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Northwest Heat Pump Water Heater Initiative Market Progress Evaluation Report #1

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Table of Contents

List of Tables:

List of Figures:

Glossary

ACS	American Community Survey (US Census Bureau)
aMW	Average megawatt – "An average megawatt (aMW) is a unit of energy output that is equivalent to the energy produced by the continuous operation of 1 megawatt of capacity over a period of one year" (http://neea.org/docs/marketing-tookits/neea_faq.pdf)
BPA	Bonneville Power Administration
DHP	Ductless heat pump
DIY	Do-it-yourself
DOE	United States Department of Energy
ENERGY STAR®	US DOE program helping businesses and individuals protect the environment through superior energy efficiency (energystar.gov)
GE	General Electric Corporation
HPWH	Heat pump water heater
HVAC	Heating, ventilation, and air conditioning
HZ	Heating zone
MPER	Market Progress Evaluation Report
MPI	Market progress indicator – a metric tracked by NEEA to measure successes of a market transformation Initiative
MRE	Market research and evaluation
NAECA	National Appliance Energy Conservation Act
NEEA	The Northwest Energy Efficiency Alliance (neea.org)
NEEP	Northeast Energy Efficiency Partnerships
NCS	Northern Climate Specification (http://neea.org/northernclimatespec)
POS	Point-of-sale
PUD	Public utilities district
RUCC	Rural-Urban Continuum Codes, produced by the US Department of Agriculture (see Appendix H: Urban/Rural Markets Definitions)
SIC code	U.S. Department of Labor Occupational Safety & Health Administration Standard Industrial Classification code
SPIF	Sales performance incentive funds
UES	Unit energy savings (of a particular energy efficiency measure)

Executive Summary

The Northwest Energy Efficiency Alliances (NEEA) engaged Evergreen Economics in January 2015 to conduct the first annual Market Progress Evaluation for NEEA's Heat Pump Water Heater (HPWH) Initiative, also known as the Smart Water Heat Initiative.

Methods

This report presents evaluation findings based on the following research tasks:

1. Market Characterization and Progress Assessment
2. Logic Model Review
3. Telephone Surveys with Homeowners
4. Telephone Surveys with Installers
5. In-depth Interviews with Utilities and Market Actors
6. Savings Assessment (non-incented HPWH installations)

Findings

1. **Manufacturers are engaged and eager to meet higher Northern Climate Specification (NCS) tiers.**
2. **Most HPWH sales to-date were planned purchases, not emergency replacement situations.**
3. **From July 2013 to January 2015 between 430 and 593 Tier 2 HPWHs were installed with Smart Water Heat incentives and/or Northwest utility incentives.**
4. **In the first year and a half, between 4,053 and 4,593 Tier 1 HPWHs were installed with Northwest utility incentives and/or manufacturer markdowns paid through NEEA upstream incentives.** The vast majority of Tier 1 HPWHs were sold with a manufacturer markdown (4,053).
5. **HPWH purchasers are comprised of households with higher incomes and education levels than the general population.**
6. **Installers do not maintain a stock HPWHs – either at a centralized location or in their service vehicles – and it takes longer for HPWHs to be installed than electric resistance water heaters (from the time of purchase to install).** However, many installers who do not stock electric resistance or heat pump water heaters report that it takes longer for HPWHs to be installed (from the time of purchase).
7. **Retailers are either directly engaged with the Initiative (and selling many Tier 1 HPWHs via manufacturer markdowns) or they sell very few or no HPWHs.**
8. **According to market actors and consumers, brand familiarity is important.**

9. **There is consensus among market actors that the update to the National Appliance Energy Conservation Act (NAECA) federal standard for large tank electric water heaters is likely to have an impact on sales in the near- and long-term,** including some impact on sales of HPWHs below 55 gallons.
10. **Despite the perception that the updated NAECA standard will have a significant impact on the water heater market, market actors report that awareness among consumers remains low.** More than half of the interviewed retailers were also unaware of the standards update. This presents an opportunity for NEEA and Northwest utilities to get ahead of the issue and provide guidance and education to Northwest consumers and vendors.
11. **The new construction market may be an opportunity worth investigating.** There are specific reasons to target this market, including:
    - ***Cost of inaction* –** every new home in the Northwest that installs an electric resistance water heater will likely not purchase a HPWH as a replacement for a number of years.
    - ***Different purchase considerations* –** for new construction, the urgency barrier is significantly less important.
    - ***Economies of scale and word of mouth.***
12. **The manufacturer markdown approach changes Initiative evaluability.** The total incentive sales volumes of Tier 1 products are unknown because it is impossible to determine whether households who purchased a HPWH with a markdown apply for and receive a utility incentive. Furthermore, there are two risks related to the evaluability of the Initiative:
    - Uncertainty regarding installation location.
    - Customer research is much more difficult and costly.

Recommendations

1. **Continue to address low awareness through broad based marketing and through cooperative marketing with supply chain partners.**
2. **Continue support for manufacturer markdowns and utility incentives for Tier 1, Tier 2, and Tier 3 HPWHs.** As with the Market Test Assessment, customers and market actors report that the incentives are key to HPWH purchases.
3. **Consider targeting the new construction market.**
4. **Consider ways to collect replaced water heater volume, such as working with Northwest utilities to add a field on incentive applications.** As the existing supply of large volume electric resistance water heaters are installed and not replenished (due to the updated NAECA manufacturing standard), it will be important for the Initiative to better understand the characteristics of the water heaters that are replaced by Initiative-supported HPWHs.

5. **Work with manufacturer and retailer partners to establish an approach for collecting HPWH purchaser data to better understand who are purchasing HPWHs with manufacturer markdowns, to improve accounting accuracy, and for evaluation purposes.**
6. **Continue to track the rate of emergency replacements through consumer and supplier market research and evaluation (MRE).** The market moving from a high proportion of planned purchases to higher proportions of emergency replacements may indicate progress towards market transformation, as planned replacements are atypical in the general water heater market (Verinnovation, 2012), and likely indicate high rates of early adopter purchases.

1 Introduction

The Northwest Energy Efficiency Alliances (NEEA) engaged Evergreen Economics in January 2015 to conduct the first annual Market Progress Evaluation for NEEA's Heat Pump Water Heater (HPWH) Initiative, also known as the Smart Water Heat Initiative. NEEA works in collaboration with the Bonneville Power Administration (BPA), the Energy Trust of Oregon and more than 100 Northwest utilities on behalf of more than 12 million energy consumers. NEEA uses the market power of the region to accelerate the innovation and adoption of energy-efficient products, services and practices.

In May 2012, NEEA launched the Heat Pump Water Heater Market Test, providing a limited number of incentives for Tier 2 HPWHs. The market test was similar to a pilot program—a small "test" version of a full-fledged initiative or rebate program. The market test phase ended in June 2013, with incentives continuing as part of the HPWH Initiative (CLEAResult is the primary implementation contractor for the Initiative).

1.1 Market Progress Evaluation Overview

At a high level, the objectives of this Market Progress Evaluation Report (MPER) include:

1. Measure and track progress toward market transformation, based on agreed-upon market progress indicators;
2. Assess the Initiative's impact on urban and rural areas of the Northwest; and,
3. Document the Initiative's progress toward agreed-upon Initiative goals.

This study documents and assesses the market progress of NEEA's HPWH Initiative. The study findings are intended to inform the future implementation of the Initiative, and therefore, we provide substantive and actionable process-related recommendations.

1.2 Initiative Goals

Key objectives of NEEA's Smart Water Heat Initiative include:

1. Increasing the number of Northern Climate Specification (NCS)-qualified HPWHs;
2. Increasing the availability of NCS-qualified products;
3. Reducing market barriers (upfront cost, low awareness and knowledge of HPWHs);
4. Increasing adoption of HPWHs in the Northwest; and,
5. Updating the National Appliance Energy Conservation Act (NAECA) to include federally-mandated manufacturing standards to eliminate availability of inefficient electric resistance water heaters.

Ultimately, the objective of the Initiative is to assist in making HPWHs the default for electric water heating. The motivation is to reduce the energy consumption of water heating in the Northwest. NEEA estimates that HPWHs will offer an energy efficiency resource of approximately 500 average megawatts (aMW) by 2029 (NEEA, 2014; additional information available here: http://neea.org/initiatives/residential/heat-pump-water-heaters).

2 Evaluation Methodology

2.1 Logic Model Review

Evergreen conducted a review of NEEA's Smart Water Heat Initiative Market Progress Indicators (MPIs) and logic model. The purpose of this review was to determine if the existing logic model warrants updates to reflect changes in the implementation strategy and to determine if the Initiative established appropriate and measureable MPIs.

2.2 Market Characterization and Progress

Evergreen completed a characterization of the HPWH market in the Northwest. The characterization includes the numbers of distributors and manufacturers serving the Northwest and the number of incentives provided for HPWHs, by performance tier and incentive source. In addition, we conducted a secondary literature review to document current national trends in the HPWH market that could impact the Northwest market.

2.3 Telephone Surveys with Homeowners and Installers

The Evergreen team completed 195 telephone surveys with homeowners who purchased a HPWH and either received a Smart Water Heat rebate (for Tier 2 HPWHs) or received a utility rebate for either a Tier 1 or Tier 2 HPWH. We completed 79 surveys with Tier 1 purchasers and 116 surveys with Tier 2 purchasers in the Northwest. We also completed 210 telephone surveys with general populations of households in the Northwest with electric water heating. In addition, the research team completed 177 telephone surveys with Northwest HPWH installers, 68 of whom received training through the Smart Water Heat HPWH Initiative and 109 who had not attended a contractor orientation. We conducted significance testing at the 90% confidence interval, and note any statistically significant differences in the findings.

2.4 In-depth Interviews with Market Actors

Evergreen conducted in-depth interviews with representatives from ten Northwest utilities with highly active HPWH incentive programs, as well as with representatives from three HPWH manufacturers, four HPWH distributors, and nine retailers that sell HPWHs. The interviews with market actors focused on program designs and business practices, experiences working in the HPWH market, customer barriers and suggestions for improving the Initiative.

2.5 Savings Assessment

The savings assessment establishes an estimate for the prevalence of non-incented HPWHs sold in the Northwest, as well as characteristics of the HPWHs and their installation locations. Findings are based on self-reported data from installers. The method consists of determining the ratio of total known incented HPWHs to self-reported incented HPWHs among surveyed installers to develop an installer sales weight. We then apply the weight to the self-reported non-incented HPWHs for surveyed installers.

3 Market Characterization and Progress

This section provides an overview of the HPWH market for Idaho, Montana, Oregon and Washington from July 2013 through January 2015.

3.1 Target Market and Initiative Achievements

The target market for the Heat Pump Water Heater Initiative is single-family homes in the Northwest with electric resistance storage water heaters. Table 1 shows the percentage of homes (Ecotope, 2011) and estimated number of homes in the target market.[1]

Table 1: Northwest Homes with Electric Water Heaters, by State

	Single-Family Homes with Electric Water Heaters	
State	**Percentage of Homes**	**Number of Homes[2]**
Idaho	52%	259,430
Montana	38%	131,503
Oregon	55%	618,450
Washington	59%	1,127,279
Total	**55%**	**2,149,426**

Table 2 below shows that there were 540 utility incentives and 4,053 point-of-purchase instant manufacturer markdowns for Tier 1 HPWHs in the Northwest from July 2013 through January 2015, with the majority of incentives going to purchases in Oregon and Washington.[3] It is unknown how many purchasers that received a utility incentive also received a manufacturer markdown at the time of purchase and therefore, it is impossible to know exactly how many HPWHs are represented by the incentive data. The range of incentivized Tier 1 HPWHs is 4,053 to 4,593 Tier 1 HPWHs.

[1] This includes tankless water heaters, which account for 3 percent of all water heaters in the Northwest.
[2] Estimate based on US Census Bureau, 2007-2011 American Community Survey five-year estimates (US Census Bureau, 2012), multiplied by the percent of homes with electric water heaters.
[3] These statistics represent the number of incentives known to Evergreen; there is evidence that additional incentives were paid by utilities that were unable to provide data for evaluation.

Table 2: Tier 1 HPWH Incentives, by Source

	Source of Incentive	
State	**Utility**	**Manufacturer Markdown**
Idaho	0	142
Montana	0	52
Oregon	101	1,879
Washington	439	1,980
Total	540	4,053

Table 3 below shows the Smart Water Heat Initiative-provided incentives for 430 Tier 2 HPWHs from July 2013 through January 2015, and reveals that utilities provided incentives for 181 Tier 2 HPWHs over the same period. As shown in the column to the right, at least 18 purchases of Tier 2 products received incentives from both a local utility and the Smart Water Heat Initiative (we were unable to conduct this analysis for 103 utility incentive records that did not contain purchaser information). Similarly, we are unable to provide an exact estimate of the number of Tier 2 HPWHs represented by the incentive data below, but the range of incentivized Tier 2 HPWHs is 430 to 593 Tier 2 HPWHs across the Northwest.

