to develop HER Program savings estimates for year 2013. Specifically, the main objectives are as follows:

1. Measure the reduction in electric and natural gas consumption between the control group and the two HER treatment groups:
   a. The "current" treatment group that continues to receive reports in the fifth year.
   b. The "suspended" treatment group that received reports for the first two years of the program but has not received reports for any subsequent years of the program.
2. Quantify the savings from HER-related increased uptake of other PSE programs which may be present in the measured consumption reduction:
   a. An increase in the number of participants and/or extent of participation in PSE rebate programs due to the home energy reports
   b. An increase due to home energy reports in the number of purchasers and/or number of purchased CFL or LED bulbs supported by PSE and NEEA upstream lighting programs
3. To provide an estimate of 2013 HER savings which are free of double counted savings resulting from participation in PSE rebate and upstream lighting programs in previous HER years

This evaluation used historical consumption data to measure the difference in consumption between the treatment and control groups. Savings estimates were also measured for the different treatment sub-groups, such as the monthly and quarterly groups and the current and suspended groups.

This evaluation also quantified the potential for double counting energy savings due to participation in other PSE rebate and upstream programs. DNV GL used the PSE program tracking data to quantify joint savings due to participation in other PSE rebate programs. To quantify joint savings from upstream programs where there is no tracking data, we used the participant survey.

1.2 Key Findings

The primary goal of this evaluation is to develop the 2013 PSE HER Program savings estimates that are free of any joint savings due to participation in other PSE energy efficiency programs. The summary of results is presented in Table 1-1.

Table 1-1: Summary of Annual Savings for PSE HER 2013

Treatment Groups	HER Measured Savings (Per Household)	Joint Savings (Per Household)	Credited Savings (Per Household)
Electric (kWh)			
Current	334.3 (+/- 53.4)	9.0	325.3
Suspended	184.3 (+/- 70.9)	18.6	165.7
Gas (therms)			
Current	14.8 (+/- 3.2)	1.4	13.4
Suspended	11.9 (+/- 4.0)	0.6	11.2

Both current and suspended treatment groups generated statistically significant savings in 2013. The average credited savings for current group were 325 kWh and 13 therms per household while average credited savings for suspended group were 166 kWh and 11 therms per household.

Table 1-2 summarizes the HER program results with respect to average consumption. The current treatment group produced credited savings at 3.0% and 1.5% for electric and gas, respectively. The suspended treatment group incurred 49% less electric savings when compared to current treatment group. This difference was statistically significant at 90% confidence level. There was no discernable difference between current and suspended households with respect to gas savings.

Table 1-2: Credited Savings per Household as a Percent of Consumption

HER Treatment Group	Electric (kWh)			Gas (therms)		
	Consumption*	Savings	Percent	Consumption*	Savings	Percent
Current	10,703.9	325.3	3.0%	890.7	13.4	1.5%
Suspended		165.7	1.5%		11.2	1.3%

**Based on control group calendar year 2013 actual consumption*

These program savings exhibit two different kinds of persistence that remain open questions for programs of this type. Households in the current group that continued to receive reports through the fifth year generated savings at or above levels established in the first two years of the program. Households in the suspended group that were in their third year of not receiving reports still generated at least half of the savings of the current treatment group.[1]

The active HER Program continued to promote other PSE gas rebate programs causing a statistically significant increase in gas rebate program savings among the current treatment group.

[1] Appendix Table 7-3 provides the historical measured savings for the HER program from 2009 to 2013. Additional weather normalized comparisons of saving over the course of the program will be reported in a separate memo.

2 INTRODUCTION

2.1 Program Description

In 2008, Puget Sound Energy (PSE) became the second utility in the U.S. to implement an innovative program designed to conserve energy. The program, referred to as the Home Energy Reports (HER) Program, utilizes a social marketing campaign, with normative messaging techniques, to encourage responsible energy behavior and choices. The campaign, administered by Opower, provides HER to households in PSE's combined gas and electric service territory. The program serves dual fuel, single family households. The HER program provides recipients with feedback on their household energy use by comparing the recipient's energy usage with that of neighboring homes, essentially using peer pressure to achieve energy savings. In addition, the reports provide tips regarding steps households can take to reduce energy consumption through behavioral changes and participation in other PSE energy efficiency programs.

The program is structured as a randomized controlled trial experimental design to facilitate precise and unbiased estimates of average per household savings that are small on a percentage basis. This means that the initial eligible population was randomly assigned to treatment and control groups. In 2010, a subset (approximately 10,000) of the original HER treatment group were randomly selected to stop receiving the reports. This created a second treatment group designed to test the persistence of report-based savings after the cessation of reports. The savings for this group has been estimated separately since the 2011 program year.

2.2 Evaluation Objectives

This report focuses on energy savings due to the PSE HER program for calendar year 2013. The specific objectives are as follows:

1. Measure the reduction in electric and natural gas consumption between the control group and the two HER treatment groups:
   a. The "current" treatment group that continues to receive reports in the fifth year.
   b. The "suspended" treatment group that received reports for the first two years of the program but has not received reports for the subsequent years of the program.
2. Quantify the savings from HER-related increased uptake of other PSE programs which may be present in the measured consumption reduction:
   a. An increase in the number of participants and/or extent of participation in PSE rebate programs due to the home energy reports
   b. An increase due to home energy reports in the number of purchasers and/or number of purchased CFL or LED bulbs supported by PSE and NEEA upstream lighting programs
3. To provide an estimate of 2013 HER savings which are free of double counted savings resulting from participation in PSE rebate and upstream lighting programs in previous HER years

2.3 Overview of This Report

This evaluation is organized as follows: Section 3 of the report presents the overall research design and data collection activities. Section 4 discusses the methodology used and Section 5 presents the results of the PSE HER program impact evaluation. Conclusions are offered in section 6 with appendices appearing in section 7.

3 RESEARCH DESIGN AND DATA COLLECTION ACTIVITIES

3.1 Experimental Design

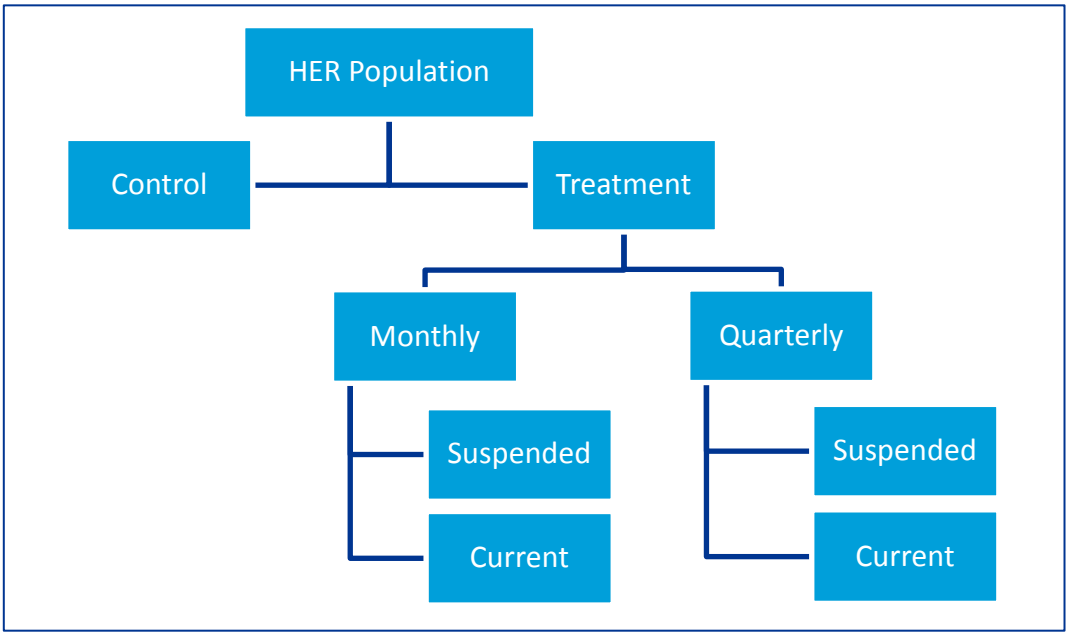
Before the program launched, a group of 83,881 single family homes, located in PSE's combined gas and electric service territory, were selected to participate in the test and control group based on the following criteria:

- Dual Fuel (home uses both natural gas and electricity, which are both provided to the service address by Puget Sound Energy)
- Single family residential home
- Uses more than 80 MBtu of energy per year
- Home does not utilize a Solar PV system
- Address must be available with parcel data from the county assessor
- Has a bill history that starts on or before January 1, 2007
- Home must have 100 similar sized homes (neighbors) within a two mile radius
- Home must have automatic daily meter reads

After selection of participating households, 39,757 homes were randomly assigned to participate in the treatment group and the remaining homes were used to serve as a control group. Of the selected treatment homes, 25 percent were randomly selected to receive HER on a quarterly basis, while the remaining 75% percent homes received the report monthly. The random assignment of monthly and quarterly reports allows both PSE and Opower to test the effect of the frequency of receiving the report on energy savings.

The program was implemented in October 2008 and for the first two program years (November 2008 – October 2010) the treatment group households received a report on a monthly or quarterly schedule per their assignment. Beginning November 2010, 9,674 treatment homes were randomly assigned to stop receiving the HER. This treatment group will be referred to as the "suspended" treatment group while households that continued receiving report will be referred to as "current" treatment group. Figure 3-1. shows a diagram of the different HER groups used in this evaluation.

Figure 3-1: HER Control and Treatment Groups



3.2 Data Sources and Disposition

This impact evaluation used information collected from customer billing data, program tracking data and participant survey data. These data collection activities are described in the following subsections.

3.2.1 Billing Analysis

PSE's Meter Data Warehouse provided daily billing data for each home included in the treatment and control groups from January 2007 to December 2013. PSE also provided weather data, and other site-specific information such as move-out dates, zip code, house square footage, home value, number of occupancy, and other site characteristics.

The pre-program period is from October 2007 to September 2008. This report focuses on program saving for calendar year 2013. Prior to conducting the analysis, DNV GL examined billing for completeness and potential data issues such as duplicates, extreme values, missing observations and inconsistencies. Data preparation steps included:

- Duplicate reads
  - When meters produced two identical reads in one day, one read was excluded from the analysis.
  - When a meter produced two different reads in a day, both reads were excluded from the analysis.
- Negative reads were removed from the analysis.
- Extreme values, greater than 400kWh per day or 40 therms per day, were excluded from the analysis.
- Missing daily observations, caused by missed daily reads, were generally followed by a single read that covered the multiple missing days. Data imputation was employed by distributing energy consumption of that next non-missing meter read. Imputation was only done when the next non-missing read covered the missing period as indicated by start and end read dates.

- All households with less than 122 days of data during any of the six years (pre-period and 5 post-periods) were removed from the final analysis dataset.

Table 3-1 summarizes the program population, counts of households removed from the analysis and the final sample used in billing analysis. Households whose occupancy status changed during the analysis period and households without assigned control group were removed from the final HER population. Roughly 12% of the original treatment group was located in zip codes that did not have an assigned control group while 26% of the original population have moved out during the analysis period.

Table 3-1: Billing Data Disposition

Population	Control	Treatment	Total
Original population	**44,124**	**39,757**	**83,881**
Not in customer/billing data	35	42	
Not randomly assigned		4,864	
Other Opower Program	111		
Move outs	11,724	10,070	
Inconsistent zip codes	72	70	
PSE sample	**32,182**	**25,426**	**57,608**
Other Data Issues (low number of data due to missing meter reads, inconsistent reads and outliers)	447	408	
Final Sample for 2012	**31,735**	**25,018**	**56,753**
Monthly - Current		11,959	
Monthly - Suspended		5,976	
Quarterly - Current		4,735	
Quarterly - Suspended		2,348	

Note: Some sites may have multiple issues.