Table 3: Tier 2 HPWH Incentives, by Source (and Known Overlap)

	Source of Incentive		
State	**Smart Water Heat**	**Utility**	**Known Overlap**
Idaho	2	0	0
Montana	0	0	0
Oregon	207	8	6
Washington	221	173	12
Total	430	181	18

3.2 Supply Side Characteristics

The Smart Water Heat Initiative established relationships with a number of water heater distributors through other initiatives and supply chain research. Table 4 presents the number of overall water heater distributor companies, branches and contacts by state.

Table 4: HPWH Distributor Companies and Contacts, by State[4]

State	Companies[5]	Branches	Contacts[6]
Idaho	17	48	35
Montana	11	28	23
Oregon	23	71	45
Washington	26	128	89
Total	**77**	**275**	**192**

The Initiative established strategic relationships with 480 companies consisting primarily of plumbers and heating, ventilation, and air conditioning (HVAC)/plumber installers. Table 5 below provides a detailed breakdown of the number of companies and Initiative trained installers by both state and role within the industry.[7]

[4] We excluded one distributor from Nevada and one from Ohio from this table because NEEA does not serve these states. We also excluded ten distributors because they did not have a state or address listed.
[5] Some companies had branches in more than one state. We counted one branch location per company per state.
[6] The number of contacts is lower than the number of branches; some branches did not list contact information.
[7] The Initiative's trained installers list was found to have Standard Industrial Classification (SIC) codes that were inconsistent with their self-reported business type in the Smart Water Heat trained installer database. For additional information, see Appendix E: Trained Installer Business Type Inconsistencies.

Table 5: Smart Water Heat Trained Installers, by Role and State

Role	State	Companies[8]	Branches	Contacts[9]
HVAC/Plumber	Idaho	15	15	23
	Montana	1	1	1
	Oregon	101	103	198
	Washington	140	143	233
Plumber	Idaho	11	11	14
	Oregon	66	68	110
	Washington	72	72	94
HVAC	Idaho	1	1	1
	Oregon	2	2	2
	Washington	3	3	4
Builder	Oregon	22	23	24
	Washington	10	10	12
Other Type of Contractor	Idaho	1	1	1
	Oregon	25	25	26
	Washington	10	12	12
Total		**480**	**490**	**755**

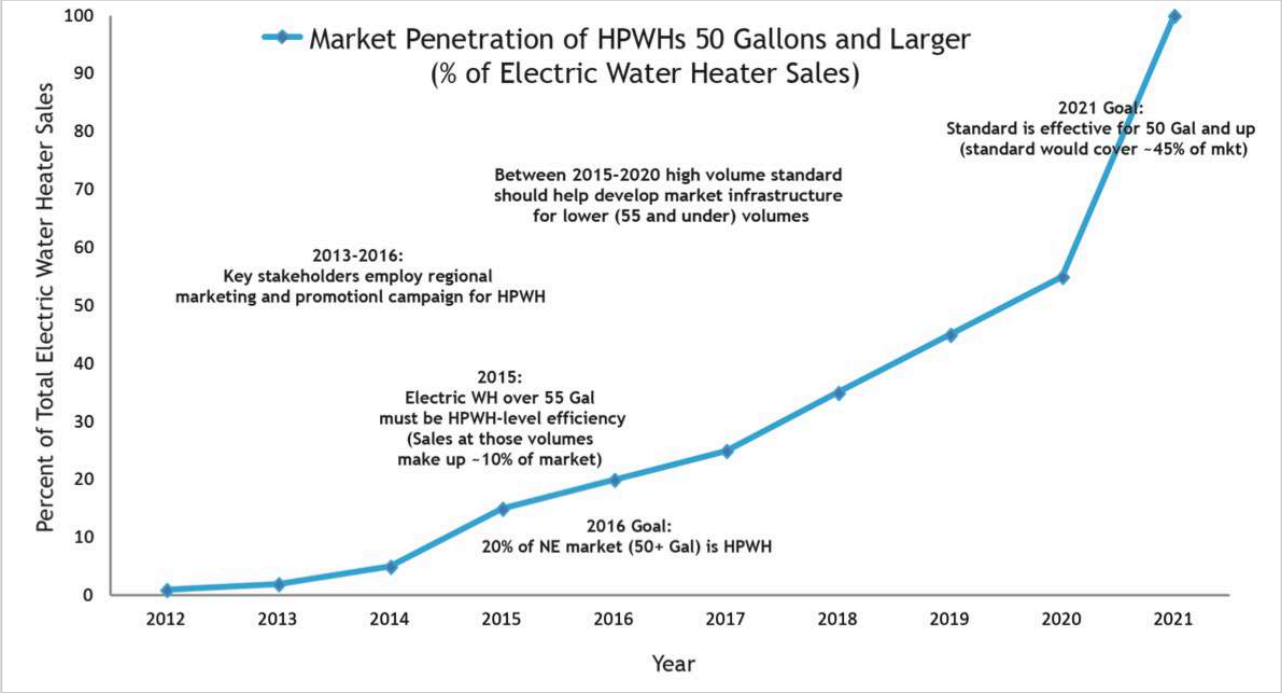
3.3 Literature Review

The purpose of this literature review, conducted as part of the Market Characterization, is to document current national trends in the HPWH market that could impact the Northwest market. Additional findings from the literature review related to market structure, consumer purchase triggers, and payback period are found in Appendix F: Additional Literature Review Findings.

In 2012, the Northeast Energy Efficiency Partnerships (NEEP) created a forecast of HPWH market transformation for HPWHs 50 gallons in size or larger. The forecast included the impacts of efficiency standards and regional marketing and promotional campaigns, and is shown in Figure 1 below (NEEP, 2012). The efficiency standards NEEP considered when making its projection are the US Department of Energy (DOE) water heater standards, effective April 16, 2015 (for 55+ gallons, adopted in 2010) and 2021 (for 50+ gallons, future adoption in 2018). Hence, the only part of this projection that does not apply to the Northwest directly is the regional marketing/promotional campaign and the 2016 market goal.

[8] Some companies had branches in more than one state, so we counted one company location per state. Four of these companies do not have any viable contacts, i.e. no contact names or phone numbers listed.
[9] Each branch location has up to seven contacts (names and/or phone numbers) and a main phone number. We only counted the main branch phone if no contact numbers were included to avoid double counting.

Figure 1: NEEP's Market Transformation Forecast, 50-Gallon+ Electric Water Heaters[10]



This same NEEP report provided some insights on the market for HPWHs in the Northeast, which largely apply to the conditions in the Northwest as well. Through its research, NEEP concluded that there are four main barriers that need to be addressed before the market will adopt HPWHs in the Northeast. These included lack of consumer awareness, high incremental cost (relative to electric resistance water heaters), lack of midstream market actor awareness and expertise, and branding of HPWH models that perform well in cold climates to help consumers select products suitable to the Northeast (they note that the NCS is still new and relatively unknown, as well as possibly less applicable to the Northeast climate than the Northwest climate).

Findings from the primary research conducted for the MPER suggest that the Northwest and Northeast HPWH markets may be dissimilar in terms of consumer and market actor awareness (see Section 5 for Northwest-specific findings).

[10] http://www.neep.org/sites/default/files/resources/2012%20HPWH%20Report_FINAL_1.pdf

4 Logic Model & MPI Review Findings

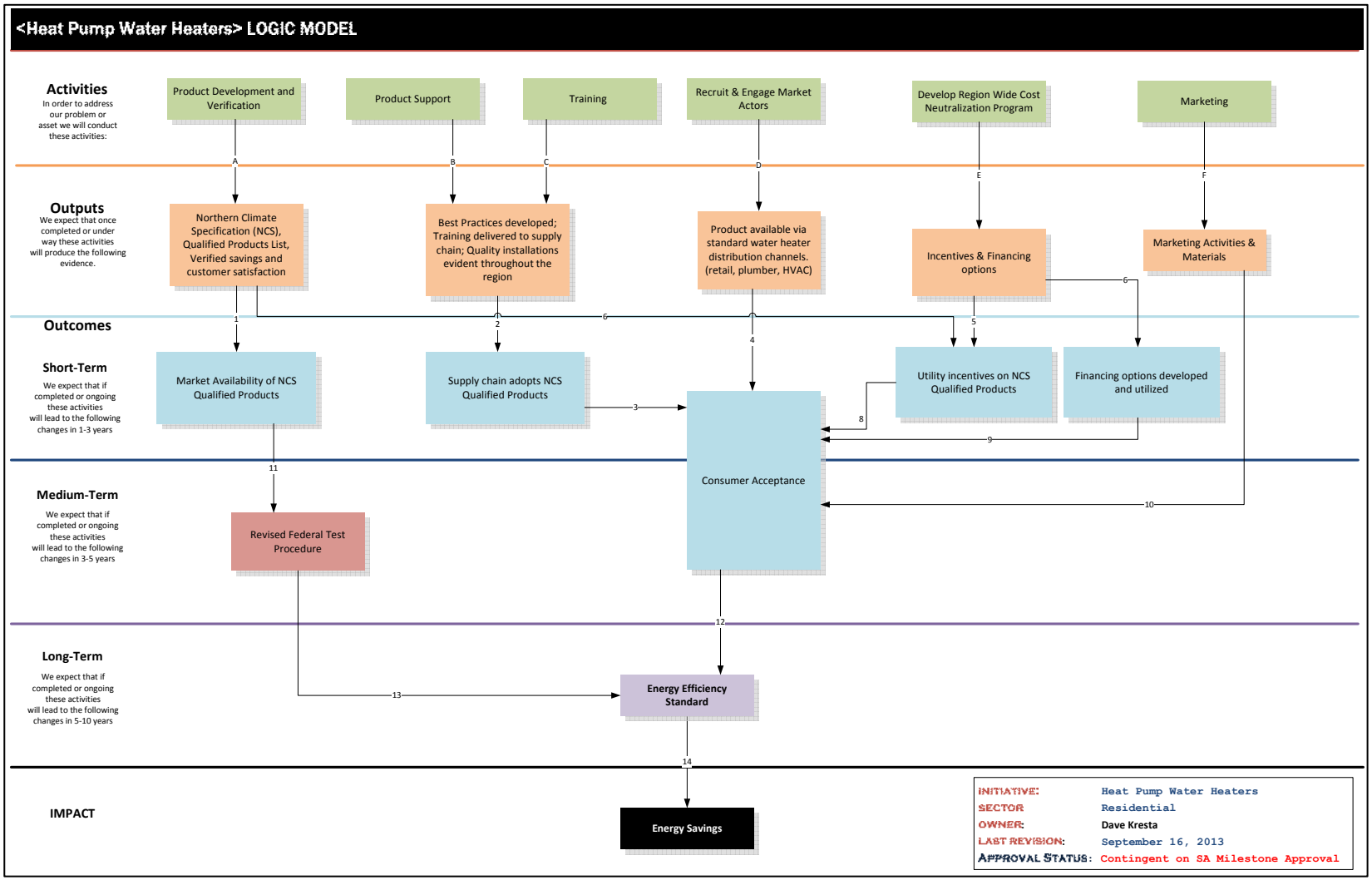
Evergreen Economics reviewed NEEA's preliminary Heat Pump Water Heater Initiative Logic Model (shown in Figure 2), as well as the Initiative's market progress indicators. The logic model contains an outdated representation of the Initiative's market intervention strategies, as the Initiative activities were still being tested when NEEA developed the model. The Initiative now includes significant upstream incentives for point-of-sale (POS) instant price reductions for Tier 1 HPWHs. Furthermore, it does not represent the logic of the Smart Water Heat incentives, which follow the same logic as the "Utility Incentives for NCS Qualified Products." In both cases, we recommend minor changes to the current model to reflect the current types of incentives offered in the Northwest. For the upstream incentives it is important to consider the short-term outcome of additional retailer product stocking on the medium-term outcome of consumer acceptance.

Beyond these two minor changes, there is one significant finding from our research that is not reflected in the logic model and has potentially large ramifications for the Initiative's program theory, logic model, and program design. Namely, it is important to consider the impact of the update to NAECA standards (for electric resistance water heaters with volumes of 55 gallons or more) on the entire HPWH market in the Northwest (for all tank sizes). As we discuss in subsequent sections of the report, market actors believe that the manufacturing standard will result in yet-undetermined levels of spillover market effects including increased consumer awareness, increased knowledge and promotional activity among market actors, and increased product stocking. What is not reflected in the current logic model is the feedback loop from the NAECA standards on the short- and medium-term outcomes. The reason that this feedback loop is important is because the updated NAECA standards (a long-term impact in the current logic model) do not cover the entire product category (all tank volumes), but will likely result in Initiative attributable sales of HPWHs among smaller water heater sales.

In addition, the logic model and program activities do not include engagement with builders despite significant sales of Initiative incentivized HPWHs to the new construction market. NEEA's logic model does not address this in its current form, but neither do the Initiative activities. Based on our recommendation to engage the new construction market (see Section 7), and if NEEA accepts this recommendation and engages with Northwest builders, the logic model would require an additional change to include an output of "Builder specification of HPWHs" with a link to "Consumer Acceptance" as the short- and medium-term outcomes.

Since the Initiative is moving towards an upstream incentive approach, it is important to consider the impacts of this on the ability of NEEA and their consultants to evaluate performance relative to market progress indicators. Importantly, it is impossible to conduct purchaser research after the consumer has left the store if no contact data is collected, and if there are a mix of incentives (with the potential for consumers to receive a point-of-sale incentive and submit an application for a utility incentive) it is impossible to track the exact number of Initiative- and utility-sponsored HPWH sales (see Section 3.1 for further information). NEEA should consider in-store research for future Initiative MPERs.

Figure 2: HPWH Initiative Preliminary Logic Model



5 Evaluation Findings

5.1 Heat Pump Water Heater Purchaser Survey

The Evergreen team completed 195 telephone surveys with homeowners who purchased a HPWH and either received a Smart Water Heat rebate (for Tier 2 HPWHs) or received a utility rebate for either a Tier 1 or Tier 2 HPWH.[11] Table 6 below provides a breakdown of survey completes by state, tier, heating zone (HZ) and urban versus rural (based on zip code).

Table 6: HPWH Purchaser Telephone Survey Final Survey Disposition, by Tier

		Tier 1		Tier 2		Overall	
State	Heating Zone, Urban/ Rural	Surveys	Percent of Tier 1	Surveys	Percent of Tier 2	Surveys	Percent Overall
OR	**HZ1**						
	Rural	0	0%	9	8%	9	5%
	Urban	12	15%	52	45%	64	33%
	HZ2						
	Rural	0	0%	3	3%	3	2%
	Urban	0	0%	5	4%	5	3%
WA	**HZ1**						
	Rural	3	4%	3	3%	6	3%
	Urban	64	81%	44	38%	108	55%
	HZ2						
	Rural	0	0%	0	0%	0	0%
	Urban	0	0%	0	0%	0	0%
Total		**79**	**100%**	**116**	**100%**	**195**	**100%**

Survey results are weighted using two methods, both of which are stratified by state, tier, urban versus rural and heating zone. The first method, the "purchaser weight," accounts for the number of purchasers in each stratum and is calculated by dividing the number of purchasers that completed installs in the population by the number of purchasers surveyed. The second method, the "water heater weight," accounts for the number of HPWHs installed in each stratum and is calculated by dividing the number of HPWHs installed in the population by the number of HPWHs installed by the survey participants (some of whom purchased more than one HPWH). Most results use the purchaser weight, and footnotes indicate where the water heater weight has been applied instead.

[11] It is likely that many or all of the Tier 1 purchasers also received an instant manufacturer markdown; however, we were not able to confirm this due to the aggregated nature of the retail sales data that the Initiative receives.

Additional findings can be found in Appendix B: HPWH Purchaser Survey Supplemental Findings.

5.1.1 Purchaser Demographics and Household Characteristics

Almost all purchasers owned their home (99%), 94 percent of which were single-family detached homes, while the remainder lived in condominiums. Installations most often occurred in urban areas (87%) across Washington and Oregon.

Interestingly, 18 percent of all purchasers relied on ductless heat pumps (DHPs) as their primary household heater compared to only 1.4 percent of all Northwest homes (Ecotope, 2012), suggesting that participation in one NEEA Initiative (for DHPs) may increase the likelihood that a household participates in another initiative. Furthermore, many HPWH purchasers have experience with DHPs or other heat pumps (ducted), suggesting that familiarity with the technology in general may increase the likelihood of a HPWH purchase because the purchaser is already aware of and familiar with the technology, albeit related to a different end use.

Among Tier 1 and Tier 2 purchaser households in both states, one-quarter of homes were built in the decade between 1990 and 1999, while 53 percent were built prior to 1980. Only 11 percent of homes were built between 1980 and 1989, and another 11 percent were built since 2000. In comparison to ACS estimates for the Northwest, a higher proportion of homes built between 1990 and 1999 purchased HPWHs than exist in the general population (these homes account for 17% of all Northwest homes, compared to 25% of HPHW purchasers). The difference is almost entirely comprised of homes built since 2000, reflecting that many homes built since 2000 have functional original water heaters (United States Census Bureau, 2014).

Tier 2 HPWH purchasers tend to have higher incomes than Tier 1 HPWH purchasers; 34 percent of Tier 2 purchasers reported a household income of $120,000 of more, compared to 17 percent of Tier 1 purchasers. Tier 1 purchasers in Oregon reported lower income than Tier 1 purchasers in Washington, but income levels for Tier 2 purchasers were similar. Tier 2 purchasers in both states tended to have high education levels than Tier 1 purchasers.

5.1.2 Sources of Awareness

Shown in Table 7, initial awareness of HPWHs most often came from utility print advertising and the Internet (15% of purchasers, each) and retail displays (14%). While only 15 percent of Tier 1 purchasers and 2 percent of Tier 2 purchasers mentioned a retailer mail advertisement as an *initial* source of awareness, 55 percent of purchasers said they either heard or learned subsequently about HPWHs from retail mail advertisements. Similarly, while only 15 percent of purchasers initially heard about HPWHs through Internet research, 40 percent indicated they conducted additional Internet research to learn more about HPWHs.

Tier 1 purchasers were more likely to learn about HPWHs through newspapers advertisements than Tier 2 purchasers (they also reported high levels of awareness from retail store displays, but Tier 2 HPWHs were not sold through retail so there is no basis for

comparison across tiers). Conversely, Tier 2 purchasers were more likely to receive additional information from a contractor/installer or through their work than Tier 1 purchasers.

Table 7: Purchaser Source of Awareness and Information Regarding HPWHs, by Tier

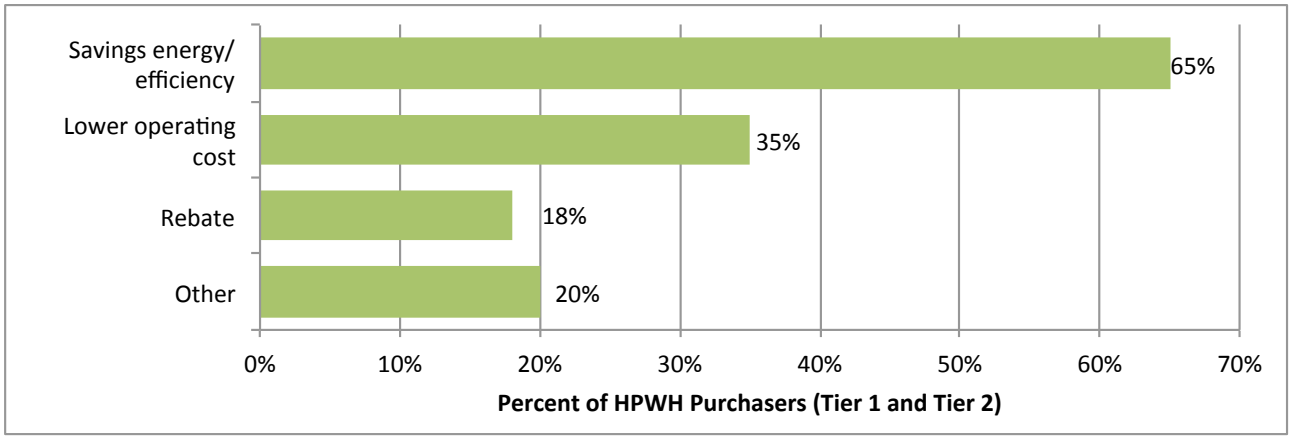
	First Mention			All Mentions		
Source of Awareness	**Tier 1 (n=76)**	**Tier 2 (n=110)**	**Overall (n=186)**	**Tier 1 (n=76)**	**Tier 2 (n=110)**	**Overall (n=186)**
Utility print ad, bill stuffer	19%	10%	15%	23%	12%	18%
Internet research	14%	16%	15%	38%	42%	40%
Retail display/saw it in store	20%*	6%	14%	33%**	11%	22%
Contractor/installer	2%*	20%	11%	3%**	26%	14%
Friend or acquaintance	9%	10%	10%	13%	13%	13%
Through work (contractor)	0%*	15%	7%	3%**	18%	10%
Retailer ad in mail	15%*	2%	7%	57%	53%	55%
Newspaper ad	10%*	0%	5%	12%**	0%	6%
Other	14%	21%	17%	21%	33%	27%

Q 1. First, how did you first hear about heat pump water heaters?
Q 2. Did you hear about them anywhere else or learn more about them from any other sources?
* Difference from Tier 2 "First Mentions" at 90% CI is statistically significant.
** Difference from Tier 2 "All Mentions" at 90% CI is statistically significant.

5.1.3 Purchase Decision / Importance of Incentives

Saving energy (65%) and lower operating cost (35%) were the most frequently cited reasons for interest in HPWHs, as shown below in Figure 3.

Figure 3: HPWH Purchasers' Reasons for Interest in HPWHs



Q 16. What initially interested you in a heat pump water heater, as opposed to other types of water heaters?

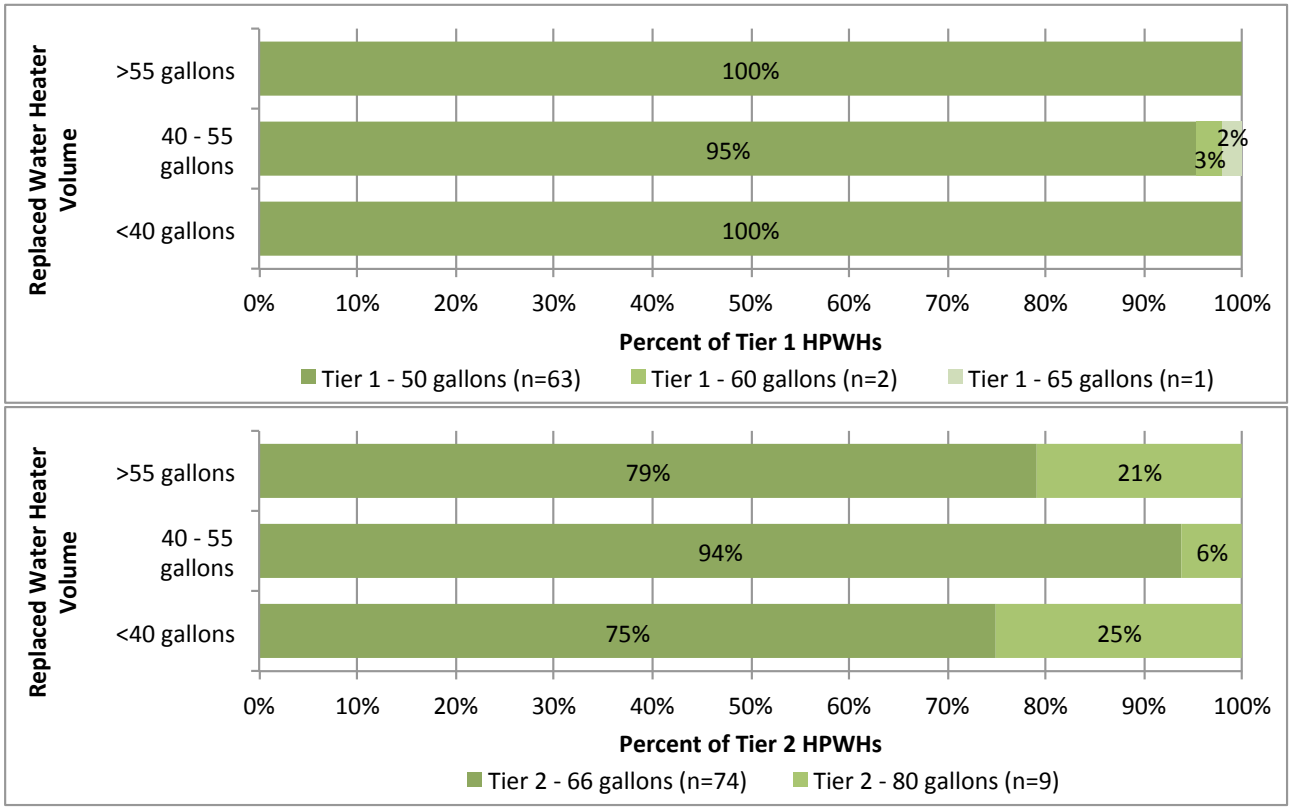
Respondents were asked to rate the importance of their reasons for interest on a 5-point scale from "not at all important" to "very important." The rebate, saving energy and the payback period were all very important when considering a HPWH purchase (4.7, 4.7, and 4.5 out of 5, respectively). Lower operating cost was ranked slightly lower (4.3 out of 5).