A small percentage of households in the treatment group have opted to not receive the reports at some point since the Pilot began. The households are not removed from the analysis even though they are no longer receiving the treatment. This is referred to as testing the "intent to treat" and is necessary to get an unbiased estimate of the reports' effect.

Tests were performed on the final sample to confirm that the sample was balanced after the natural attrition of move outs and the other reductions in sample size. The tests compared differences in baseline usage and household characteristics between control and treatment groups. The tests confirmed that the final sample used in 2013 evaluation was balanced. Results from t-tests are provided in Appendix 7.1.

3.2.2 Joint Savings Analysis

3.2.2.1 Program Tracking Data

PSE provided tracking data for HER households participating in other PSE rebate programs during the HER period. The data included measure description, estimated date of install, number of units bought and claimed savings. The program tracking data was used to avoid double counting savings by adjusting measured HER savings to account for other savings related to increased participation in PSE rebate program.

3.2.2.2 Participant Survey Data

The DNV GL team utilized a Computer Aided Telephone Interview (CATI) survey to collect data used in the analysis of upstream lighting program. Table 3-2 provides counts of surveyed households and response rates. DNV GL formed a starting population of 24,055 households.

Table 3-2: Survey Dispositions

Description	Number	Percent
Starting Population	24,055	
Never Called	752	
Selected for Calling	23,303	100%
Known Not Eligible	6,681	27%
Valid Sample	16,790	72%
Full Completes	**1,616**	**10%**
No eligible purchases	428	3%
Refused	2,620	16%
Not completed, eligible	2,885	19%
Not completed, unknown eligibility	9,073	54%

DNV GL stratified by household energy use and randomly selected 23,303 households to survey. Over one-fifth of these households were determined to be ineligible because of the following reasons: disconnected numbers, business numbers, language barrier, fax or computer tones, no such person at number, employment security, or did not live at the address on record in the past year.

Of the valid sample, DNV GL completed 1,616 surveys with households that had at least one CFL, CFL fixture, LED or LED fixture purchases. We also contacted 428 respondents who indicated they did not make any CFL, CFL fixture, LED or LED fixture purchases in the last year. The survey screened out these 428 respondents, but tracked their purchase answers for use as zeroes in the upstream participation analyses. Taken together, we obtained a response rate of 13 percent, which is a typical rate for this type of survey.

Calls took place from January 21st to February 25th, 2014. Respondents were called at least six times during evenings and weekends before being considered unreachable. DNV GL left one voicemail message after the second call that indicated what the call was about and provided a call-back number. The surveys asked about CFL, CFL fixture, LED or LED fixture purchases in the past year and demographics. For the questions common to previous years, wording was kept as consistent as possible.

4 METHODOLOGY

This evaluation used daily household energy consumption data to estimate the reduction in energy consumption resulting from HER. This consumption reduction is the full measure of savings caused by mailing of reports and is referred to here as measured savings. Savings were estimated using a difference-in-differences approach. Measured savings were compared for the following groups:

- Control vs Current and Suspended treatment groups,
- Current vs. Suspended treatment groups, and
- Monthly recipients vs. quarterly recipients.

The HER program has a secondary objective of promoting other energy efficiency programs within PSE. If this promotion is successful, the measured consumption reduction will include the savings from any increased uptake of these other energy efficiency programs. We refer to this as joint program savings because credit for these savings is shared by both HER program and other PSE programs. To account for joint savings, DNV GL utilized PSE tracking data and end-use load shape data to quantify the potential for double counting of energy savings with PSE rebate programs. Also, DNV GL used the household survey to address joint savings potential due to participation in upstream CFL and fixture programs, for which there is no tracking data.

Joint savings are discussed in the subsequent sections and are ultimately removed from the 2013 savings estimate to avoid double counting. The measured savings with joint savings removed will be referred to as "credited savings" in this report.[2]

4.1 Difference-in-Differences

The difference-in-differences approach is a simple, robust approach to measuring program-related savings in a randomized experimental design framework. The approach compares mean energy consumption between the pre- and post-report periods for both the treatment and the control groups.

A simple pre-post comparison of treatment group consumption, without a control group, does not account for systemic effects (economic factors, fuel prices, etc.) that impact all households' consumption patterns during the measurement periods. It is possible that these systemic effects will increase or decrease consumption in the post-report period unrelated to the effects of the reports. This would bias the estimate of consumption reduction, a particular concern when expected reduction is relatively small. The control group, pre-post difference provides a robust estimate of the non-program, systemic effects on consumption that are observed in the post-report period. Because the control group was randomly assigned, their response to the systemic effects is representative of the treatment group response. The term "difference-in-differences" refers to the removal of the of the control group difference (systemic effects only) from the treatment group difference (program effects and systemic effects).

A full discussion of the difference-in-differences approach can be found in Appendix 7.3.1.

[2] We explicitly avoid using the gross/net terminology here to avoid confusion with the more typical freeridership/spillover usage of those terms. It is important to note that because of the experimental design framework of the HER program, freeridership is not an issue.

4.2 Joint Savings Analysis

The goal of the joint savings[3] analysis is to quantify savings that are included in the measured HER program savings but have already been credited to other PSE energy efficiency programs.

4.2.1 Rebate Program Joint Savings

Energy efficiency purchases that occur directly through a Puget Sound Energy rebate programs are tracked in PSE data systems. DNV GL analysed PSE rebate program tracking data to identify possible increased uptake of other PSE energy efficiency programs by the two treatment groups and the control group. These programs include clothes washers, energy efficient heating systems, etc. In these program tracking data systems, rebate program participation and associated savings are tied directly to the customer within the HER program treatment and control groups. The experimental design framework makes it possible to accurately measure any increased activity in programs by the HER treatment groups.

For this analysis, DNV GL added 2013 data to the compiled data on all rebated installations, for both treatment and control groups. Savings were assigned on a daily basis starting with the installation date and carrying forward to the measure life.[4] Savings are apportioned across the days of the year based on measure-level load shapes so that savings occur during the year approximately when they would be captured in the difference-in-differences calculations. For the 2013 rebate program joint savings calculation, the total accumulated savings of the control group in 2013, for all installations since the beginning of the program, is removed from the total accumulated savings of the treatment group in 2013. The difference is the effect of HER on rebate program activity. These are savings that would not occur if the HER Program was not operating. Because the savings are already being claimed by the rebate programs that facilitate the participation, this difference will be removed from the overall measured consumption reduction caused by the HER Program.

4.2.2 Upstream Program Joint Savings

DNV GL uses a similar process to estimate joint savings associated with the upstream CFL bulb and fixture programs which now also include LED bulbs and fixtures. DNV GL utilizes the survey data in place of the rebate program tracking data. The survey was conducted to gather information on the purchase and installation of CFLs and LEDs for HER program treatment and control groups for calendar year 2013. The survey gathered store-specific information associated to respondent's CFL and LED purchases (bulbs or fixtures). Data on participating retailers were used to calculate the number of purchased program CFL bulbs and fixtures.

DNV GL calculated the difference in PSE-sponsored CFLs and LEDs between the treatment and control group households to determine the average number of additional CFL or LED bulbs or fixtures per treatment household. The number of bulbs or fixtures is multiplied by the average claimed savings for bulbs or fixtures of that type to determine the amount of additional savings associated with CFLs and LEDs purchased in 2013 due to the HER program.

Table 4-1 provides the average claimed savings per bulb and fixture type. The numbers are a weighted average of the different specific bulb and fixture types in each category using the program-level counts of bulbs and fixtures.

[3] Sometimes referred to as uplift in other evaluations.

[4] All measure lives are at least as long as the five years the HER Program has been in place.

Table 4-1: Average Claimed Savings per Bulb or Fixture Type

Bulb or Fixture Type	Average per unit Claimed Saving
CFL Bulb	16.9
CFL Fixture	64.6
LED Bulb	33.3
LED Fixture	69.0

To expand these results across the five years of the program, DNV GL assumed these bulbs were all installed on the first day of each program year (January 1st) and the joint savings carried forward on a load shape-weighted basis. The 2011 upstream purchase data were used as a proxy for purchases prior to 2011 before an upstream survey was conducted. It's assumed the bulbs and fixtures stay in place for the full five year measure life. Through this fifth year, the upstream joint savings are cumulative.

Appendix 7.4 provides the survey instrument used to gather CFL and LED purchase and installation data for HER program 2013.

5 RESULTS

Results of the impact evaluation are provided for calendar year 2013. These results will be used to support PSE savings claims for the 2013 HER Program. Table 5-1 provides the counts of households in each treatment category that were used in this evaluation.

Table 5-1: Participating HER Households by Report Status and Mailing Frequency

Treatment Group	Monthly	Quarterly	Total
Current	11,959	4,735	16,694
Suspended	5,976	2,348	8,324
Total	17,935	7,083	25,018

Section 5.1 provides the overall actual savings achieved in calendar year 2013. The results include average household and total savings for current and suspended treatment groups. Sub-sections discuss each of the components of the overall savings – the measured savings, the rebate program joint savings and the upstream joint savings.

5.1 2013 Program Savings

Table 5-2 provides the household- and program-level savings for the HER Program for calendar year 2013. These results are calculated separately for current and suspended treatment groups. The three components to estimating credited savings are the following:

- **Measured savings** is the average difference in consumption between HER treatment groups and the control group. It is calculated using a difference-in-differences approach that compares treatment and control group consumption in the pre- and post-report periods.
- **Rebate program joint savings** represents the increased activity in PSE rebate programs as a result of receiving, or having received, the report. This is the difference in PSE rebate program savings between the two PSE HER treatment groups (current and suspended) and the control group.
- **Upstream program joint savings** represents the increased use of PSE-supported CFL and LED bulbs and fixtures as a result of receiving the Home Energy Report. This is the difference in PSE upstream program savings between the two PSE HER treatment groups (current and suspended) and the control group.

Table 5-2: HER Savings Per Household Based on Actual Consumption in 2013

Treatment Groups	HER Measured Savings (per household)	Joint Savings (per household)		Credited Savings (per household)
		PSE Rebate Program	Upstream Program	
Electric (kWh)				
Current	334.3 (+/- 53.4)	1.7 (+/- 4.2)	7.3 (+/- 24.0)	325.3
Suspended	184.3 (+/- 70.9)	0.6 (+/- 5.5)	18.0 (+/- 25.6)	165.7
Gas (therms)				
Current	14.8 (+/- 3.2)	1.4 (+/- 0.7)	n/a	13.4
Suspended	11.9 (+/- 4.0)	0.6 (+/- 0.8)	n/a	11.2

[1]*Values in parentheses are based on 90% confidence interval, two-tailed test. The +/- for upstream savings were based on 2013 survey results.*

To estimate credited savings per households, joint savings from rebate and upstream programs were subtracted from the measured savings derived from consumption analysis. Credited savings per household may be expanded to the full population for the current and suspended groups using the counts in Table 5-1. The total program savings for electric and gas would be composed of savings generated by current and suspended treatment groups.

Table 5-3 summarizes the HER program results with respect to average consumption. The current treatment group produced credited savings at 3.0 and 1.5 percent for electric and gas, respectively. The suspended treatment group generated 49 percent less electric savings when compared to current treatment group. This difference was statistically significant at 90% confidence level. There was no discernable difference between current and suspended households with respect to gas savings.