5.1.3.1 Replaced Water Heater Characteristics

Most HPWH purchasers replaced their previous water heater as part of a planned replacement (86%) as opposed to an emergency situation (14%).[12]

Figure 4 shows the disposition of purchased water heater volumes compared with the replaced water heater volumes, first for Tier 1 HPWHs and then for Tier 2 HPWHs.[13] As shown, nearly all purchased Tier 1 HPWHs were 50 gallons in size, and most purchased Tier 2 HPWHs were exactly 66 gallons, regardless of replaced water heater volume.

Figure 4: Installed HPWH Tier and Volume by Replaced Water Heater Volume[14]



Q 8. How many gallons was your previous water heater tank?

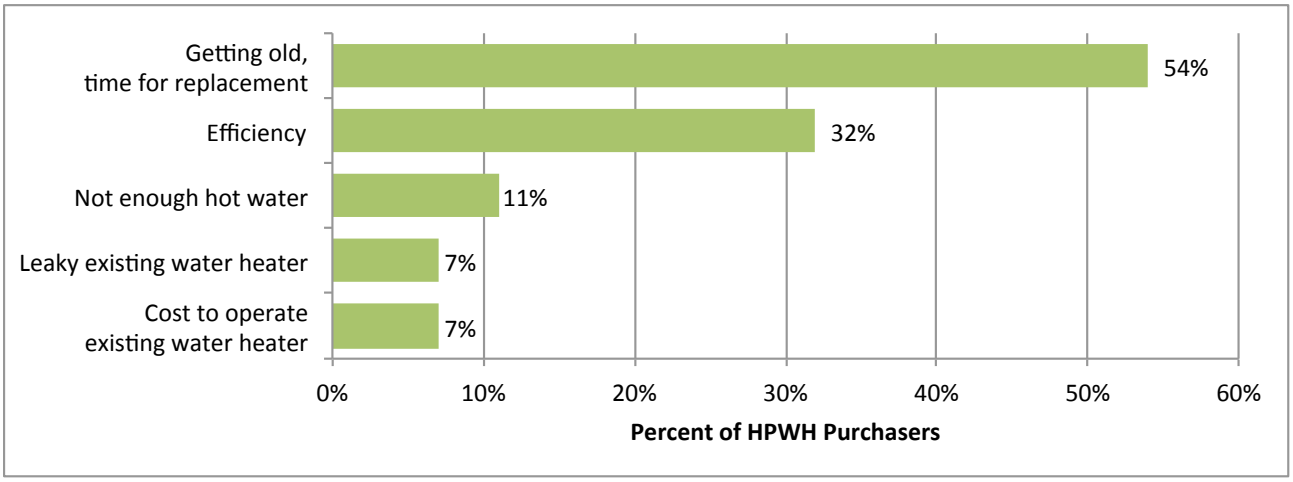
5.1.3.2 Reasons for Purchasing a HPWH

As shown below in Figure 5, over half of the HPWH purchasers replacing an existing water heater did so because it was getting old and was reaching the end of its useful life. Nearly one-

[12] A much higher rate of planned replacement than in the overall Northwest market (57%; Verrinovation, 2012).
[13] It is important to note that purchased tank volume statistics are heavily skewed by the dispositions of available NCS-qualified HPWHs on the market in the Northwest (there are many large volume models available, but only one small volume Tier 1 HPWH).
[14] Water heater weights used.

third of purchasers wanted to upgrade to a more efficient water heater solution. Overall, the reasons for purchase were statistically consistent across Tier 1 and Tier 2 purchasers (at 90% CI).

Figure 5: Primary Reasons for Replacing Water Heater



Q 13. What was the reason you decided it was time to replace your previous water heater?

Additionally, 59 percent of Tier 1 and 78 percent of Tier 2 purchasers believed the installation of the HPWH has increased the value of their home. That said, only 42 percent of Tier 2 purchasers would have purchased their Tier 2 HPWH if the available rebate were half as much, while 24 percent were unsure and 34 percent would not have purchased a HPWH (this line of questioning was not asked of Tier 1 purchasers). This suggests that the available rebates are very important in purchase decisions, especially for Tier 2 HPWHs.

More than one-third of all HPWH purchasers said they had no concerns when considering the purchase of a HPWH (35%). The most common concerns included HPWH reliability (10%), general performance (7%) and water heating speed (7%).

5.1.3.3 Financing and Tax Credits

We asked HPWH purchasers about various types of financial assistance they may have received to assist with their HPWH purchase, including federal tax credits, state tax credits and traditional loans. The most common financing source was the federal tax credits, which were used by approximately 51 percent of purchasers, including 47 percent of Tier 1 purchasers and 58 percent of Tier 2 purchasers. The federal tax credit was slightly more important to Tier 2 purchasers than to those who purchased Tier 1 HPWHs, though the difference was not statistically significant. On a scale from 1 (not at all important) to 5 (very important), the average importance scores for Tier 2 and Tier 1 purchasers were 4.0 and 3.5, respectively.

The majority of purchasers did not and will not receive state tax credits for their HPWH purchase (70%), primarily because state tax credits were not available in Washington in

2014. Overall, 87 percent of Oregon purchasers said they have or will receive state tax credits, compared to 47 percent that have or will receive a federal tax credit. Among purchasers who have or will receive them, state tax credits were important to both Tier 1 and Tier 2 purchasers, who gave average scores of 4.6 and 4.5, respectively.

Overall, loans were used by only 8 percent of purchasers, and most frequently by Tier 2 purchasers. For purchasers that did receive a loan, the most common sources included local banks or credit unions (51%) and retailer credit options (24%).

5.1.4 HPWH Installation Processes

Approximately two-thirds of Tier 1 HPWHs were installed by the purchaser as part of a do-it-yourself (DIY) installation, compared to only 7 percent of Tier 2 HPWHs.[15] Nearly all Tier 1 purchasers (96%) and 76 percent of Tier 2 purchasers claimed that the idea to purchase a HPWH was their own idea versus a suggestion from a contractor or installer.

The most common methods for finding the HPWH installer included having a previous relationship with the contractor (24%), personal recommendations (15%) and retailer recommendations (11%). Four percent of Tier 1 purchasers and 6 percent of Tier 2 purchasers found an installer through the Smart Water Heat list of qualified contractors.

Overall, two-thirds of installations across both tiers took less than four hours, and only 10 percent took longer than eight hours. Purchaser satisfaction with installation times was very high and did not vary significantly by tier or by who installed the HPWH. The average satisfaction score for Tier 1 purchasers was 4.4, compared to 4.6 for Tier 2 purchasers.

Most HPWHs were installed in the garage, as shown in Table 8. Garage installation was especially common for Tier 1 purchasers (67%), whereas Tier 2 purchasers were more likely to install the HPWH in the basement (31%) than Tier 1 purchasers (17%), though these differences are not statistically significant.

Table 8: HPWH Installation Location, by Tier[16]

Installation Location	Tier 1 (n=79)	Tier 2 (n=116)	Overall (n=195)
Garage	67%	53%	60%
Basement	17%	31%	24%
Utility Room/Closet	10%	12%	11%
Other	6%	4%	5%
Total	**100%**	**100%**	**100%**

Q53. Where is your new water heater located?

[15] Water heater weights used.
[16] Water heater weights used.

5.1.5 HPWH Usage and Satisfaction

Over half of Tier 2 HPWHs are set to Auto/Hybrid mode (53%), along with 37 percent of Tier 1 HPWHs (the difference is not statistically significant). Forty-two percent of all HPWHs are set to heat pump only mode, according to survey respondents.

Seventy-five percent of purchasers were aware that HPWH air filters must be cleaned, including 85 percent of Tier 1 purchasers and 64 percent of Tier 2 purchasers. Among these purchasers, 86 percent of purchasers learned about the need to clean the filter from their installer—if an installer had done the installation as opposed to a DIY installation. Because a large percentage of HPWHs were installed over the last year, only 45 percent of purchasers have had their air filter cleaned thus far.

Overall, HPWHs have met the expectations of the vast majority of purchasers (93%). As a result, 93 percent of purchasers said they have or would recommend a HPWH to someone they know. The most common reasons for recommending HPWHs include lower energy bills (57%), energy efficiency (22%) and available rebates (15%). Overall, purchasers were highly satisfied with the sound level of the HPWHs (4.2 out of 5), the change in electricity bill (4.2 out of 5), the maintenance requirements (4.4) and the HPWH overall (4.6 out of 5).

5.2 General Population Households Telephone Surveys

The Evergreen team completed 210 telephone surveys with general population households in the Northwest with electric water heating (hereafter referred to as the "general population"). The purpose of this survey was to benchmark awareness, perceptions and intentions of homeowners over time to use as indicators of market transformation for HPWHs.

Our sampling targets were stratified by state, heating zone and urban versus rural location. We relied on 2013 Rural-Urban Continuum Codes (RUCC) developed by the United States Department of Agriculture (found in Appendix H: Urban/Rural Markets Definitions), as well as the Northwest Regional Technical Forum's definition of heating zone. We used data from the American Community Survey (ACS) (United Stated Census Bureau, 2014) to develop the sampling universe for the general population survey of Northwest households. Table 9 below provides a breakdown of survey completes by state, heating zone and urban versus rural.

Table 9: General Population Homeowner Telephone Survey Disposition, by State

Heating Zone, Urban/Rural	Idaho		Montana		Oregon		Washington		Total	
	n	%	n	%	n	%	n	%	n	%
HZ1										
Rural	1	3%	N/A	0%	22	31%	8	9%	31	14%
Urban	12	40%	N/A	0%	42	60%	60	71%	114	53%
HZ2										
Rural	5	17%	4	16%	2	3%	8	9%	19	9%
Urban	2	7%	2	8%	4	6%	9	11%	17	8%
HZ3										
Rural	4	13%	13	52%	N/A	0%	N/A	0%	17	10%
Urban	6	20%	6	24%	N/A	0%	N/A	0%	12	6%
Total	**30**	**100%**	**25**	**100%**	**70**	**100%**	**85**	**100%**	**210**	**100%**

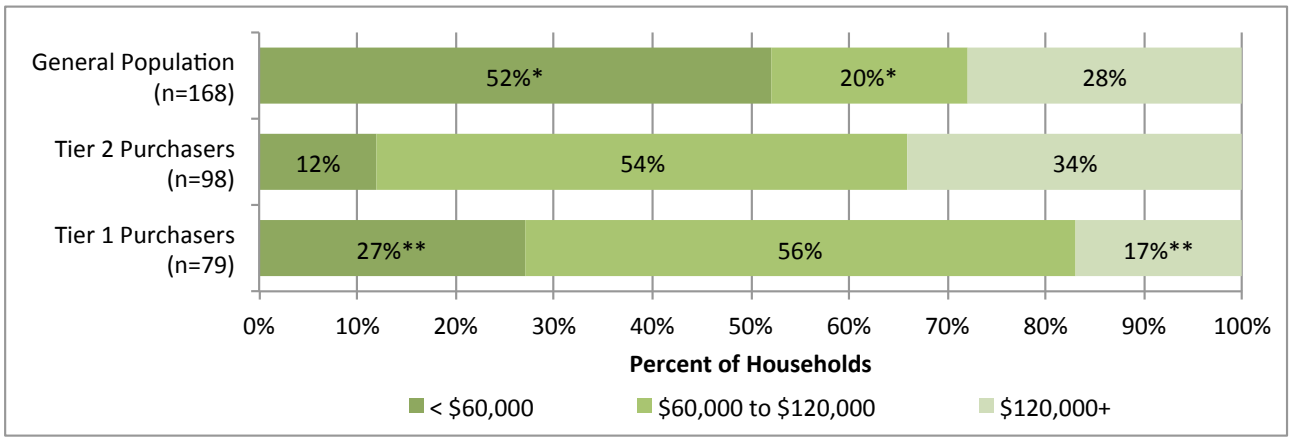
All of the following tables and statistics provide the total number of responses in each category (n) and the weighted population proportion (%). Additional findings can be found in Appendix C: General Population Households Telephone Surveys Supplemental Findings.

5.2.1 Northwest General Population Demographics and Water Heater Characteristics

Nearly all respondents own their home (99%). The most common home types were single-family detached (85%) and manufactured homes (10%), followed by single-family attached homes/condos (5%, all in urban areas). More than half were built between 1970 and 2005 (58%) and only 4 percent were built since 2006. All of the survey respondents' homes have their own electric resistance storage water heater; households that did not meet this criterion were excluded from the survey.

Figure 6 below shows that there are significant differences in household income between HPWH purchasers and the general population of Northwest households with electric water heaters. More than half of the general population report household income below $60,000 per year, compared to 12 percent of Tier 2 and 27 percent of Tier 1 purchasers.

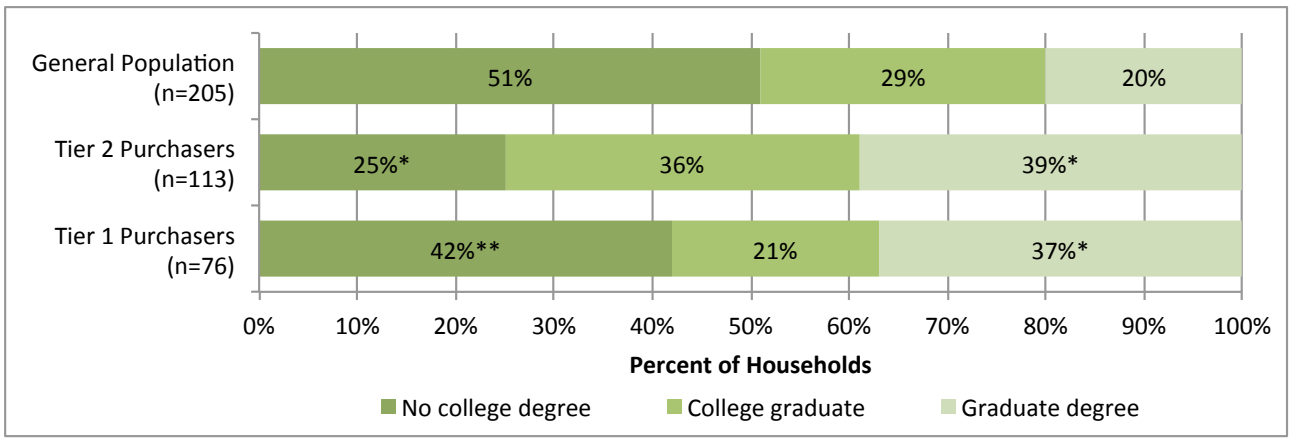
Figure 6: Comparison of Household Income – General Population, HPWH Purchasers



Q 41. Which of the following categories includes your approximate annual household income from all sources in 2014, before taxes?
* Difference from both Tier 1 and Tier 2 purchasers at 90% CI is statistically significant.
** Difference from Tier 2 purchasers at 90% CI is statistically significant.

Figure 7 compares the household education of the Northwest general population with Tier 1 and Tier 2 HPWH purchasers. More than half of the general population has not received a college degree, compared to one-quarter of Tier 2 purchasers (Tier 1 purchasers are similar to the general population in this regard). Almost 40 percent of HPWH purchasers have received a graduate degree, compared to 20 percent of the general population. Taken together, the evidence reported in Figure 6 and Figure 7 shows that HPWH purchasers are comprised of households with higher incomes and education levels than the general population.

Figure 7: Comparison of Household Education – General Population, HPWH Purchasers



Q 17. Which of the following includes the highest level of education you have completed?
* Difference from both Tier 1 and Tier 2 purchasers at 90% CI is statistically significant.
** Difference from Tier 2 purchasers at 90% CI is statistically significant.

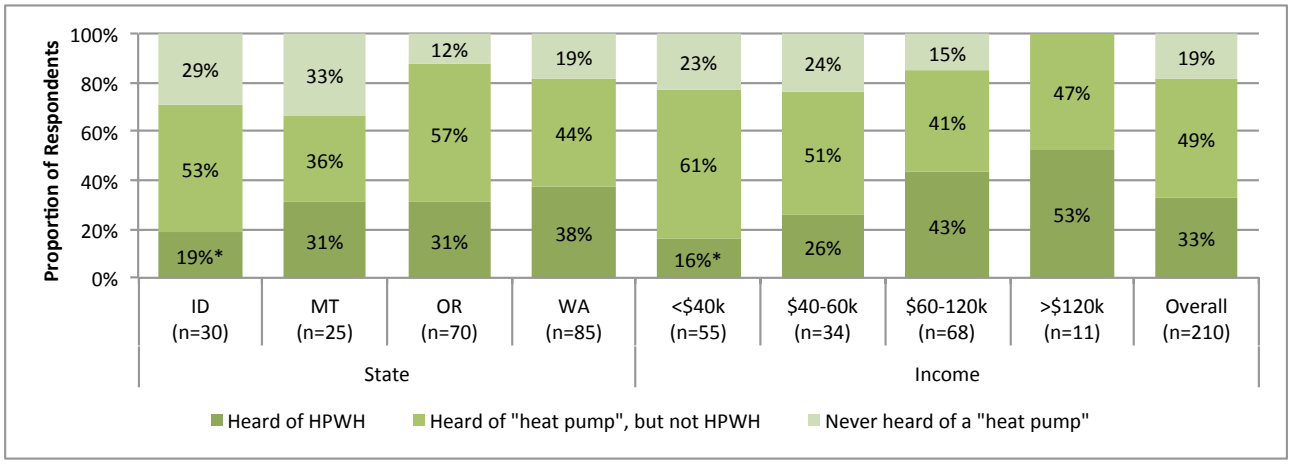
We asked each homeowner about the age, size and location of their current water heaters. More than one-third of electric water heaters in the Northwest are over ten years old (38%),

while equal proportions are five to ten years old and less than five years old (31%, each). Approximately 8 percent of households have more than one water heater, ranging in size from 20 to 180 gallons. The average sizes of their water heaters are very similar, averaging 56 gallons for the primary and 57 gallons for the secondary. The majority of primary water heaters are between 40 and 59 gallons (66%). The vast majority of households said their water heater(s) provided sufficient hot water under normal circumstances (96%). Most residential electric storage water heaters in the Northwest are located in heated, insulated areas of homes (60% of primary and 80% of secondary).

5.2.2 Awareness of the Technology and Northwest Incentives

At the beginning of the survey, 81 percent of respondents said they had heard the term "heat pump" before the survey (relating to any appliances), and 33 percent said they had heard of a heat pump water heater (see Figure 8).[17] Those with household incomes above $60,000 were significantly more likely to be aware of HPWHs than those with household incomes below $40,000. There were no statistically significant differences between states, those in urban versus rural areas, single-family detached versus manufactured homes, or by education. Among consumers aware of HPWHs, only 21 percent have seen a HPWH in person.

Figure 8: Awareness of "Heat Pump" and "Heat Pump Water Heater"



Q2. Before today, had you heard the term "heat pump" related to any appliances?
Q3. Before today, had you heard the term "heat pump water heater"?
* Difference from households with income above $60K at 90% CI is statistically significant.

The most common sources of awareness of HPWHs among general population households aware of HPWHs are friends and acquaintances (24%), advertising (23%), and Internet research (21%). When making decisions about appliances to purchase in general, the most common sources of information are Internet research (41%), store displays or salespeople

[17] Fourteen respondents did not recognize the term "heat pump" but they said they were familiar with the technology when we clarified that "this method of heating works like a refrigerator, but in reverse".

(37%), and friends and acquaintances (26%). The most common sources that households plan to use in the future if they need more information on HPWHs are Internet research (57%), information in retail stores (15%), a contractor/installer (12%) and their utility (12%).

Of the sixty-five respondents who were aware of HPWHs prior to taking the survey, nine said they had heard of specific brands, including Rheem (36%), General Electric (GE) (32%), Whirlpool (20%) and Kenmore (20%). Among the respondents who were able to name at least one specific brand of HPWH, consumers were slightly more likely to say they would consider buying a Whirlpool HPWH than the other brands.

When we prompted all sixty-five respondents with a list of specific HPWH brands, they were most likely to say they would consider purchasing HPWHs from Whirlpool (35%), GE (34%) or Kenmore (30%). All three of these brands manufacture a variety of home appliances, while almost all of the remaining brands we asked about do not. In contrast, only 7 percent said they would consider a Bradford White HPWH. Bradford White manufactures water heaters but no other appliances, reducing the likelihood that a homeowner would have any experience with their products.

Twenty percent of respondents stated they would like to know more about HPWHs. The most commonly requested information includes how HPWH technology works (24%), the efficiency of HPWHs compared to other water heaters (12%) and payback period (11%).

Of the respondents aware of HPWHs, 60 percent said they were aware of utility rebates for purchasing and installing HPWHs. Next, we asked anyone who said they were aware of HPWH rebates to tell us the amount, but only three respondents said they could. Specifically, one said the utility HPWH rebates were $25, one said $500 and one said the Smart Water Heater HPWH rebates were $2,500.

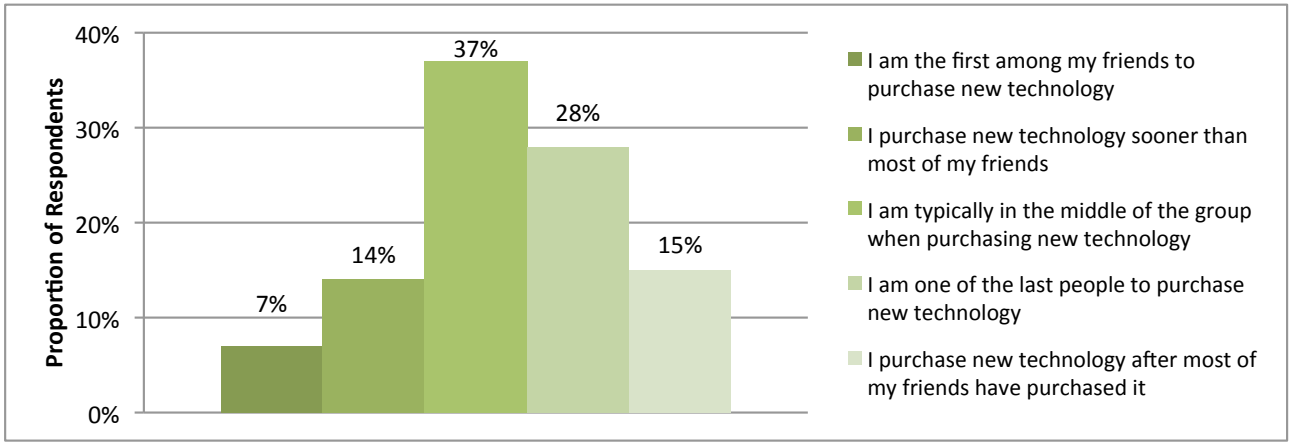
5.2.3 Interest in Energy Efficiency, Technology and HPWHs

We asked respondents to rate the importance of having an energy-efficient home on a scale of 1 to 5, where 5 is very important and 1 is not important at all. The average importance rating across the general population was 4.1, with 77 percent giving a rating of 4 or 5. The average rating was higher among those with a college or graduate degree (4.3 out of 5) than those with lower educational attainment (3.9 out of 5), suggesting that education may contribute to interest in energy efficiency. The highest and lowest income brackets both had an average rating of 4.0 out of 5, indicating that income is not an important factor.

In order to gauge the Northwest general population's tendency to accept new technology, we read a series of five statements and then asked them to pick whichever best describes them. The results are in Figure 9. About 21 percent of respondents said they typically adopt new technology "first" or "sooner than most" (7 percent and 14 percent, respectively), while 28 percent said they are "one of the last". The segments of the population who were most likely to say they adopt new technology "first" or "sooner than most" are those with a college degree (26% and 21%, respectively) or a graduate degree (30%), as well as those with a household

income over $120,000 (26%). Consumers who are least likely to say they adopt new technology "first" or "sooner than most" are those living in Idaho or Montana (11% in each), living in manufactured homes (16%) or living in single-family attached homes (9%). The responses to this question did not vary significantly between urban and rural areas.