Table 5-3: Credited Savings per Household as a Percent of Consumption

HER Treatment Group	Electric (kWh)			Gas (therms)		
	Consumption*	Savings	Percent	Consumption*	Savings	Percent
Current	10,703.9	325.3	3.0%	890.7	13.4	1.5%
Suspended		165.7	1.5%		11.2	1.3%

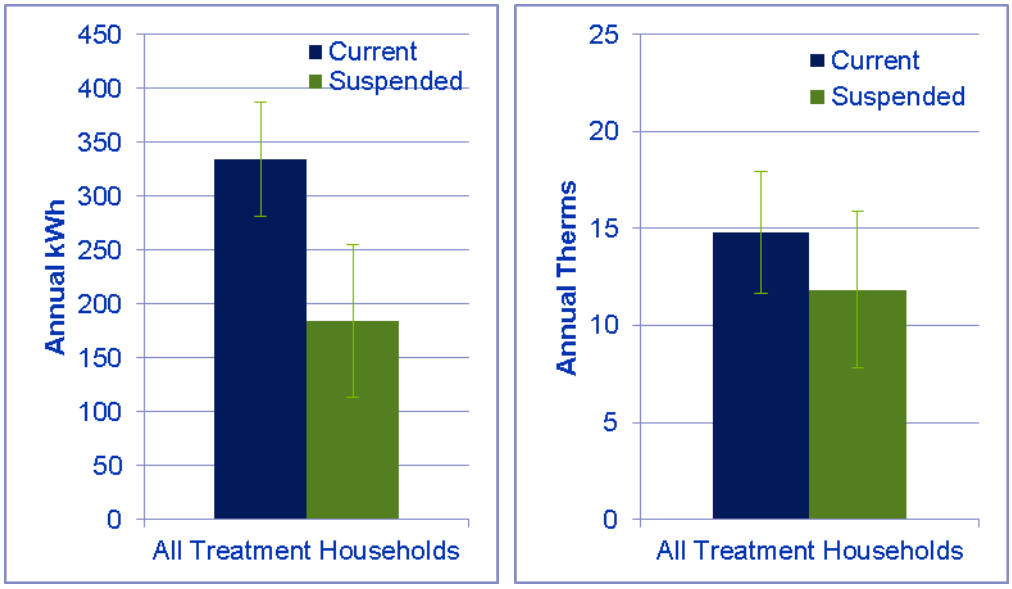
**Based on control group calendar year 2013 actual consumption*

5.1.1 Measured Program Savings

5.1.1.1 Current vs Suspended Treatment Groups

Figure 5-1 summarizes the calendar year 2013 measured savings for the current and suspended treatment groups. Savings for both current and suspended report groups were significantly different from zero based on a 90% confidence interval, two-tailed test.

Figure 5-1: Average Annual Savings for Current and Suspended Treatment Groups



The difference in electric savings between the two groups was statistically significant at the 90% confidence level while difference in gas savings between the suspended and current treatment groups has never been statistically significant.

Appendix Table 7-3 provides the historical measured savings for the HER program from 2009 to 2013.

5.1.1.2 Monthly vs Quarterly Treatment Groups

Figure 5-2 provides the 2013 program savings for monthly and quarterly recipients. The measured savings results for current treatment groups for monthly and quarterly recipients - generally conform to the expectation that monthly recipients generate more savings than quarterly recipients.

Figure 5-2: Average Annual Savings for Monthly vs Quarterly Current Recipients

Results show that both monthly and quarterly groups generated electric savings. However, the difference in savings between the monthly and quarterly groups was not statistically significant at 90% confidence level. For the suspended treatment group, electric savings generated by quarterly recipients was higher than monthly recipients but the difference is not statistically significant.

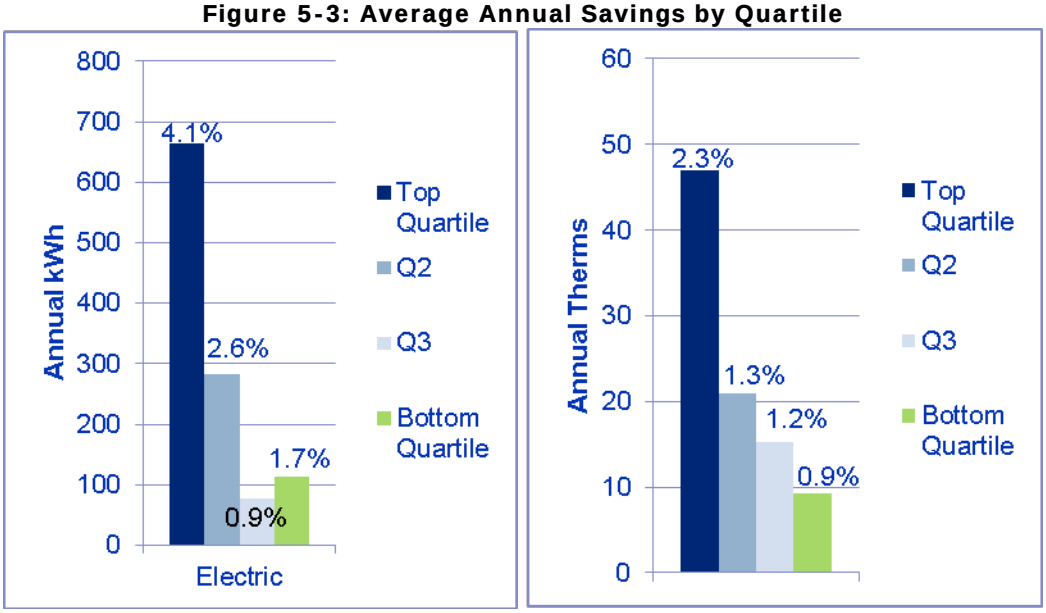
Gas savings were statistically significant for all treatment groups. Additionally, the gas savings for current-monthly recipients was found significantly higher than current-quarterly recipients. There was no statistical difference in savings between monthly and quarterly recipients in the suspended group.

5.1.1.3 Annual Savings by Consumption Quartile

This program and similar programs have found that there is a correlation between greater household consumption and greater savings. In this case, the savings are greater even on a percentage basis. Figure 5-3 shows the savings in both energy (kWh and therms) and in percentage of expected non-program consumption. The top quartile households save electricity at a rate of over 4.0 percent compared to an

overall rate of 2.7 percent.[5] For gas, households save at a rate of 2.3 percent compared to 1.5 percent rate overall.

Figure 5-3: Average Annual Savings by Quartile



With the exception of the electric energy savings of the bottom quartile, both electric and gas savings decline by quartile group, with the highest users saving the most energy and the lowest users saving the least amount of energy. It is worth noting that the lowest quartile group is unique in terms of their electric savings over time. For all other quartiles, both gas and electric consumption has decreased since 2008 for both the control and treatment groups. For these other quartiles, the HER reports have furthered a general decrease in consumption across the treatment group. However, consumption has increased for the lowest electric quartile. The effect of the reports for this quartile simply shows the lowest quartile treatment households increasing electric usage at a slower rate than their control counterparts. Table 5-4 provides the percentile cut-offs and the mean consumption within each quartile. For both electric and gas, the top quartile households use more than twice the energy of the bottom quartile households.

Table 5-4: Average Annual Savings by Quartile - Average Consumption and Cut-offs

Quartile	Percentile Cut-offs	Electric		Gas	
		Lower Bound (kWh)	Quartile Mean	Lower Bound (Therms)	Quartile Mean
Top	75th Percentile	13,386	16,076	1,187	1,259
Q2	Median	10,069	11,034	966	952
Q3	25th Percentile	7,735	8,735	791	796
Bottom		0	6,642	0	613

[5] These overall percentages are based on measure savings prior to netting out double counting. They are slightly higher than the percentages reported based on credited savings in Table 5-3

5.1.2 Joint Savings Analysis

To understand the impact of the HER program on the uptake of other PSE programs and to avoid double counting of savings, DNV GL conducted a joint savings analysis for rebate and upstream programs. The PSE rebate programs included purchases of energy efficient measures such as lighting, heating and cooling system, water-heating systems, insulation and appliances. The rebated measures are all tracked at the household level so it is possible to directly calculate the number installed and savings claimed for the two treatment groups and the control group. The upstream program reduces the price of CFL and LED bulbs and fixtures at cooperating retailers. These savings, unlike the rebate savings, cannot be tracked at the household level, so require an alternative, survey-based approach.

5.1.2.1 Rebate Program Joint Savings

Table 5-5 presents the PSE rebate program joint savings analysis for current and suspended treatment groups across HER post years. Each year's joint savings estimate covers all years up through that year. Joint savings, like savings, last for the life of the measure. For 2013, Electric savings from PSE rebate programs were not statistically significant for either current or suspended groups while gas savings were statistically significant for the current treatment group.

Table 5-5: Annual Joint Rebate Savings per Household for Electric and Gas, Current and Suspended Groups

Fuel	Year	HER Group per Household Rebate Savings			Joint Rebate Savings per Household	
		Control	Current	Suspended	Current	Suspended
Electric (kWh)	2009	3.7	4.0	4.6	0.3	0.9
	2010	13.9	14.8	16.2	0.9	2.3
	2011	25.3	25.1	27.7	-0.2	2.4
	2012	40.1	40.7	41.7	0.6	1.6
	2013	51.8	53.5	52.4	1.7	0.6
Gas (Therms)	2009	1.2	1.5	1.5	0.3*	0.2*
	2010	4.7	5.6	5.4	0.9*	0.7*
	2011	7.8	9.0	8.7	1.1*	0.9*
	2012	9.8	11.1	10.5	1.3*	0.7
	2013	11.2	12.5	11.8	1.4*	0.6

**Indicates statistically significant at 90% confidence level*

5.1.2.2 Upstream Program Joint Savings

The upstream joint savings measure the effect of the HER program on reduced-price retail sales of CFL and LED bulbs and fixtures. LED bulbs and fixtures are included in the estimated upstream joint savings for the first time this year.[6] Table 5-6 provides the number of CFL and LED bulbs and fixture purchases for the control, current treatment and suspended treatment groups in 2013. There was almost no difference in the purchase of upstream program-supported CFLs or LEDs due to the HER program. In two instances, it appears the control group purchased more CFL bulbs than the treatment groups.

Table 5-6: Count of CFL and LED Bulbs and Fixture Purchased Per Household in 2013

Fuel	HER Groups			Joint Rebate Counts per household[1]	
	Control	Current	Suspended	Current	Suspended
CFL Bulbs	5.1	5.2	4.7	0.1	-0.4
CFL Fixtures	0.1	0.1	0.0	0.0	0.0
LED Bulbs	3.2	3.1	3.3	-0.1	0.1
LED Fixtures	0.1	0.2	0.4	0.0	0.2
Total CFL Purchased	5.2	5.2	4.7	0.1 (+/- 0.7)	-0.5 (+/-0.7)
Total LED Purchased	3.3	3.3	3.6	0.0 (+/- 0.7)	0.3 (+/- 0.8)
Total Upstream Lighting	8.5	8.5	8.3	0.0 (+/- 1.0)	-0.2 (+/- 1.1)

[1] *Not statistically significant at 90% confidence level*

The small and negative joint savings indicate that in this year the program did not increase uptake of the upstream program offerings much or at all. Negative joint savings in later years, as are occurring for the suspended group for CFL bulbs, are consistent with a hypothesis that HER reports may accelerate the adoption and purchase of CFL but not ultimately increase the overall number purchased.[7] Both positive and negative results are integrated into the cumulative calculations of upstream joint savings so as to be able to account for such occurrence.

The survey work indicates that the average household across all groups purchased an average of over three LED bulbs. This is impressively high, even if it remains below CFL levels for recent years. Somewhat surprisingly, given previous CFL results, there was no evidence that the HER reports increased the uptake of reduced-price LED bulbs or fixtures.

None of the HER program-related changes in upstream bulb and fixture purchases were statistically different from zero. Despite this, because they are a sample-based estimate, it is generally accepted that these upstream joint savings should still be removed from measured savings if there is evidence of positive joint savings which would indicate possible double counting.

[6] LED sales prior to 2013 were small. They were not included in the 2012 upstream survey.

[7] If at any point the overall joint savings became negative, then removal of them from the measured savings would actually increase credited savings. In keeping with the most exacting possible definition of credited savings, we would not increase the credited savings in this scenario.

PSE upstream savings were calculated by assigning the weighted average of the claimed savings per CFL or LED bulb or fixture to the estimated difference in counts.[8]

Table 5-7 provides the estimates of the annual joint savings from CFL and LED bulbs and fixture purchases across all post years. The 2013 estimate includes savings generated from CFLs purchased by HER participants in prior years. The recent trend of greater upstream joint savings for the suspended group remained the case for year five as well.