Figure 9: Adoption of New Technology



Q33. Which of the following do you think best describes you?

Of the respondents who were aware of HPWHs, 29 percent said they had considered installing one in their home. Those with a graduate degree were statistically significantly more likely to consider installing a HPWH than those with lower educational attainment; differences between states and other demographics are not significant.

The most common primary reasons for deciding not to install a HPWH (including not installing one "yet") are that their existing equipment is still working (36%), the cost is prohibitive (24%), they have concerns that the HPWH will not work in their space (11%), or that they do not know (enough) about them (8%).[18]

As part of the survey, we provided respondents with information about HPWHs including the typical installed costs and available financial incentives, as well as the maintenance requirements, energy savings and equipment size relative to electric resistance water heaters. We then asked them to rate their level of interest in installing a HPWH in their home (on a scale of 1 to 5, with 1 being not at all interested and 5 being very interested). The average interest rating overall was 2.1 out of 5, with 16 percent of respondents rating their interest as a 4 or 5 and 65 percent rating their interest as a 1 or 2.

On average, interest in HPWHs was slightly higher among those with a graduate degree (2.4 out of 5) and those with a household income above $60,000 (2.4), while interest was slightly lower among those with no college education (1.7) and among those making less than $40,000

[18] The ranking of all concerns (as opposed to "primary") does not change, but the proportions increase slightly.

a year (1.8). Interest was higher in Oregon and Washington (both 2.2) than in Idaho (1.5) and Montana (1.7). Interest did not differ significantly between rural and urban areas.

5.2.4 Barriers and Purchase Triggers

We asked respondents to explain why they were not interested in HPWHs (by rating their interest as a 3 out of 5 or below). Overall, the most common reasons were the upfront cost (30%), the presence of functional existing equipment (25%) or that they had recently purchased a resistance water heater (10%). As expected, upfront cost was a barrier more often among households with lower incomes; those with incomes below $40,000 were more likely than others to say the cost is too high (43%) or that they are too old to invest in their home (20%); this difference was found to be statistically significant. Those with household incomes above $120,000 were more likely than others to say they needed to do more research (34%), and this difference was also statistically significant.

The thirty-three respondents who said they were interested in HPWHs (by rating their interest as a 4 or 5 out of 5) were asked what benefits of HPWHs are especially attractive to them. Overall, lower utility bills/lower monthly operating cost (44%) and saving energy (43%) were the most commonly reported benefits.

Later, we asked those who were aware of HPWHs prior to the survey about purchase triggers; these are future conditions that could have a significant impact on their decision to buy a new HPWH versus a different type of water heater. The most powerful triggers were a decline in the cost of HPWH (71%), failure of their current water heater (64%) or an increase in the utility rebate (61%). Households in manufactured homes were less likely than other home types to report that declining cost (51%) or their current water heater breaking (37%) would have an impact, and households in rural areas were less likely than those in urban areas to report that a contractor/retailer promotion would impact their decision (31%). We asked the twelve respondents who said no to all of these purchase triggers if a combination of these things would impact their decision and all said that a combination would not have an effect.

Among the households that were at least somewhat interested in installing a HPWH in their home, 70 percent said that changes to their household finances could trigger a purchase.

5.3 Northwest Utility In-depth Interviews

This section provides findings from in-depth interviews with ten representatives from Northwest electric utilities with HWPH programs. The interviews were completed in April and May of 2015, and selected key findings are presented below.

5.3.1 Utility Program Characteristics

When asked the reasons for starting a HWPH program, most interviewees gave the following answers either singly or in combination: to achieve the high energy savings potential that HPWHs offer, to offer all cost effective measures to their customers, to be consistent with offerings by BPA, and/or to leverage NEEA's support for this major Initiative. Among the

seven utilities that receive funding from BPA, two waited one to two years after BPA approved the HPWH measure to ensure that the technology is reliable.

Most of the utilities are offering $300 rebates for Tier 1 models and $500 rebates for Tier 2 / Tier 3 models. The lowest rebate level is $200 for all models, and the utility with the highest rebate offers $500 for Tier 1 and $800 for Tier 2 / Tier 3 models. No utilities are offering distinct Tier 3 rebates yet, and most want to see more regional testing first and "some high-quality ducting with air sealing installs." Most of the BPA-funded utilities will wait for BPA to create a new Tier 3 unit energy saving (UES) measure, while one may precede BPA with self-funding if promising test results materialize. Reportedly, the utilities' rebate levels will generally remain unchanged over the next two years unless changes are recommended by NEEA and/or BPA based on new savings research.

None of the utilities are segmenting within the single-family homes market in their marketing efforts, but encourage customers to install HPWHs in unconditioned spaces when they call with retrofit inquiries or during whole home audits. The two most common methods for promoting HWPHs, specifically, are utility websites and direct mailings to utility customers. In contrast, mass media and social media promotions are often focused on general energy efficiency and do not generate much interest in HWPHs. Some media (local newspapers, monthly magazines) feature specific measures, including HWPHs, on a rotating basis. One utility was also planning an email blast to past rebate program participants about HWPHs.

Direct mailings and bill stuffers—usually with assistance and co-branding from NEEA and manufacturers—on upcoming retail and manufacturer promotions are the most common promotion strategies. According to the interviewees, promotional mailings to customers have increased demand for HWPHs from "a little" to "a lot." One utility noted that "limited availability" messaging and rebate bonuses (for example, $50 above the standard rebate) have been very effective.

One rural Oregon utility stocks HWPHs and sells directly to customers at low cost after rebates, because local retailers reduced their own stocks, one retailer closed, and local plumbers were not actively promoting HPWHs. This utility offers 50 and 80 gallon GE GeoSpring units that can be transported on their side and installed without a contractor (DIY). This stocking has also been effective for emergency installations for customers who call the utility with questions. Another rural Oregon Public Utility District (PUD) has consistently increased customer interest through *Ruralite Magazine* advertising. Alternatively, a large Washington utility with a contractor-led program allows contractors to give instant rebates by filling out the project forms so customers do not have to do anything, which facilitates sales. About half of the utilities have a non-functioning physical model or cardboard HPWH display. Both types have helped to generate customer questions and were characterized as being "somewhat" to "very" effective. Overall, the utilities are increasing customer interest via a range of promotional strategies, with no single strategy being the most effective for all utilities.

Most of the utilities interviewed are working with local retailers under NEEA's leadership, and staff go to stores to ensure that HPWHs are stocked, to distribute utility rebate forms and to confirm that the store manager understands the utility rebate amounts and requirements. The utility staff we spoke with were not highly familiar with the Smart Water Heat customer education materials available in the stores and could not comment on their effectiveness.

Our findings suggest that most utilities rely on NEEA to engage distributors and manufacturers on behalf of the region. One large Washington utility, however, is working with both groups directly and with NEEA—by getting distributors to stock new qualifying models and making local installers aware of retail and manufacturer promotions. This utility regularly coordinates utility rebates and manufacturer and retailer markdowns to maximize sales through a network of preferred contractors. Another utility in Oregon offers sales performance incentive funds (SPIFs) to four distributors for specifying HWPHs to contractors.

Reported DIY installation rates across the utilities range from 25 percent to 90 percent, with interviewees reporting that they "are easy to do" and "any plumber should be able to do it." Half of the utilities have no or few interactions with local installers, in part due to high rates of DIY installs. Some utilities are more engaged with local installers and provide customers with lists of installers that watched a GE GeoSpring installation video, or inform installers that call them about Initiative trainings. Two utilities want high contractor involvement. One maintains a preferred contractor network, provides referrals to customers and proactively informs installers about local retail promotions. The other proactively directs installers to NEEA trainings, provides information about the updated NAECA standards and provides cooperative marketing funding and NEEA marketing collateral.

5.3.2 Expectations of Future Demand

The utility program managers interviewed for this report are generally expecting market adoption to increase more significantly starting in the next three to five years as HPWH awareness and acceptance continue to grow. In the words of one interviewee, "*we are just scratching the surface now*." According to the interviewees, adoption in new construction, word of mouth among family and friends and improving technology reliability will all help to increase demand.

In the short term, utility representatives report that retail promotions backed up with utility rebates will continue to be effective, and some manufacturers are doing aggressive and effective promotions. The introduction of new Tier 2 / Tier 3 models by GE, a reputable national brand, has piqued customer interest, and ducted Tier 2 / Tier 3 models offer higher savings potential which could increase demand.

In the longer term, the updated NAECA standards are expected to increase HPWH sales significantly, and should expedite the introduction of more brands and models. In this shifting market with new efficiency baselines, one interviewee speculated that the utilities will likely need to decrease their rebate levels. Most of the utilities believe manufacturer prices will also

edge downwards "*just like other electronics or appliances*" in the long term, while energy efficiency (and overall cost effectiveness) continues to increase.

5.3.3 Market Transformation Challenges

The utilities collectively reported that the vast majority of direct customer feedback they have received has been positive; customers are observing lower energy bills, have sufficient hot water and are noticing quiet HPWH operations. Of the few problems that have been reported or discovered (for example, missing earthquake strapping, inadequate side clearance, ineligible installs in conditioned spaces, trying to serve very large households), most have resulted from customers not following utility guidance or not reading specific installation directions. That said, utility representatives noted that there are still some remaining technical challenges, including:

- HPHWs are not attractive in some local markets with many manufactured homes, custom homes with design variations and/or many 1950s–1980s "rambler ranch" style homes with small conditioned spaces for water heaters.
- One utility mentioned that there are several poor Internet reviews of a particular HPWH model, although they have received no negative customer reports themselves. According to the reviews, evaporator coil failures are causing the compressor to fail and leak refrigerant, and then the HWPH defaults to non-efficiency mode. Two other utility representatives mentioned that a few customers have worked out (unspecified) warranty issues with the same manufacturer on their own.
- One interviewee was concerned that there are no or few technicians to service and repair HWPHs over the long term in their local territory (and perhaps regionally), as there will be equipment failures over time.

In addition, the interviewees mentioned the following current market challenges:

- Household awareness – The region is still learning about HWPHs and awareness is low.
- Equipment costs – The efficiency and reliability of Tier 2 / Tier 3 models has increased substantially, but equipment costs have increased too. These tiers will require continued rebates, and Tier 1 models may be preferred in the short term especially since many customers are comfortable with DIY installs.
- Install costs – Three utilities had concerns about high and variable install costs, with one speculating that high levels of DIYs can lead installers to inflate costs where they can, and another blaming general contractors' regular mark-up practices. NEEA will need to watch the install costs for ducted Tier 2 / Tier 3 models going forward, as some utilities said some costs were high in the past for discontinued Tier 2 HPWHs.
- Equity – HWPHs are expensive for limited-income customers, even after incentives.

- Disengaged installation contractors – Two utilities reported that some trained installers claim to be unfamiliar with or not interested in working with HWPHs for their utility customers. This may also be leading to increased install costs.
- Revolving retail staff – Staff have varying levels of HWPH knowledge to impart to customers.

5.3.4 Working with NEEA

NEEA's efforts to introduce a broad range of HPWH products have been very valuable to the utilities. In particular, coordinated local promotions with key manufacturers have been very effective, and NEEA's retail work has led to many HPWH installations in the service territories of some larger/urban utilities.

The utilities reported that NEEA's technical and educational assistance—staff to answer questions, website information and Frequently Asked Questions page, DIY installation guide—has been very useful to the utilities and their customers. Similarly, the utilities are utilizing much of the marketing templates, text copy and images available on the Smart Water Heat utility resources webpage, with many describing the materials as "very good" or "engaging." The brand-compatible templates are helping some of the smaller utilities to get their own promotions up and running quickly.

Overall, the utility-representatives found the updated Initiative website to be better organized and more customer-friendly than the prior version, and are increasingly trying to push customers there for detailed information. Regarding installation inspections, one smaller, rural utility stated that it is somewhat difficult to coordinate inspections with Initiative staff, but most noted that the process was working well, and those that want to accompany or request specific inspections findings are able to do so. Lastly, all of the interviewees were current on recent and planned Initiative activities. Most are members of the utilities working group that convenes monthly, and noted that regular and ad hoc communications from NEEA has facilitated information sharing and coordination across the region.

5.3.5 Future Assistance Needs

At least half of the utility representatives offered variations of the following suggestions to improve NEEA's HPWH Initiative and hasten market transformation:

- Conduct more regional mass marketing to increase public awareness and understanding of HPWHs. Households need to be learning about HPWHs from multiple sources before they need a new water heater. Many customers are wary of contractor "upselling" during emergencies, and some are skeptical of bill stuffer information.
- Continue to increase retailer stocking of HWPHs. Emergency replacements may become a leading growth market as the early adopter market becomes saturated, and the primary long-term strategy offered for emergency replacements was to increase customer awareness (above) and increase stocking among retailers.