Table 5-7: Annual Joint Upstream Savings Per Household for Current and Suspended Treatment Groups

Program Year	Treatment Group	
	Continued	Suspended
Year 1*	0.86	
Year 2	1.59	
Year 3	2.32	15.26
Year 4	5.47	10.49
Year 5**	7.32	17.99

**Includes last two months of 2008*
***Includes LEDs*

The joint savings analysis was used to provide an estimate of credited savings for PSE HER. Combining both rebate and upstream joint savings, the current treatment group shared around 9.0 kWh and 1.4 therms savings per household between HER and other PSE programs. For the suspended group, HER and other PSE programs share 18.6 kWh and 0.6 therms savings per household. These joint savings were deducted from the HER measured savings to avoid double counting of savings with other PSE programs. The HER credited savings for 2013 was based on savings with these joint program savings netted out.

6 CONCLUSIONS

The purpose of this evaluation was to measure the impact of the PSE HER program for calendar year 2013. The PSE HER program generated statistically significant reduction in consumption. For calendar year 2013, PSE HER program generated credited savings of 325 kWh and 13 therms per household in the current group. These savings constitute 3.0 percent and 1.5 percent of the household's average electric and gas consumption, respectively.

The Overall HER Program results are a combination of savings generated by an ongoing, current treatment group and a suspended treatment group that only received reports for the first two years of the program. The current treatment group savings are slightly higher than those reported for the same group in the year four program evaluation. The suspended group, despite not receiving reports for the last three years, produced only 49 percent less electric savings and the 16 percent less gas savings when compared to current treatment group.

[8] Multiple types of bulbs and fixtures were sold through the upstream program. We used program bulb and fixture counts to produce an average per LED or CFL bulb or fixture savings for use in the savings calculations. See Table 4-1 for the savings values.

These program savings exhibit two different kinds of persistence that remain open questions for programs of this type. Those current households that continued to receive reports through the fifth year generated savings at or above levels established in the first two years of the program. The suspended group households that were in their third year of not receiving reports still generated over half of the savings of the current group.

The active HER Program continued to effectively promote other PSE gas rebate programs causing a statistically significant increase in gas rebate program savings among the current treatment group. As of the fifth year, the suspended group shows decreased gas rebate activity than was present in the previous three years. There has never been any evidence of increased activity in electric rebate programs or upstream program. All of these savings are removed from the final credited savings estimate, but it is important to remember the additional value of the HER program in promoting the other gas rebate programs.

The joint savings analysis for upstream programs was expanded for 2013 to include LEDs as well as CFLs. While a surprisingly large number of LED were purchased by both treatment and control groups, the different was effectively zero, indicating that the HER reports are not adding to the demand for LED bulbs and fixtures over and above the demand that exists for non-HER households.

7 LIST OF APPENDICES

7.1 Randomization Test

All tests of the remaining 2013 HER population indicate there is no statistically significant difference between the treatment and control groups.

Table 7-1: Testing for Differences in Electric and Gas Consumption Between Treatment and Control

Fuel	Monthly	Treatment			Control			Control - Treatment	
		Count	Mean	Std Error	Count	Mean	Std Error	Difference	Pr > |t|
Electric	Oct-2007	25,018	1,109	3.47	31,735	1,108	3.04	-1.63	0.72
	Nov-2007	25,018	949	2.94	31,735	948	2.59	-0.74	0.85
	Dec-2007	25,018	977	3.00	31,735	978	2.64	1.21	0.76
	Jan-2008	25,018	879	2.68	31,735	880	2.38	1.05	0.77
	Feb-2008	25,018	840	2.52	31,735	840	2.23	0.30	0.93
	Mar-2008	25,018	806	2.43	31,735	807	2.17	1.30	0.69
	Apr-2008	25,018	819	2.62	31,735	822	2.35	2.49	0.48
	May-2008	25,018	846	2.64	31,735	849	2.38	2.84	0.42
	Jun-2008	25,018	796	2.39	31,735	798	2.16	1.34	0.68
	Jul-2008	25,018	919	2.69	31,735	918	2.38	-0.36	0.92
	Aug-2008	25,018	994	2.97	31,735	994	2.59	-0.51	0.90
	Sep-2008	25,018	1,215	3.80	31,735	1,215	3.30	-0.09	0.99
Gas	Oct-2007	25,018	162	0.33	31,735	162	0.29	-0.06	0.89
	Nov-2007	25,018	121	0.25	31,735	121	0.22	-0.19	0.58
	Dec-2007	25,018	121	0.26	31,735	121	0.23	-0.02	0.96
	Jan-2008	25,018	96	0.22	31,735	96	0.19	-0.11	0.71
	Feb-2008	25,018	53	0.14	31,735	53	0.13	-0.11	0.58
	Mar-2008	25,018	43	0.14	31,735	43	0.13	0.04	0.83
	Apr-2008	25,018	21	0.11	31,735	21	0.10	0.14	0.34
	May-2008	25,018	21	0.11	31,735	21	0.11	0.18	0.25
	Jun-2008	25,018	29	0.12	31,735	29	0.11	0.02	0.89
	Jul-2008	25,018	76	0.19	31,735	76	0.17	-0.01	0.98
	Aug-2008	25,018	113	0.24	31,735	113	0.22	0.03	0.93
	Sep-2008	25,018	148	0.31	31,735	148	0.27	0.04	0.92

Table 7-2: Testing for Differences in Individual Characteristics Between Treatment and Control

Characteristics	Treatment			Control			Control - Treatment	
	Count	Mean	Std Error	Count	Mean	Std Error	Difference	Pr > |t|
age	25,018	30.9	0.1	31,735	31.0	0.1	0.0	0.75
bathrooms	25,018	2.3	0.0	31,735	2.3	0.0	0.0	0.87
bedrooms	24,992	3.6	0.0	31,679	3.6	0.0	0.0	0.22
fireplace	25,018	1.0	0.0	31,735	1.0	0.0	0.0	0.64
house_value	25,016	347,055	1,077	31,734	347,773	966	719	0.62
num_occ	22,028	2.2	0.0	27,824	2.2	0.0	0.0	0.52
sqft	25,018	2159.3	4.0	31,735	2,157.7	3.6	-1.6	0.77

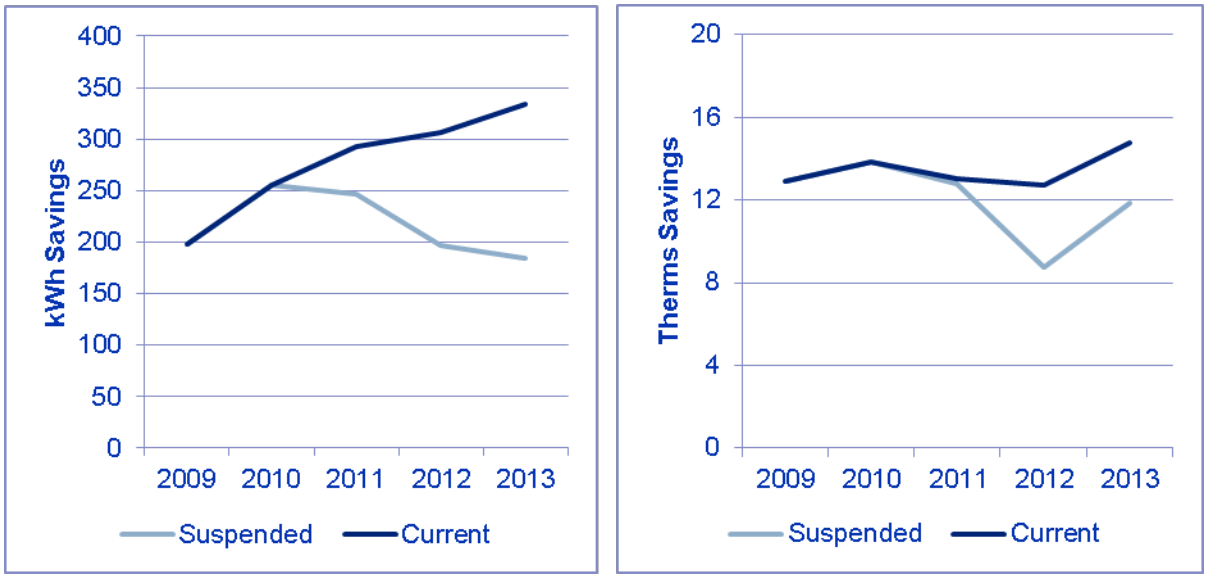
7.2 HER Measured Savings from 2009 to 2013

The following table and figure report actual savings for the five years of the PSE HER Program. The HER savings show some sensitivity to weather and this may explain some of the changes year to year. A set of historical weather-normalized comparisons of savings will be reported in a separate memo.

Table 7-3. HER Measured Savings Based on Actual Consumption from 2009 to 2013

Year and Group	Electric (kWh)	+/-	Gas (therms)	+/-
2009	197.71	23.99	12.93	1.65
2010	254.86	31.34	13.81	2.13
2011- Current	292.17	42.20	13.01	2.68
2012 - Current	306.01	47.87	12.72	2.89
2013 - Current	334.31	53.37	14.78	3.16
2011- Suspended	246.42	55.48	12.77	3.43
2012- Suspended	196.01	63.26	8.72	3.72
2013- Suspended	184.32	70.85	11.85	4.04

Figure 7-1. HER Measured Savings Between Current and Suspended Treatment Groups



7.3 Impact Methodology

7.3.1 Difference-in-differences

The difference-in-differences approach is the most direct and simple way of leveraging the experimental design of the HER program. The approach compares the difference in the average consumption of the treatment group between pre- and post-report period with the same difference for the control group. The treatment group pre-post difference captures all changes between the two periods including those related to receiving the reports. The control group captures all changes with the exception of those related to the report, because the control group did not receive the reports. The random selection of the treatment and control groups ensures that, on average, the control group will appropriately reflect the non-report related changes experienced by treatment and control group alike between the pre-and post-report periods. Removing the non-report differences, as represented by the control group difference, from the treatment difference produces an estimate of the report's isolated effect on consumption.

The average energy consumption is calculated for both treatment and comparison group in both pre- and post-report periods. The difference-in-differences estimate is then produced with the following equation.

$$\Delta C_i = \alpha_i + \beta T_i + \varepsilon_i$$

where

ΔC_i	=	Pre-post difference in annual consumption for household i;
α	=	Intercept
T	=	Treatment indicator (value of 1 if treatment and 0 otherwise)
β	=	Treatment effect or savings estimate
ε	=	error term

The difference-in-differences approach can be applied on a monthly or seasonal basis. As long as time periods are balanced in the pre- and post-report periods, the savings estimate will be consistent for that time period.

7.4 Survey Instrument

Puget Sound Energy
Home Energy Report Program 2013
CATI Survey

[NOTE TO PROGRAMMER / PROJECT MANAGER: I WOULD LIKE THE DISPOSITIONS TO TRACK WHICH QUESTION THEY TERMINATED AT. FOR EXAMPLE, I'D LIKE A DIFFERENT CODE FOR EACH OF THE FOLLOWING TERMINATE POINTS: I2, PS1, I3, I4, X1, X3, XL1, XL3]

I INTRODUCTION

I0 May I please speak with <CONTACT NAME>?

[IF CONTACT NAME IS AVAILABLE, READ I1]

[IF CONTACT NAME IS NOT AVAILABLE, ASK]
Are you or someone else familiar with this household's purchases of light bulbs in the past year? IF "YES" GO TO I1**[IF NEITHER AVAILABLE, ARRANGE FOR CALLBACK]**

I1 Hello, my name is _____ from __ calling on behalf of Puget Sound Energy. PSE is conducting a survey about how households in their service area use energy. They are interested in learning more about their customers' purchases of energy-using equipment.

This is NOT a sales call and the information that you provide will be kept strictly confidential.

[IF NECESSARY:
Puget Sound Energy will use your input to improve the programs they offer to residential customers.]