- Study the (large) manufactured homes market, where HPWH retrofits in confined conditioned spaces are challenging.

See Appendix D: Additional In-depth Interview Findings for additional assistance needs (each mentioned by one utility).

5.4 HPWH Manufacturer Interviews

Evergreen Economics interviewed representatives from three HPWH manufacturers currently producing HPWHs that meet at least Tier 1 of the Northern Climate Specification.

5.4.1 Business Scope and Practices

The three manufacturers vary somewhat in their business scope and practices related to the production of HPWHs. One produces only water heaters, whereas the other two produce a wide range of appliances for the residential market. All three are international companies, with two headquartered in the United States and one headquartered in Europe. All three manufacturers have sold HPWHs in the US market since 2010 or slightly before, and the European company has sold HPWHs to the European market for approximately 35 years.

5.4.2 Marketing Strategies and Sales

All three manufacturers target their marketing towards the wholesaler and distributor market, as well as the installer market. Two of the companies also focus heavily on the retail market—and therefore target end-users as well—while the third company targets green builders and engineers working in the new construction market, as well as homeowners looking to install solar photovoltaic systems.

All three manufacturers promote energy efficiency and cost savings in their marketing to end-user and retail partners, while one also provides payback (five to seven years) and warranty (ten years) information to show that a HPWH purchase is an investment with limited risk. All three reported that their messaging in the Northwest was slightly different than in other areas of the country, with two focusing heavily on available incentives and one focusing on product tier and relative availability—these differences are all attributed to NEEA's efforts.

Federal tax credits are not reliable enough for manufacturers to include in their marketing, and they do not believe that they have any impact on sales, since they are enacted retroactively and customers cannot include the credit in their purchase decision.

Two of the three manufacturers reported that Northwest HPWH incentives had a significant impact on their overall sales of HPWHs in the region in 2014 (the third reported minimal impact on sales). One of these manufacturers currently produces a product that is Tier 3 capable (with ducting and use of the appropriate settings; otherwise they are considered Tier 2), while both of the other manufacturers are planning on introducing Tier 3 capable units in the near future. All three manufacturers' Tier 3 production plans are directly related to NEEA's efforts in promoting the Northern Climate Specification and tying incentives to the

higher tiers. In the words of one respondent, "*NEEA has driven the evolution of the technology and available products*."

Only two manufacturers were able to discuss HPWH pricing, and both believe that it is relatively stable. One noted that raw material cost increases may lead to slight HPWH price increases, while the other noted that if their sales volume increases, costs to the consumer will drop slightly. One of the manufacturers expressed concern that Tier 3 HPWHs would be too expensive for households outside of cold climate regions as more basic HPWH models perform perfectly well in warmer climates.

5.4.3 Interactions with Other Market Actors

Manufacturers regularly interact with distributors and retailers—their primary customers—and help train HPWH installers (typically plumbers and contractors). All manufacturers rely on installers to promote and sell HPWHs to consumers, as they are the primary salespeople in the traditional water heater replacement market.

According to the manufacturers, installer education has and will continue to result in reduced installation costs due to competition and increased familiarity with the installation process and related considerations (space, condensate lines, ducting and wiring). NEEA's efforts to inform and educate the installation community have helped, according to all manufacturers. One manufacturer reported that the installation price charged by installers can be twice as high for HPWHs purchased through retail, versus purchased directly from the installer (because their typical business practices include markups on the products themselves, so this is a way to recoup the lost revenue resulting from the retail purchase by the end-user).

All three manufacturers work closely with their distribution partners in the Northwest, and two provide training for distributor staff. Two provide marketing collateral and one encourages distributors to include their HPWHs as an option in any water heater specification sheet given to consumers. Two manufacturers reported that their products are stocked by many distributors across the Northwest, but one reported that in some areas, it may take up to forty-eight hours for product to reach a consumer. Reportedly, some distributors do not stock their HPWHs due to the high price compared to their competition.

Two of the manufacturers have worked directly with Northwest appliance retailers to promote HPWHs (the third was not certain). One manufacturer provides funding for in-store advertising, trains sales associates, places collateral in the stores and adds messaging to their print advertisements and websites. The other manufacturer noted that high turnover among sales associates, coupled with their need to have broad knowledge regarding a wide range of appliances, means that they often have insufficient knowledge about HPWHs.

5.4.4 Interactions with NEEA and Smart Water Heat Initiative

Two of the manufacturers have had significant interaction with NEEA and the Smart Water Heat Initiative (including the implementation contractor, CLEAResult). They have worked in collaboration with the Initiative on special promotions (upstream incentives, special

marketing materials, etc.), and one reported frequent engagement with the Initiative for ongoing market actor trainings (especially installer trainings). Both reported that their collaboration with the Initiative in 2014 left them very satisfied, although for slightly different reasons. One mentioned that there have been some challenges along the way, but that through open collaboration, they were able to overcome the challenges together with the Initiative. The other stated that the Initiative's proactive support has led them to focus their research and development on meeting Tier 3 of the Northern Climate Specification, despite selling HPWHs nationally (where Tier 3 design features are not always needed).

The manufacturer who reported minimal direct contact with the Initiative also reported that they have changed their HPWH design to meet the Northern Climate Specification's higher tiers as a direct result of promotional and incentive activity in the Northwest. They also expressed interest in increasing their collaboration with the Initiative in the near future.

5.4.5 HPWH Barriers and Challenges

Manufacturers described the following key barriers and challenges in bringing HPWHs to the mass market in the Northwest:

- Upfront cost, combined with low consumer awareness and education – These factors, along with inconsistent availability, impede HPWH sales, particularly in emergency replacement situations when many customers will not take time to research HPWHs (the "urgency barrier");
- Ducting and space issues – Products with ducting kits to exhaust cool air to the outside are easier to fit into smaller household spaces. Plumbers, however, are often not comfortable installing ducting, and in colder climates, exterior ducting can create additional cold air infiltration if the additional wall holes are not properly sealed. Going forward, the NAECA manufacturing requirements may cause high-demand households requiring 55+ gallon tanks with constrained space to either install ducting or reconfigure their home's plumbing (and possibly their home's electrical configuration), according to one manufacturer.

Manufacturers reported these same barriers during the Market Test Assessment (Evergreen Economics, 2013).

5.4.6 Future Expectations

All three manufacturers anticipate slightly higher HPWH sales in 2015 compared to 2014, largely due to the updated NAECA standards. Two of the manufacturers predict modest growth over the next three years (one was unable to estimate growth), and all reported that incentives will remain key to growth in the near term.

Regarding technological developments, all are focused on improvements to the base HPWH functionality (efficient hot water supply and meeting or exceeding Tier 3 specifications), with the aim of eliminating most installation barriers (discussed previously). Two are focused on

introducing new Tier 2 / Tier 3 HPWH models, while the manufacturer currently producing Tier 2 / Tier 3 HPWHs is focused on increasing the ambient temperature operating range.

Secondarily, two are focusing on smart grid connectivity and demand response applications. While one manufacturer believes that wireless control is a natural next step as more appliances are becoming available with the capability, the other manufacturer does not believe wireless control is important for water heaters as most people have never interacted directly with their water heaters, even to change the temperature set-point during vacations.

According to two manufacturers, the new construction market is the fastest growing market segment for HPWHs. Builders and owners have the time to weigh options and to consider the payback period and the return on investment, and also have the capacity to build homes to the space requirements of a HPWH.

5.5 HPWH Distributor In-depth Interviews

The Evergreen team conducted in-depth interviews with representatives from four of the major HPWH distribution companies. All of the distribution companies stock and supply water heaters for the residential market in the Northwest. This section presents findings from the interviews with water heater distributors.

5.5.1 Business Scope and Practices

Three of the four distributor respondents were owners or key managers of their business while the fourth distributor respondent was a corporate purchasing agent. Respondents reported selling HPWHs for three and a half years on average, compared to eighteen years selling water heaters in general.

The interviewees reported stocking multiple water heater and HPWH brands. Two of the four distributors stock GE, one stocks A.O. Smith, one stocks State (an A.O. Smith subsidiary), one stocks Rheem, one stocks Ruud, and one stocks Bradford White. Two distributors had stocked AirGenerate HPWHs in 2014 (but not currently). All four respondents stock Tier 1 HPWHs, and two also stock GE Tier 3 qualifying HPWHs.

HPWH sales comprise about one percent of business revenues for three of the distributors, and five percent for the other distributor. One respondent emphasized that the emergence of GE HPWHs has increased their HPWH sales because of the product's superior overall quality.

5.5.2 HPWH Supply

All four distributors maintain a stock of HPWHs as opposed to purchasing them upon receiving an order. Two distributors source their HPHWs exclusively from one partner manufacturer each, and the other two source HPWHs from multiple manufacturers.

Regarding future stocking practices, all four distributors noted that their HPWH inventory depends on the available rebates. Two distributors anticipate higher HPWH stocking levels as manufacturers expand their Tier 2 / Tier 3 product lines. One distributor stated that their

company was shifting away from HPWHs because of uncertainty surrounding regional rebate levels and manufacturer reliability, while the last distributor was holding off on stocking decisions until getting more clarity on regional rebates.

Two of the distributors estimated that over 50 percent of their HPWH sales were for retrofits in existing homes versus new construction. One of the remaining distributors estimated that their HPWH sales are evenly split between existing homes and the new construction market, while one distributor focuses almost exclusively on new construction. Two of the distributors said that the new construction market is the fastest growing market segment for HPWHs, while one said the retrofit market continues to grow.

Overall, two of the four distributors reported minor lead time supply problems with certain manufacturers; however, both said these problems have been resolved either by switching manufacturers or adjusting their purchasing strategy. The other two distributors noted no problems getting the HPWHs they need from manufacturers.

5.5.3 Marketing Strategies and Sales

Only one distributor of the four stated that they are actively marketing HPWHs in the Northwest—through monthly journal ads and bi-annual fliers showcasing NEEA and other available rebates. However, two of the other distributors that do not actively market HPWHs said they have designated areas in their respective businesses that showcase their HPWHs and the available rebates, in addition to sending regular emails to clients that promote the products, rebates, code changes and upcoming trainings. The remaining distributor relies heavily on their direct sales staff to contact HVAC and plumbing contractors directly.

All four distributors consider plumbing contractors to be their target market, for both retrofits and new construction, and the key marketing message to plumbers is the available rebate. Three of the distributors noted that energy efficiency is also a key marketing message; however, as one distributor pointed out, "*you can push efficiency and the fact that they look nicer but the rebates are what moves [HPWHs]*." As a result, all four distributors stated that NEEA has influenced their marketing and overall sales of HPWHs because they are responsible for the rebates.

Two distributors said that because of the quality and larger rebate levels for the GE Tier 2 / Tier 3 HPWHs (their most popular products), they expect their HPWH sales to increase over the next three years, while another one said their sales will increase if they can source a high-quality Tier 2 HPWH from State (an A.O. Smith subsidiary). The remaining distributor said that their company has shifted its focus to other types of HVAC products and that the Tier 1 HPWH from A.O. Smith was their most popular product. Two distributors said HPWHs are somewhat of a high priority for their company and two said they are not a high priority at all.

The two distributors working with GE HPWHs said their marketing has increased somewhat over the last year because of the increased quality and availability of the Tier 2 GE products. The remaining two distributors indicated no change in their HPWH marketing efforts over the

last year. Additionally, all four said that NEEA's HPWH marketing had never conflicted with their company's marketing efforts, although none of the distributors reported any type of marketing support from NEEA directly.

Going forward, distributors said additional marketing efforts from NEEA that aim to raise awareness to contractors and end-users could help increase their HPWH sales. The three distributors that said they would continue to focus on HPWH sales anticipated they would be able to keep up with market demand going forward. Additionally, two of the three expected the expiration of federal tax credits would have no impact on their HPWH sales while one expects the expiration to "*hurt [business] significantly*."

5.5.4 HPWH Pricing

Two of the four distributors said they had noticed a relatively small increase in manufacturers' HPWH prices over the last two years and the other two distributors said that prices have been relatively consistent. For the two that noted price increases, both said that increased competition and product availability are major influences on HPWH price.

Despite the higher equipment costs noticed by two of the distributors, all four distributors said the final price for end-users has actually decreased somewhat for all HPWH models because of the increase in available rebates. Going forward, the distributors expected prices for end-users to decrease further as more Tier 2 products reach the market. However, two distributors noted that end-user prices are highly affected by available rebates and could potentially increase if the rebates decreased.