[IF NECESSARY:
You may validate the legitimacy of this study by contacting Bobbi Wilhelm via email at bobette.wilhelm@pse.com or via phone at 425.223.1504]

CELL1 First, I need to ask a few questions before we can get started on the survey, have you received this call on a wireless phone or on a landline phone?

1	WIRELESS	→ **GOTO CELL2**
2	LANDLINE	→ **GOTO I2**
96	REFUSED	→ **CALLBACK**
97	DON'T KNOW	→ **CALLBACK**

CELL2 Are you driving a vehicle or using any equipment or machinery that requires your attention?

[INTERVIEWER: IF RESPONDENT SAYS YES, READ] Due to safety reasons we will need to call you back at a more convenient time. Thank you very much.

1	YES	→**CALLBACK**
2	NO	
96	REFUSED	→**CALLBACK**

97 DON'T KNOW →**CALLBACK**

I2 Do you or anyone else in your household work for a gas or electric utility, including Puget Sound Energy?

1 Yes SPECIFY:_____ ➔**THANK & TERMINATE**
2 No
96 REFUSED
97 DON'T KNOW

PS1 I am calling about <**ADDRESS**>. Do you live at this address?

1 Yes ➔**GOTO I3**
2 No ➔ **Thank and Terminate**
96 REFUSED ➔ **Thank and Terminate**
97 DON'T KNOW ➔ **Thank and Terminate**

I3 Are you familiar with this household's purchases of light bulbs in the past year?

1 Yes ➔ **GOTO I4**
2 No ➔ **[ASK: May I speak to someone who is? SCHEDULE INTERVIEW IF PERSON NOT AVAILABLE OR ARRANGE FOR CALLBACK]**
96 REFUSED ➔**THANK & TERMINATE INTERVIEW**
97 DON'T KNOW ➔**THANK & TERMINATE INTERVIEW**

I4 I'm going to ask you about lighting equipment your household purchased in 2013. There are two types in particular. Compact fluorescent light bulbs – also known as CFLs – these come in many shapes and sizes. The most common type of CFL is made with a glass tube bent into a "twisty" shape that fits in a regular light bulb socket.
[NOTE TO CALLER: SPEAK OUT THE LETTERS OF C-F-Ls "see- eff- els"]

Second, LEDs are the most efficient light bulbs available today and have only been available for the past couple of years. They have fins on the side of the light and are generally more expensive than CFLs.

[NOTE TO CALLER: SPEAK OUT THE LETTERS OF L-E-Ds "ell- eee- dees"]

Which of the bulbs I described, if any, have you heard of before today's call? [Do not read]

1. CFLs only➔ **C1**
2. LEDs only ➔ **SKIP TO L1**
3. Both CFLs and LEDs➔ **C1**
4. None➔ **THANK AND TERMINATE. DO NOT COUNT AS COMPLETE**

96 REFUSED➔ **THANK AND TERMINATE. DO NOT COUNT AS COMPLETE**
97 DON'T KNOW ➔ **THANK AND TERMINATE. DO NOT COUNT AS COMPLETE**

C CFL PURCHASE(S)

C1 First, I'm going to ask you some questions about **CFL bulbs**. Right now, I am only asking about **bulbs** that are **purchased separately without a fixture**. I'll refer to Compact Fluorescent bulbs as CFL bulbs for the rest of this call.

C2 **CUT**

C3 Did you or anyone in your household purchase any CFL bulbs in 2013?
[**IF NECESSARY**: CFL bulbs come in many shapes and sizes. The most common type of CFL is made with a glass tube bent into a "twisty" shape and fits in a regular light bulb socket.]

1 Yes
2 No → **SKIP TO X1.**
96 REFUSED → **SKIP TO X1.**
97 DON'T KNOW → [**REVIEW: IF NECESSARY**: CFL bulbs come in many shapes and sizes. The most common type of CFL is made with a glass tube bent into a "twisty" shape and fits in a regular light bulb socket. **REPEAT C3, IF STILL=96, SKIP TO X1.]**

C4 Approximately, how many CFL bulbs did your household purchase in 2013? If you purchased any multi-packs, please tell me the total number of BULBS you purchased. [**IF NECESSARY**: For example, a pack with three bulbs would count as three. Your best estimate is fine.]

1 One → **SKIP TO C8** **SET TOT_LAMPS=1**
2 More than one [SPECIFY, REQUIRE ANSWER. IF DK, GOTO C4b]
→ **SKIP TO C5** **SET TOT_LAMPS=ANSWER**
96 REFUSED → **SKIP TO X1**
97 DON'T KNOW → **ASK C4B**

C4B What is your best estimate of the NUMBER of CFL bulbs purchased in 2013.

1 One → **SKIP TO C8** **SET TOT_LAMPS=1**
2 RECORD ANSWER
→ **SKIP TO C5** **SET TOT_LAMPS=ANSWER**
96 REFUSED → **SKIP TO X1**
97 DON'T KNOW → **SKIP TO X1**

C5 Did you purchase all the CFL bulbs at the same store?

1 Yes → **SKIP TO C8**
2 No
96 REFUSED → **SKIP TO C12**
97 DON'T KNOW → **SKIP TO C12**

C6 REMOVED

C7 From how many different stores did you purchase CFL bulbs in 2013? **[IF NECESSARY SAY –** Your best estimate is fine]
1_____ [RECORD # OF STORES]
96 REFUSED → **SKIP TO C12**
97 DON'T KNOW → **SKIP TO C12**

[BEFORE STARTING STORE MODULE, SET SUM_LAMPS = 0]

[STORE MODULE – C8 to C11 -- REPEAT UP TO 3 TIMES]

[IF (TOT_LAMPS = 1) OR (C5 =1) Program so that if only one store. Ask STORE MODULE only one time]

IF (TOT_LAMPS = 1) OR (C5 =1), SKIP TO C8]

C8 [READ ONLY FIRST TIME THROUGH MODULE

(if C7=1) I'm going to ask about **the store** where you purchased the CFL bulb in 2013.

(if C7>1)I'm going to ask about **the two stores *(if C7=2)*/the three stores *(if C7=3)*/up to three different stores (if C7>3)** where you might have purchased CFL bulbs in 2013. First, I'll ask you some questions about where you purchased the **most** bulbs, then repeat for stores where you may have bought fewer.

[Responses to c8, c9, and c11 should be coded as c8a-c c9a-c and c11a-c for stores 1 through 3 asked about]

C8a At what store did you buy the most CFL bulbs? [Use store precodes listed below]

C8b [READ ONLY SECOND TIME THROUGH MODULE]
Now let's go through those questions for the place where you purchased the second most number of CFL bulbs in 2013. At what store did you buy the second most CFL bulbs?

C8c [READ ONLY THIRD TIME THROUGH MODULE]
Now let's go through those questions for the place you purchased the third most. At what store did you buy the third most CFL bulbs?

[DO NOT READ] [ACCEPT ONLY ONE RESPONSE]

1.	ACE HARDWARE
2.	ALBERT'S RED APPLE
3.	ALBERTSONS
4.	ARIRANG ORIENTAL MARKET
5.	ASIAN FOOD CENTERS
6.	BARTELL DRUGS
7.	BATTERIES PLUS
8.	BEAVER VALLEY GENERAL STORE
9.	BEST BUY
10.	BIG LOTS
11.	BRIDLE TRAILS RED APPLE MARKET
12.	CARNATION MARKET
13.	CARNICERIA LA CHIQUITA
14.	COSTCO
15.	DO IT BEST - ISLAND LUMBER & HARDWARE
16.	DO IT BEST HARDWARE CENTER
17.	DODSON'S IGA
18.	DOLLAR TREE

19.	FOOD MARKET AT LEA HILL
20.	FOSS' GROCERY
21.	FRED MEYER
22.	FRONT STREET RED APPLE MARKET
23.	FRY'S ELECTRONICS
24.	GARGUILES RED APPLE MARKET
25.	GOODWILL
26.	GROCERY OUTLET
27.	H MART
28.	HADLOCK BUILDING SUPPLY
29.	HAGGEN
30.	HARDWARE SALES
31.	HOME DEPOT
32.	INTERCONTINENTAL FOODS
33.	LOWE'S
34.	MAPLE VALLEY MARKET
35.	MCLENDON HARDWARE
36.	MOUNT VERNON RED APPLE MARKET
37.	OLYMPIA LIGHTING CENTER
38.	ONLY A DOLLAR PLUS
39.	PIONEER MARKET
40.	PIONEER ROBERTS MARKET
41.	PRAIRIE CENTER RED APPLE MARKET
42.	PUGET PANTRY
43.	RALPH'S RED APPLE MARKET
44.	SAM'S CLUB
45.	SCOTT LAKE GROCERY
46.	SEBO'S DO IT CENTER
47.	SEBO'S HARDWARE AND EQUIPMENT RENTAL
48.	THE MARKETS
49.	THE STAR STORE, INC.
50.	TRUE VALUE HARDWARE
51.	VALLEY HARVEST MARKET
52.	VASHON MARKET
53.	VASHON THRIFTWAY
54.	WALGREENS
55.	WALMART
56.	WALT'S LYNWOOD CENTER
57.	WESTSIDE BUILDING SUPPLY DO IT CENTER

95 OTHER (SPECIFY) _____
96 REFUSED → **SKIP TO C11**
97 DON'T KNOW → **SKIP TO C11**

C9 In what city or town was this store located?

[DO NOT READ] [ACCEPT ONLY ONE RESPONSE]

1	ANACORTES
2	AUBURN
3	BAINBRIDGE ISLAND
4	BELLEVUE
5	BELLINGHAM
6	BLAINE
7	BONNEY LAKE
8	BOTHELL
9	BREMERTON
10	BURIEN
11	BURLINGTON
12	CARNATION
13	CLE ELUM
14	CLINTON
15	CONCRETE
16	COUPEVILLE
17	COVINGTON
18	DES MOINES
19	EDGEWOOD
20	ELLENSBURG
21	ENUMCLAW
22	EVERSON
23	FEDERAL WAY
24	FERNDALE
25	FREELAND
26	GRAHAM
27	ISSAQUAH
28	KENMORE
29	KENT
30	KINGSTON
31	KIRKLAND
32	LA CONNER
33	LACEY
34	LANGLEY

35	LYNDEN
36	MAPLE VALLEY
37	MERCER ISLAND
38	MOUNT VERNON
39	NEWCASTLE
40	NORTH BEND
41	OAK HARBOR
42	OLYMPIA
43	POINT ROBERTS
44	PORT HADLOCK
45	PORT LUDLOW
46	PORT ORCHARD
47	PORT TOWNSEND
48	POULSBO
49	PUYALLUP
50	REDMOND
51	RENTON
52	ROSLYN
53	SAMMAMISH
54	SEDRO WOOLLEY
55	SILVERDALE
56	SUMNER
57	TENINO
58	TUKWILA
59	TUMWATER
60	VASHON
61	WOODINVILLE
62	YELM

95 OTHER (SPECIFY) _____
96 REFUSED
97 DON'T KNOW

[C10 DELETED]

[IF TOT_LAMPS=1, AUTO POPULATE C11=1 AND SKIP TO C12]
[IF C5=1 (ONE TRIP) AUTO POPULATE C11 = TOT_LAMPS AND SKIP TO C12]
[INSERT "REMAINING" IN QUESTION SCRIPT FOR C11 only for LOOPS 2 and 3]

C11 How many of the (remaining) **[TOT_LAMPS – SUM_LAMPS]** CFL bulbs did you purchase at that time?

1 [RECORD #]
96 REFUSED [GOTO NEXT LOOP]

97 DON'T KNOW [GOTO NEXT LOOP]

END OF LOOP RULES:
SUM_LAMPS = SUM_LAMPS + C11
IF SUM_LAMPS >= 0.9* TOT_LAMPS, BREAK LOOP AND GOTO C12

IF (TOT_LAMPS = 1) OR (C5 =1), BREAK LOOP AND GO TO C12

GOTO C8b FOR 2nd PURCHASE,
GOTO C8c FOR 3rd PURCHASE,
or BREAK LOOP AND GOTO C12 IF NO MORE PURCHASES TO ASK ABOUT

C12 How many of the **[TOT_LAMPS]** bulbs that you purchased in 2013 are currently installed in or around your home?

1 [RECORD #]
996 REFUSED
997 DON'T KNOW

C13 What type of bulb did *the majority* of these CFL bulbs replace? Was it . . .

[IF TOT_LAMPS=1 USE ALTERNATE WORDING: What type of bulb did the CFL replace? Was it…]

[READ 1-5. ACCEPT ONE ANSWER. CHANGE ALL OPTIONS TO SINGULAR WHEN tot_lamps=1]

1 Other CFL bulbs,
2 Regular/incandescent bulbs,
3 Halogen bulbs,
4 A mix of CFL and other bulbs, or
5 Did not replace other bulbs
95 SOMETHING ELSE
96 REFUSED
97 DON'T KNOW

[IF C12 >= TOT_LAMPS (DID NOT INSTALL LESS THAN PURCHASED) SKIP TO NEXT APPLICABLE SECTION]

C14 What did you do with the bulbs you did NOT install. Did you . . ?

[READ 1-4. ACCEPT MULTIPLE ANSWERS]

1 store them in your home,
2 give them away,
3 return them to the store, or
4 INSTALLED THEM ALL
95 do something else with them? (SPECIFY: _____)
96 REFUSED
97 DON'T KNOW

X Compact Fluorescent Fixtures

X1 Now I'm going to ask you about CFL FIXTURES. A CFL bulb will plug into a FIXTURE and these fixtures often have an Energy Star label. Have you **heard** of CFL fixtures?

[OPTIONAL: To ensure safety and maximum bulb light, some CFLs require specialty fixtures. Some CFLs may overheat if placed in a can light or other recessed fixtures.]

1 Yes
2 No ➔ **IF I4=3 SKIP TO L1. OTHERWISE:**

C3=2, 96, 97	**T&T. DO NOT COUNT AS COMPLETE**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

96 REFUSED ➔ **IF I4=3 SKIP TO L1. OTHERWISE:**

C3=2, 96, 97	**T&T. DO NOT COUNT AS COMPLETE**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

97 DON'T KNOW **IF I4=3 SKIP TO L1. OTHERWISE:**

C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

X2 DELETED

X3 Did you or someone in your household **buy** any CFL fixtures in 2013?

1 Yes
2 No ➔ **IF I4=3 SKIP TO L1. OTHERWISE:**

C3=2, 96, 97	**T&T. DO NOT COUNT AS COMPLETE**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

96 REFUSED ➔ **IF I4=3 SKIP TO L1. OTHERWISE:**

C3=2, 96, 97	**T&T. DO NOT COUNT AS COMPLETE**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

97 DON'T KNOW ➔ **IF I4=3 SKIP TO L1. OTHERWISE:**

C3=2, 96, 97	**T&T. DO NOT COUNT AS COMPLETE**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**

IF C4=96 or C4B = 96, 97	**T&T. DO NOT COUNT AS COMPLETE**

X4 How many CFL fixtures did you buy in 2013?

1	One	**→ SKIP TO X8**	**SET TOT_FIX=1**
2	More than one [SPECIFY, REQUIRE ANSWER. IF DK, GOTO X4b]	**➔SKIP TO X5**	**SET TOT_FIX=ANSWER**
96	REFUSED	**→ IF I4=1, SKIP TO D0; IF I4=3, SKIP TO L1; .**	
97	DON'T KNOW	**➔GOTO X4B***	

X4B What is your best estimate of the NUMBER of CFL fixtures purchased in 2013?

1	One	**→ SKIP TO X8**	**SET TOT_FIX=1**
2	RECORD ANSWER	**➔SKIP TO X5**	**SET TOT_FIX=ANSWER**
96	REFUSED	**→ IF I4=1, SKIP TO D0; IF I4=3, SKIP TO L1;**	
97	DON'T KNOW	**→ IF I4=1SKIP TO D0; IF I4=3SKIP TO L1;**	

X5 Did you purchase all the CFL fixtures on the same shopping trip?

1	Yes	**➔ SKIP TO X8**
2	No	
96	REFUSED	**➔ SKIP TO X12**
97	DON'T KNOW	**➔ SKIP TO X12**

X6 REMOVED

[ASK IF X5 = 2, MORE THAN ONE STORE]
X7 On how many different trips did you purchase CFL fixtures in 2013?

1	[RECORD # OF TRIPS]	
96	REFUSED	**➔ SKIP TO X12**
97	DON'T KNOW	**➔ SKIP TO X12**

[BEFORE STARTING STORE MODULE, SET SUM_FIX = 0]

STORE MODULE – X8 to X11
[REPEAT UP TO 3 TIMES]

[IF (TOT_FIX = 1) OR (X5 =1) Program so that if only one store. Ask STORE MODULE only one time]

IF (TOT_FIX = 1) OR (X5 =1), SKIP TO X8]

X8 **[READ ONLY FIRST TIME THROUGH MODULE**
(if X7=1) I'm going to ask about **the store** where you purchased the CFL fixture in 2013.
(if X7>1)I'm going to ask about **the two stores *(if X7=2)*/the three stores *(if X7=3)*/up to three different stores *(if X7>3)*** where you might have purchased CFL fixtures in 2013. I'll ask you some questions about where you purchased the **most** fixtures, then repeat for stores where you may have bought fewer.

[Responses to x8, x9, and x11 should be coded as x8a-c x9a-c and x11a-c for stores 1 through 3 asked about]

[READ ONLY FIRST TIME THROUGH MODULE]

X8a At what store did you buy the most CFL fixtures?

X8b [READ ONLY SECOND TIME THROUGH MODULE]
Now let's go through those questions for your 2nd CFL fixture purchase in 2013. At what store did you buy the second most CFL fixtures?

X8c [READ ONLY THIRD TIME THROUGH MODULE]
Now let's go through those questions for your 3rd CFL fixture purchase. At what store did you buy the third most CFL fixtures?

[DO NOT READ. ACCEPT ONLY ONE RESPONSE]

1.	ACE HARDWARE
2.	ALBERT'S RED APPLE
3.	ALBERTSONS
4.	ARIRANG ORIENTAL MARKET
5.	ASIAN FOOD CENTERS
6.	BARTELL DRUGS
7.	BATTERIES PLUS
8.	BEAVER VALLEY GENERAL STORE
9.	BEST BUY
10.	BIG LOTS
11.	BRIDLE TRAILS RED APPLE MARKET
12.	CARNATION MARKET
13.	CARNICERIA LA CHIQUITA
14.	COSTCO
15.	DO IT BEST - ISLAND LUMBER & HARDWARE
16.	DO IT BEST HARDWARE CENTER
17.	DODSON'S IGA
18.	DOLLAR TREE
19.	FOOD MARKET AT LEA HILL

20.	FOSS' GROCERY
21.	FRED MEYER
22.	FRONT STREET RED APPLE MARKET
23.	FRY'S ELECTRONICS
24.	GARGUILES RED APPLE MARKET
25.	GOODWILL
26.	GROCERY OUTLET
27.	H MART
28.	HADLOCK BUILDING SUPPLY
29.	HAGGEN
30.	HARDWARE SALES
31.	HOME DEPOT
32.	INTERCONTINENTAL FOODS
33.	LOWE'S
34.	MAPLE VALLEY MARKET
35.	MCLENDON HARDWARE
36.	MOUNT VERNON RED APPLE MARKET
37.	OLYMPIA LIGHTING CENTER
38.	ONLY A DOLLAR PLUS
39.	PIONEER MARKET
40.	PIONEER ROBERTS MARKET
41.	PRAIRIE CENTER RED APPLE MARKET
42.	PUGET PANTRY
43.	RALPH'S RED APPLE MARKET
44.	SAM'S CLUB
45.	SCOTT LAKE GROCERY
46.	SEBO'S DO IT CENTER
47.	SEBO'S HARDWARE AND EQUIPMENT RENTAL
48.	THE MARKETS
49.	THE STAR STORE, INC.
50.	TRUE VALUE HARDWARE
51.	VALLEY HARVEST MARKET
52.	VASHON MARKET
53.	VASHON THRIFTWAY
54.	WALGREENS
55.	WALMART
56.	WALT'S LYNWOOD CENTER
57.	WESTSIDE BUILDING SUPPLY DO IT CENTER

95 OTHER (SPECIFY) _____
96 REFUSED ➔ **SKIP TO X12**

97 DON'T KNOW ➔ **SKIP TO X12**

X9 In what city or town is this store located?

[DO NOT READ. ACCEPT ONLY ONE RESPONSE]

1	ANACORTES
2	AUBURN
3	BAINBRIDGE ISLAND
4	BELLEVUE
5	BELLINGHAM
6	BLAINE
7	BONNEY LAKE
8	BOTHELL
9	BREMERTON
10	BURIEN
11	BURLINGTON
12	CARNATION
13	CLE ELUM
14	CLINTON
15	CONCRETE
16	COUPEVILLE
17	COVINGTON
18	DES MOINES
19	EDGEWOOD
20	ELLENSBURG
21	ENUMCLAW
22	EVERSON
23	FEDERAL WAY
24	FERNDALE
25	FREELAND
26	GRAHAM
27	ISSAQUAH
28	KENMORE
29	KENT
30	KINGSTON
31	KIRKLAND
32	LA CONNER
33	LACEY
34	LANGLEY
35	LYNDEN

36	MAPLE VALLEY
37	MERCER ISLAND
38	MOUNT VERNON
39	NEWCASTLE
40	NORTH BEND
41	OAK HARBOR
42	OLYMPIA
43	POINT ROBERTS
44	PORT HADLOCK
45	PORT LUDLOW
46	PORT ORCHARD
47	PORT TOWNSEND
48	POULSBO
49	PUYALLUP
50	REDMOND
51	RENTON
52	ROSLYN
53	SAMMAMISH
54	SEDRO WOOLLEY
55	SILVERDALE
56	SUMNER
57	TENINO
58	TUKWILA
59	TUMWATER
60	VASHON
61	WOODINVILLE
62	YELM

95 OTHER (SPECIFY) _____
96 REFUSED
97 DON'T KNOW

X10 DELETED

[IF TOT_FIX=1, AUTO POPULATE X11=1 AND SKIP TO X12]
[IF X5=1 (ONE TRIP) AUTO POPULATE X11 = TOT_FIX AND SKIP TO X12]

[INSERT "REMAINING" IN QUESTION SCRIPT FOR X11 only for LOOPS 2 and 3. IF TOTFIX-SUMFIX=1, SKIP X11]

X11 How many of the (remaining) **[TOT_FIX – SUM_FIX]** CFL fixtures did you purchase at that time?

1 [RECORD #]

96 REFUSED [GOTO NEXT LOOP]
97 DON'T KNOW [GOTO NEXT LOOP]

END OF LOOP RULES:
SUM_FIX = SUM_FIX + X11
IF SUM_FIX >= .9*TOT_FIX BREAK LOOP AND GOTO X12

IF (TOT_FIX = 1) OR (X5 =1) BREAK LOOP AND GOTO X12

GOTO X8b FOR 2nd PURCHASE,
GOTO X8c FOR 3rd PURCHASE,
or GOTO X12 IF NO MORE PURCHASES TO ASK ABOUT

X12 How many of the **[TOT_FIX]** fixtures that you purchased in 2013 are currently installed in or around your home?

1 [RECORD #]
96 REFUSED
97 DON'T KNOW

X13 What did the new CFL fixtures replace? Was it . . .

[IF TOT_FIX=1 USE ALTERNATE WORDING: What did the new CFL fixture replace? Was it …]

[READ LIST, ACCEPT MULTIPLE. CHANGE ALL OPTIONS TO SINGULAR WHEN tot_fix=1]
1 Other CFL fixture
2 Regular/incandescent/halogen fixture
3 Mix of different fixtures
4 It was an additional fixture

95 Something else? (SPECIFY_____)
96 REFUSED
97 DON'T KNOW

[IF X12 >= TOT_FIX (DID NOT INSTALL LESS THAN PURCHASED) SKIP TO NEXT APPLICABLE SECTION]
X14 What did you did with the fixture(s) you did not install. Did you ?

[READ 1-4. ACCEPT MULTIPLE ANSWERS]
1 Store it/them in your home,
2 Give it/them away,
3 Return it/them to the store, or
95 do something else? (SPECIFY _____)
96 REFUSED
97 DON'T KNOW

[IF I4=3 PROCEED TO L1, OTHERWISE SKIP TO D0]

L LED PURCHASE(S)

ASK IF I4=2-3

L1 Now, I'm going to ask you about LED bulbs. Right now, I am only asking about LED **bulbs** that are **purchased separately without a fixture**.

L2 **cut**

L3 Did you or anyone in your household purchase any LED in 2013?

1 Yes
2 No → **SKIP TO XL1**
96 REFUSED → **SKIP TO XL1**
97 DON'T KNOW → [**REVIEW: IF NECESSARY**: LEDs are the most efficient light bulbs available today. They are often small bulbs that come attached to a fixture. **REPEAT L3, IF STILL=96 SKIP TO XL1.]**

L4 Approximately, how many LED bulbs did your household purchase in 2013? If you purchased any multi-packs, please tell me the total number of BULBS you purchased. [**IF NECESSARY**: For example, a pack with three bulbs would count as three. Your best estimate is fine.]

1 One → **SKIP TO L8** **SET LTOT_LAMPS=1**
2 More than one [SPECIFY, REQUIRE ANSWER. IF DK, GOTO L4b]
→ **SKIP TO L5** **SET LTOT_LAMPS=ANSWER**
96 REFUSED → **SKIP TO XL1**
97 DON'T KNOW → **ASK L4b**

L4B What is your best estimate of the NUMBER of LED bulbs purchased in 2013?

1 One → **SKIP TO L8** **SET LTOT_LAMPS=1**
2 RECORD ANSWER
→ **ASK L5** **SET TOT_LAMPS=ANSWER**
96 REFUSED → **SKIP TO XL1**
97 DON'T KNOW → **SKIP TO XL1**

L5 Did you purchase all the LEDs on the same shopping trip?

1 Yes → **SKIP TO L8**
2 No
96 REFUSED → **SKIP TO L12**
97 DON'T KNOW → **SKIP TO L12**

L6 REMOVED

L7 On how many different trips did you purchase LEDs in 2013? **[IF NECESSARY SAY –** Your best estimate is fine]

1_____ [RECORD # OF TRIPS]
96 REFUSED → **SKIP TO L12**
97 DON'T KNOW → **SKIP TO L12**

BEFORE STARTING STORE MODULE, SET LSUM_LAMPS = 0

STORE MODULE – L8 to L11
REPEAT UP TO 6 TIMES]

[IF (LTOT_LAMPS = 1) OR (L5 =1) Program so that if only one store. Ask STORE MODULE only one time]

IF (LTOT_LAMPS = 1) OR (L5 =1), SKIP TO L8]

[L8, L9, and L11 should be coded as L8a-c, L9a-c, L11a-c for the three stores asked about]

L8 **[READ ONLY FIRST TIME THROUGH MODULE**
(if L7=1) I'm going to ask about **the store** where you purchased the LED bulbs in 2013.
(if L7>1) I'm going to ask about **the two stores *(if L7=2)*/the three stores *(if L7=3)*/up to three different stores *(if L7>3)*** where you might have purchased your LEDs in 2013. I'll ask you some questions about the first purchase, then repeat some questions for the later purchases.

L8a At what store did you buy the most LEDs?

L8b **[READ ONLY SECOND TIME THROUGH MODULE]**
Now let's go through those questions for your 2nd LED purchase in 2013. At what store did you buy the second most LEDs?

L8c **[READ ONLY THIRD TIME THROUGH MODULE]**
Now let's go through those questions for your 3rd purchase. At what store did you buy the third most LEDs?

[DO NOT READ] [ACCEPT ONLY ONE RESPONSE]

58.	ACE HARDWARE
59.	ALBERT'S RED APPLE
60.	ALBERTSONS
61.	ARIRANG ORIENTAL MARKET
62.	ASIAN FOOD CENTERS
63.	BARTELL DRUGS
64.	BATTERIES PLUS
65.	BEAVER VALLEY GENERAL STORE
66.	BEST BUY
67.	BIG LOTS
68.	BRIDLE TRAILS RED APPLE MARKET
69.	CARNATION MARKET
70.	CARNICERIA LA CHIQUITA
71.	COSTCO
72.	DO IT BEST - ISLAND LUMBER & HARDWARE
73.	DO IT BEST HARDWARE CENTER
74.	DODSON'S IGA
75.	DOLLAR TREE
76.	FOOD MARKET AT LEA HILL

77.	FOSS' GROCERY
78.	FRED MEYER
79.	FRONT STREET RED APPLE MARKET
80.	FRY'S ELECTRONICS
81.	GARGUILES RED APPLE MARKET
82.	GOODWILL
83.	GROCERY OUTLET
84.	H MART
85.	HADLOCK BUILDING SUPPLY
86.	HAGGEN
87.	HARDWARE SALES
88.	HOME DEPOT
89.	INTERCONTINENTAL FOODS
90.	LOWE'S
91.	MAPLE VALLEY MARKET
92.	MCLENDON HARDWARE
93.	MOUNT VERNON RED APPLE MARKET
94.	OLYMPIA LIGHTING CENTER
95.	ONLY A DOLLAR PLUS
96.	PIONEER MARKET
97.	PIONEER ROBERTS MARKET
98.	PRAIRIE CENTER RED APPLE MARKET
99.	PUGET PANTRY
100.	RALPH'S RED APPLE MARKET
101.	SAM'S CLUB
102.	SCOTT LAKE GROCERY
103.	SEBO'S DO IT CENTER
104.	SEBO'S HARDWARE AND EQUIPMENT RENTAL
105.	THE MARKETS
106.	THE STAR STORE, INC.
107.	TRUE VALUE HARDWARE
108.	VALLEY HARVEST MARKET
109.	VASHON MARKET
110.	VASHON THRIFTWAY
111.	WALGREENS
112.	WALMART
113.	WALT'S LYNWOOD CENTER
114.	WESTSIDE BUILDING SUPPLY DO IT CENTER

95 OTHER (SPECIFY) _____

96 REFUSED → **SKIP TO L11**
97 DON'T KNOW → **SKIP TO L11**

L9 In what city or town was this store located?

[DO NOT READ] [ACCEPT ONLY ONE RESPONSE]

1	ANACORTES
2	AUBURN
3	BAINBRIDGE ISLAND
4	BELLEVUE
5	BELLINGHAM
6	BLAINE
7	BONNEY LAKE
8	BOTHELL
9	BREMERTON
10	BURIEN
11	BURLINGTON
12	CARNATION
13	CLE ELUM
14	CLINTON
15	CONCRETE
16	COUPEVILLE
17	COVINGTON
18	DES MOINES
19	EDGEWOOD
20	ELLENSBURG
21	ENUMCLAW
22	EVERSON
23	FEDERAL WAY
24	FERNDALE
25	FREELAND
26	GRAHAM
27	ISSAQUAH
28	KENMORE
29	KENT
30	KINGSTON
31	KIRKLAND
32	LA CONNER
33	LACEY
34	LANGLEY
35	LYNDEN

36	MAPLE VALLEY
37	MERCER ISLAND
38	MOUNT VERNON
39	NEWCASTLE
40	NORTH BEND
41	OAK HARBOR
42	OLYMPIA
43	POINT ROBERTS
44	PORT HADLOCK
45	PORT LUDLOW
46	PORT ORCHARD
47	PORT TOWNSEND
48	POULSBO
49	PUYALLUP
50	REDMOND
51	RENTON
52	ROSLYN
53	SAMMAMISH
54	SEDRO WOOLLEY
55	SILVERDALE
56	SUMNER
57	TENINO
58	TUKWILA
59	TUMWATER
60	VASHON
61	WOODINVILLE
62	YELM

95 OTHER (SPECIFY) _____
96 REFUSED
97 DON'T KNOW

[L10 DELETED]

[IF LTOT_LAMPS=1, AUTO POPULATE L11=1 AND SKIP TO L12]
[IF L5=1 (ONE TRIP) AUTO POPULATE L11 = LTOT_LAMPS AND SKIP TO L12]
[INSERT "REMAINING" IN QUESTION SCRIPT FOR L11 only for LOOPS 2 and 3]

L11 How many of the (remaining) **[LTOT_LAMPS – LSUM_LAMPS]** LED bulbs did you purchase at that time?

1 [RECORD #]
96 REFUSED [GOTO NEXT LOOP]

97 DON'T KNOW [GOTO NEXT LOOP]

END OF LOOP RULES:
LSUM_LAMPS = LSUM_LAMPS + L11
IF LSUM_LAMPS >= .9*LTOT_LAMPS, BREAK LOOP AND GOTO L12

IF (LTOT_LAMPS = 1) OR (L5 =1), BREAK LOOP AND GO TO L12

GOTO L8b FOR 2nd PURCHASE,
GOTO L8c FOR 3rd PURCHASE,
or BREAK LOOP AND GOTO L12 IF NO MORE PURCHASES TO ASK ABOUT

L12 How many of the **[LTOT_LAMPS]** bulbs that you purchased in 2013 are currently installed in or around your home?

1 [RECORD #]
996 REFUSED
997 DON'T KNOW

L13 What type of bulb did *the majority* of these LED bulbsreplace? Was it . . .

[IF LTOT_LAMPS=1 USE ALTERNATE WORDING: What type of bulb did the LED replace? Was it...]

[READ 1-5. ACCEPT ONE ANSWER. CHANGE ALL OPTIONS TO SINGULAR WHEN LTOT_LAMPS=1]

1 CFLs,
2 Regular/incandescent bulbs,
3 Halogen bulbs,
4 A mix of CFL and other bulbs, or
5 Did not replace other bulbs
95 SOMETHING ELSE
96 REFUSED
97 DON'T KNOW

[IF L12 >= LTOT_LAMPS (DID NOT INSTALL LESS THAN PURCHASED) SKIP TO NEXT APPLICABLE SECTION]

L14 What did you do with the bulbs you did NOT install. Did you . . ?

[READ 1-4. ACCEPT MULTIPLE ANSWERS]

1 store them in your home,
2 give them away,
3 return them to the store, or
4 I INSTALLED THEM ALL
95 do something else with them? (SPECIFY: _____)
96 REFUSED
97 DON'T KNOW

XL LED Fixtures

XL1 Now I'm going to ask you about LED **FIXTURES**. **LED fixtures** are designed specifically to use LEDs that plug in to the fixture. These fixtures often have an Energy Star label. Have you heard of these? [**IF NECESSARY**: These are not very common]

1 Yes
2 No ➔ **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AND (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

96 REFUSED ➔ **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AND (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

L3=1	**SKIP TO D0**
C3=1	**SKIP TO D0**

97 DON'T KNOW ➔ **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AN (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

XL2 DELETED

XL3 Did you or someone in your household buy any LED fixtures in 2013?

1 Yes
2 No ➔ **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**

X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AN (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

96 REFUSED → **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AN (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

97 DON'T KNOW → **IF:**

L4=1 or 2 or L4B=1 or 2	**SKIP TO D0**
C4=1 or 2 or C4B=1 or 2	**SKIP TO D0**
X4=1 or 2 or X4B=1 or 2	**SKIP TO D0**
(L3=2, 96, 97 OR L4 =96 OR L4B=96 or 97) AN (C3=2, 96, 97 OR C4=96 OR C4B= 96 or 97) AN (X3=2, 96, 97 OR X4=96 OR X4B=96 or 97)	**T&T. DO NOT COUNT AS COMPLETE**

XL4 How many LED fixtures did you buy in 2013?

1 One → **SKIP TO XL8** **SET LTOT_FIX=1**
2 More than one [SPECIFY, REQUIRE ANSWER. IF DK, GOTO X4b]
→**SKIP TO XL5** **SET LTOT_FIX=ANSWER**
96 REFUSED → **IF I4=1, SKIP TO D0;**
IF I4=3, SKIP TO D0;

97 DON'T KNOW →**GOTO XL4b**

XL4B What is your best estimate of the NUMBER of LED fixtures purchased in 2013?

1 One → **SKIP TO XL8** **SET LTOT_FIX=1**
2 RECORD ANSWER
→**SKIP TO XL5** **SET LTOT_FIX=ANSWER**
96 REFUSED → **IF C3 ≠ 1, AND L3 ≠ 1 AND X3≠ 1 THANK AND TERMINATE, DO NOT COUNT AS COMPLETE. IF XL3=1 SKIP TO D0**
97 DON'T KNOW → **IF C3 ≠ 1, AND L3 ≠ 1 AND X3≠ 1 THANK AND TERMINATE, DO NOT COUNT AS COMPLETE. IF XL3=1 SKIP TO D0**

XL5 Did you purchase all the LED fixtures on the same shopping trip?

1 Yes → **SKIP TO XL8**
2 No
96 REFUSED → **SKIP TO XL12**

97 DON'T KNOW ➔ **SKIP TO XL12**

XL6 REMOVED

[ASK IF XL5 = 2, MORE THAN ONE STORE]
XL7 On how many different trips did you purchase LED fixtures in 2013?

1 [RECORD # OF TRIPS]
96 REFUSED ➔ **SKIP TO XL12**
97 DON'T KNOW ➔ **SKIP TO XL12**

[BEFORE STARTING STORE MODULE, SET LSUM_FIX = 0]

STORE MODULE – XL8 to XL11
[REPEAT UP TO 3 TIMES]

[IF (LTOT_FIX = 1) OR (XL5 =1) Program so that if only one store. Ask STORE MODULE only one time]

IF (LTOT_FIX = 1) OR (XL5 =1), SKIP TO XL8]

[Responses to XL8, XL9, and XL11 should be coded as XL8a-c XL9a-c and XL11a-c for stores 1 through 3 asked about]

XL8. [READ ONLY FIRST TIME THROUGH MODULE]
(if XL7=1) I'm going to ask about **the store** where you purchased the LED fixture in 2013.
(if XL7>1) I'm going to ask about **the two stores *(if XL7=2)*/the three stores *(if XL7=3)*/up to three different stores *(if XL7>3)*** where you might have purchased LED fixtures in 2013. First, I'll ask you some questions about where you purchased the **most** fixtures, then repeat some questions for stores where you may have bought fewer.

[READ ONLY FIRST TIME THROUGH MODULE]

X8a At what store did you buy the most LED fixtures?

X8b [READ ONLY SECOND TIME THROUGH MODULE]
Now let's go through those questions for your 2nd LED fixture purchase in 2013. At what store did you buy the second most LED fixtures?

X8c [READ ONLY THIRD TIME THROUGH MODULE]
Now let's go through those questions for your 3rd LED fixture purchase. At what store did you buy the third most LED fixtures?

[DO NOT READ. ACCEPT ONLY ONE RESPONSE]

1. ACE HARDWARE
2. ALBERT'S RED APPLE
3. ALBERTSONS
4. ARIRANG ORIENTAL MARKET
5. ASIAN FOOD CENTERS

6.	BARTELL DRUGS
7.	BATTERIES PLUS
8.	BEAVER VALLEY GENERAL STORE
9.	BEST BUY
10.	BIG LOTS
11.	BRIDLE TRAILS RED APPLE MARKET
12.	CARNATION MARKET
13.	CARNICERIA LA CHIQUITA
14.	COSTCO
15.	DO IT BEST - ISLAND LUMBER & HARDWARE
16.	DO IT BEST HARDWARE CENTER
17.	DODSON'S IGA
18.	DOLLAR TREE
19.	FOOD MARKET AT LEA HILL
20.	FOSS' GROCERY
21.	FRED MEYER
22.	FRONT STREET RED APPLE MARKET
23.	FRY'S ELECTRONICS
24.	GARGUILES RED APPLE MARKET
25.	GOODWILL
26.	GROCERY OUTLET
27.	H MART
28.	HADLOCK BUILDING SUPPLY
29.	HAGGEN
30.	HARDWARE SALES
31.	HOME DEPOT
32.	INTERCONTINENTAL FOODS
33.	LOWE'S
34.	MAPLE VALLEY MARKET
35.	MCLENDON HARDWARE
36.	MOUNT VERNON RED APPLE MARKET
37.	OLYMPIA LIGHTING CENTER
38.	ONLY A DOLLAR PLUS
39.	PIONEER MARKET
40.	PIONEER ROBERTS MARKET
41.	PRAIRIE CENTER RED APPLE MARKET
42.	PUGET PANTRY
43.	RALPH'S RED APPLE MARKET
44.	SAM'S CLUB
45.	SCOTT LAKE GROCERY

46.	SEBO'S DO IT CENTER
47.	SEBO'S HARDWARE AND EQUIPMENT RENTAL
48.	THE MARKETS
49.	THE STAR STORE, INC.
50.	TRUE VALUE HARDWARE
51.	VALLEY HARVEST MARKET
52.	VASHON MARKET
53.	VASHON THRIFTWAY
54.	WALGREENS
55.	WALMART
56.	WALT'S LYNWOOD CENTER
57.	WESTSIDE BUILDING SUPPLY DO IT CENTER

95 OTHER (SPECIFY) _____
96 REFUSED ➔ **SKIP TO XL12**
97 DON'T KNOW ➔ **SKIP TO XL12**

XL9 In what city or town is this store located?

[DO NOT READ. ACCEPT ONLY ONE RESPONSE]

1	ANACORTES
2	AUBURN
3	BAINBRIDGE ISLAND
4	BELLEVUE
5	BELLINGHAM
6	BLAINE
7	BONNEY LAKE
8	BOTHELL
9	BREMERTON
10	BURIEN
11	BURLINGTON
12	CARNATION
13	CLE ELUM
14	CLINTON
15	CONCRETE
16	COUPEVILLE
17	COVINGTON
18	DES MOINES
19	EDGEWOOD
20	ELLENSBURG
21	ENUMCLAW

22	EVERSON
23	FEDERAL WAY
24	FERNDALE
25	FREELAND
26	GRAHAM
27	ISSAQUAH
28	KENMORE
29	KENT
30	KINGSTON
31	KIRKLAND
32	LA CONNER
33	LACEY
34	LANGLEY
35	LYNDEN
36	MAPLE VALLEY
37	MERCER ISLAND
38	MOUNT VERNON
39	NEWCASTLE
40	NORTH BEND
41	OAK HARBOR
42	OLYMPIA
43	POINT ROBERTS
44	PORT HADLOCK
45	PORT LUDLOW
46	PORT ORCHARD
47	PORT TOWNSEND
48	POULSBO
49	PUYALLUP
50	REDMOND
51	RENTON
52	ROSLYN
53	SAMMAMISH
54	SEDRO WOOLLEY
55	SILVERDALE
56	SUMNER
57	TENINO
58	TUKWILA
59	TUMWATER
60	VASHON
61	WOODINVILLE

62	YELM

95 OTHER (SPECIFY) _____
96 REFUSED
97 DON'T KNOW

XL10 DELETED

[IF LTOT_FIX=1, AUTO POPULATE XL11=1 AND SKIP TO XL12]
[IF XL5=1 (ONE TRIP) AUTO POPULATE XL11 = LTOT_FIX AND SKIP TO XL12]
[INSERT "REMAINING" IN QUESTION SCRIPT FOR XL11 only for LOOPS 2 and 3]

XL11 How many of the (remaining) **[LTOT_FIX – LSUM_FIX]** LED fixtures did you purchase at that time?

1 [RECORD #]
96 REFUSED [GOTO NEXT LOOP]
97 DON'T KNOW [GOTO NEXT LOOP]

END OF LOOP RULES:
LSUM_FIX = LSUM_FIX + XL11
IF LSUM_FIX >=.9*LTOT_FIX BREAK LOOP AND GOTO XL12

IF (LTOT_FIX = 1) OR (XL5 =1) BREAK LOOP AND GOTO XL12

GOTO XL8b FOR 2nd PURCHASE,
GOTO XL8c FOR 3rd PURCHASE,
or GOTO XL12 IF NO MORE PURCHASES TO ASK ABOUT

XL12 How many of the **[LTOT_FIX]** fixtures that you purchased in 2013 are currently installed in or around your home?**]**

1 [RECORD #]
96 REFUSED
97 DON'T KNOW

XL13 What did the new LED fixtures replace? Was it . . .

[IF LTOT_FIX=1 USE ALTERNATE WORDING: What did the new LED fixture replace? Was it …]

[READ LIST, ACCEPT MULTIPLE. CHANGE ALL OPTIONS TO SINGULAR WHEN LTOT_FIX=1]
1 A CFL fixture,
2 Regular/incandescent fixture with regular bulbs,
3 A halogen fixture,
4 A mix of different fixtures

5 It was an additional fixture, or
95 Something else? (SPECIFY_____)
96 REFUSED
97 DON'T KNOW

[IF XL12 >= LTOT_FIX (DID NOT INSTALL LESS THAN PURCHASED) SKIP TO NEXT SECTION - DEMOGRAPHICS]

XL14 What did you do with the fixture(s) you did not install. Did you ?

[READ 1-4. ACCEPT MULTIPLE ANSWERS]

1 Store it/them in your home,
2 Give it/them away,
3 Return it/them to the store, or
95 do something else? (SPECIFY _____)
96 REFUSED
97 DON'T KNOW

D DEMOGRAPHICS

D0 Thank you, I have few final questions about your household. These will be used for statistical purposes only.

D1 Which of the following best describes the type of home you live in? Is it a… [READ]
01 Single family, detached,
02 Single family attached, such as town house or row house,
03 Apartment in multi-unit structure of 2–4 units,
04 Apartment in multi-unit structure of 5 or more units, or
05 Mobile Home?
96 REFUSED
97 DON'T KNOW

D2 Approximately what year was your home built? **[DO NOT READ]**
01 2006 OR LATER
02 2000 TO 2005
03 1990 TO 1999
04 1980 TO 1989
05 1970 TO 1979
06 1950 TO 1969
07 EARLIER THAN 1950
96 REFUSED
97 DON'T KNOW

D3 What is the approximate finished square footage of your home? Your best estimate is fine.

[DO NOT READ]
01 LESS THAN 1,2000 SQUARE FEET
02 1,200 TO LESS THAN 1,800 SQUARE FEET
03 1,800 TO LESS THAN 2,400 SQUARE FEET
04 2,400 TO LESS THAN 3,000 SQUARE FEET
05 3,000 SQUARE FEET OR MORE
96 REFUSED
97 DON'T KNOW

D4 Including yourself and children, how many people live in your home at least six months of the year?

01___ RECORD NUMBER OF PEOPLE

96 REFUSED
97 DON'T KNOW

D5 What is the highest level of education you have obtained?

[READ LIST]

1 Some high school,

2 High school graduate, including GED,
3 Some college or an Associate's degree,
4 Bachelor's degree,
5 Some graduate school,
6 Graduate or professional degree,
96 REFUSED
97 DON'T KNOW

W WRAP UP

W0 Those are all the questions I have for you. Is there anything that you want me to pass on to PSE?

1 [RECORD RESPONSE]
2 [No response]
96 REFUSED
97 DON'T KNOW

W1. Thank you very much for your time and opinions.

RECORD GENDER

1 Male
2 Female
3 Can't determine

About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter and greener.