Only two distributors provided estimates of the average installation cost charged by installers, both quoting between $700 and $1,000. In general, three of the four distributors do not anticipate installation cost changing over the next two years, while one distributor said installation cost might decrease as competition increases.

5.5.5 Interactions with Other Market Actors

Three of the four distributors had provided water heater training to installers in the past, and one had discontinued this service. None of the distributors had concerns about the ways that installers are installing HPWHs, although they mentioned technical challenges (such as space and ventilation controls) and maintenance of HPWHs as possible technical difficulties. Three of the four distributors rely on contractors to promote their HPWHs to end users and feel that the trainings have been a good way to ensure that contractors use appropriate messaging.

The distributors said that overall, they have worked well with their current manufacturers and have had only minor challenges in the past involving product supply. None of the distributors worked with Northwest retailers to promote HPWHs because they view them as competition and also because they carry different brands (from the same manufacturer).

5.5.6 Interactions with NEEA and CLEAResult

Only one of the four distributors noted any interaction with NEEA or CLEAResult in the past year, via an email question regarding the available rebates. All distributors said that NEEA's rebates have had a positive influence on their view of the HPWH market in the Northwest (one also mentioned that NEEA's educational and promotional efforts influence their view in the same way). Two distributors were very satisfied with NEEA's work "behind-the-scenes."

5.5.7 HPWH Barriers and Challenges

Three of the four distributors mentioned high initial price as a main barrier to widespread HPWH adoption, and one distributor mentioned lack of awareness and knowledge of HPWHs among end-users and market actors as a main barrier. Three distributors said there are no consumer segments that are resistant to HPWHs, while one said that lower income customers are less likely to purchase HPWHs because of their higher cost. Two distributors noted that higher income and new construction segments are most receptive to purchasing HPWHs.

Two of the distributors said that contractor customers call occasionally with questions regarding HPWH control boards. However, in general, none of the distributors said they receive many customer calls for assistance. Three of the four distributors said they have had fewer than five HPWH returns, two specifically citing Air Generates having to be returned on occasion due to problems with the control boards.

Three of the four distributors said they believe HPWHs will gain acceptance in emergency replacement situations if prices become more similar to traditional water heater options, if NEEA and the utilities increase the rebate levels and if awareness among consumers grows.

5.5.8 Future Expectations

HPWH technology trends predicted by distributors included increased energy efficiency and increased competition between manufacturers (each mentioned by two respondents). None of the distributors knew of any new HPWH developments specific to cold climate applications.

Three of the distributors said the update to the NAECA standards will increase the HPWH market even though most consumers are unaware of the updated standards. Distributors noted that on-demand gas water heaters, multi-tank systems, and commercial tanks will be the only other options for consumers that need a high-capacity water heater. Three distributors said the updated standards will have at least some effect on the smaller volume electric water heater market as well. Two of those distributors believed that some customers may opt for smaller-capacity water heaters in certain situations.

5.6 HPWH Retailer In-depth Interviews

Evergreen interviewed nine water heater retailers. Of the nine interviewed, five had sold HPWHs and four had not but had the ability to order HPWHs as needed.[19] Overall, of the nine firms interviewed, two were large retailers and the remaining seven were smaller retailers.

5.6.1 Business Scope and Practices

Among the five retailers that had sold HPWHs, three were smaller retailers and two were large retailers. The interviewees from the three smaller retailers were two owner/presidents and one manager. One of the large retailer interviews was with a Sales Associate and the other large retailer interview was with nationally-focused staff including the Green Leadership manager, the Director of Sustainability and one Phone Sales and Service Manager.

The five retailers that have sold HPWHs have been doing so for an average of just over three and a half years. Of all nine interviewed firms, six were unfamiliar with the Northern Climate Specification's tiers, and one was aware of the tiers but unsure which tier HPWH they sell. The remaining two retailers said they either have two Tier 1 models or one Tier 2 model.

Three of the retailers estimated that they generate from one to five percent of total revenue from HPWHs, while another estimated that HPWHs sales generate five to fifteen percent of their revenues.

5.6.2 HPWH Supply

Both large retailers and one small retailer source HPWHs directly from the manufacturer(s). The remaining small retailers source from distributors and retailer cooperatives.

One large chain reported that some stores (at the national level) will have stock and the rest will have to bring in units from a warehouse, depending on the popularity of HPWHs in various regions. They reported that the Northwest is a stronger market than others (like the Midwest) and believed there would be inventory of HPWHs at stores in the region.

Five of the nine retailers (one large and four smaller) reported that they have HPWHs in stock or have access to HPWHs in a nearby warehouse. The remaining four retailers (three small and one large) said that they do not stock HPWHs but can order them as needed.

Only three of the nine retailers predict an increase in stocking of HPWHs at their stores in the near to mid term (one large and two small retailers). Three respondents predict no increase in stocking of HPWHs and three were unsure. No sourcing problems were reported.

[19] We performed two separate interviews for one of the large retailers. For each of the interviews, the staff held a position at the national level and responded consistently to questions we asked. For this reason, we are counting them as a singular data point here.

5.6.3 Marketing Strategies and Sales

The majority of interviewees (six of nine) do not do HPWH marketing at all. Of the remaining three, one large retailer reported that they do print ads and online advertisements in addition to partnering with utilities to co-promote and create a sense of urgency with marketing blitzes. The remaining two small retailers who advertise have signs in stores with one also distributing door-to-door flyers. The large retailer that currently does no marketing did not have HPWHs in stock due to low sales, but when they were in stock, they had manufacturer marketing posted in-store.

Of those who sold HPWHs, the majority of retailers reported that their customers for HPWHs are homeowners and not contractors. Retailers reported that homeowners who buy HPWHs typically have higher incomes, interest in energy savings and interest in saving money. One retailer noted that landlords can be particularly interested because of the longer lifetime of HPWHs. Another added that while they usually work with property managers of multi-family buildings, HPWHs are not a good fit due to space constraints. One large retailer interviewee noted that, nationally, there are more interested customers where utility programs exist (and customers subsequently have a higher awareness of rebates and incentives).

Four interviewees (of the five who had sold HPWHs) reported a variety of messages that they deliver to their customers either over the phone or in-store. The most common were monetary savings (mentioned by three retailers), energy savings (three retailers), tax credits when available (two retailers) and rebates when available (one retailer).

None of the retailers changed their marketing messages in the past year, and no retailers reported that NEEA or Northwest utility messaging or marketing efforts have conflicted with their activities. One large retailer commented that they would be able to participate with NEEA more often if they were given more lead time for their initiatives.

Two interviewees shared specific details of the marketing assistance they received from NEEA. One of the retailers had received signage, and the other (large) retailer had worked with NEEA on multiple efforts including email blasts, point of purchase signage, language for sales associates, in-store testing of short term promotions and in store materials. We asked interviewees what types of additional information they would like from NEEA and/or utilities, and respondents mentioned a variety of desired assistance, including price comparisons (among retailers), information about energy savings, rebate availability, brochures and customer testimonials (all mentioned by one respondent each).

The retailers sell HPWHs from a variety of manufacturers including Reliance (mentioned by three retailers), GE (four retailers), Kenmore (two retailers), American (one retailer) and Rheem (one retailer). The three stores that offer Reliance HPWHs are three of the four stores that did not sell any HPWHs. Retailers that sell GE HPWHs claimed that the GE models are more preferable to them and to end users due to their plumbing attachment placement and sizing, which are similar to regular water heaters. We also heard that GE has done a good job marketing the product to retailers and sales associates.

Of the two firms that have been in contact with NEEA, the small retailer believes that the Initiative has had no impact on their HPWH sales and the other (a large retailer) said that they have seen a nearly triple digit percentage increase in sales when they do promotions in conjunction with manufacturers and NEEA over a short timeframe. This same retailer was the only one to credit NEEA with having an effect on their stocking of GE HPWHs (rather than another brand).

Regarding future HPWH pricing, six interviewees were unable to provide an accurate prediction. One believed prices would increase, and the remaining two believed prices would decrease (one estimated a 5 percent decrease). Four of seven retailers believe the expiration of federal tax credits will lower their sales slightly.

5.6.4 Interactions with Other Market Actors

None of the respondents were concerned with the way their HPWHs were being installed. Two retailers hire their own contractors. Interviewees reported no major problems with the distributors and manufacturers that they work with. When we asked if distributors or manufacturers could improve anything in particular, two interviewees mentioned that they could reduce their cost, and one smaller retailer said they could use additional advertising.

5.6.5 Interactions with NEEA and CLEAResult

Four of the nine respondents were aware of NEEA and two had interacted with NEEA staff. Of these two, only one had interacted with NEEA and/or CLEAResult in the past year (it is possible that another employee had contact with the Initiative). This respondent represented a large retailer at the national level. They reported having regular meetings with CLEAResult and that they work with NEEA over the phone and in person a couple times a year. NEEA and the respondent's firm worked collaboratively on a number of projects, including developing collateral, releasing marketing blasts and educating sales associates. This interviewee credited NEEA with increasing HPWH awareness (including within their company) along with working together with manufacturers to develop products that meet the Northern Climate Specification. They also appreciate NEEA's responsiveness, collaboration, ability to work within business parameters and post-meeting summary emails.

5.6.6 HPWH Barriers and Challenges

The two most commonly mentioned barriers to sales of HPWHs were price and lack of awareness among consumers. Among the four retailers who had not sold HPWHs, all believe customer awareness is the main barrier to sales. HPWH price was mentioned by six of the interviewees, including two of those who had not sold HPWHs. Two respondents mentioned installation costs as a barrier and two respondents noted that there are a lot of "unknowns" such as cool-air byproduct and the HPWH noise level.

According to the interviewees, very few customers have required assistance with their HPWHs. One interviewee reported one instance of an issue with the heat pump components

and another with the onboard computer, while another retailer mentioned that the control board, thermostats and heating elements have failed on a limited number of products.

5.6.7 Future Expectations

The majority of retailers were unaware of the updated NAECA standards (including both large retailer interviewees). Of the two retailers who had taken actions related to the standards update, one upgraded inventory and conducted staff training, and the other wrote to local property owners and managers notifying them of new prices and options. The consensus was that homeowners are also unaware of the updated standard.

After we informed interviewees about the NAECA standard, we asked them to think about what other options customers will have if they need or want a high-capacity electric water heater. The most common responses were that customers will purchase either a smaller electric resistance or an on-demand water heater (mentioned by four and three respondents, respectively), or install multiple smaller units (two responses). Only three interviewees would estimate how often high water demand consumers would opt for HPWH technologies, and two estimated half and one estimated 13 percent.

Considering the effects of the updated NAECA standard on the smaller volume electric water heater market, there was an even split between the four responding retailer representatives; two believe there will be an increase in sales, and two believe that sales would stay the same.

The majority of respondents (five of the seven who answered) believe that the fastest growing market for HPWHs is in existing homes (either remodels or replacements). One interviewee reported that while there are size limitations, the units are looking more and more like conventional water heaters and so are able to fit in similar spaces, which makes them more applicable for replacement in existing homes.

Four retailers predicted that sales would increase over the next three years (the remaining five were unable to answer). Two respondents provided specific estimates: two to four percent and six to ten percent, respectively. All four interviewees believe that the increase depends on utility incentives "*quite a bit*" (two respondents), or that the incentives play a "*big part*" of their prediction that sales would slightly increase (one respondent).

5.7 HPWH Installer Survey Findings

The Evergreen team completed 177 telephone surveys with Northwest HPWH installers: 68 who received training through the Smart Water Heat HPWH Initiative ("trained installers") and 109 who had not ("general population installers"). Findings are presented for all installers except where we encountered statistically significant differences between respondent groups.

All installers were aware of heat pump or hybrid water heaters, and all installed residential water heaters in one or more of the Northwest states. Across all installers, 53 percent said residential water heaters account for less than 10 percent of their company's revenues, while

44 percent estimated they account for between 10 and 50 percent, and 3 percent of respondents estimated they accounted for over 50 percent.

Among the general population installers, 73 percent reported that nobody at their company had received manufacturer training on HPWHs, compared to only 23 percent of trained installer companies. A large proportion of general population installers and trained installers (74%) do not plan on sending staff for additional manufacturer training over the next year.

5.7.1 Experience with HPWHs

Approximately one-quarter of general population installers and two-thirds of trained installers had performed at least one HPWH installation prior to the survey (27% and 67%, respectively). HPWHs account for less than five percent of revenue for all installers.

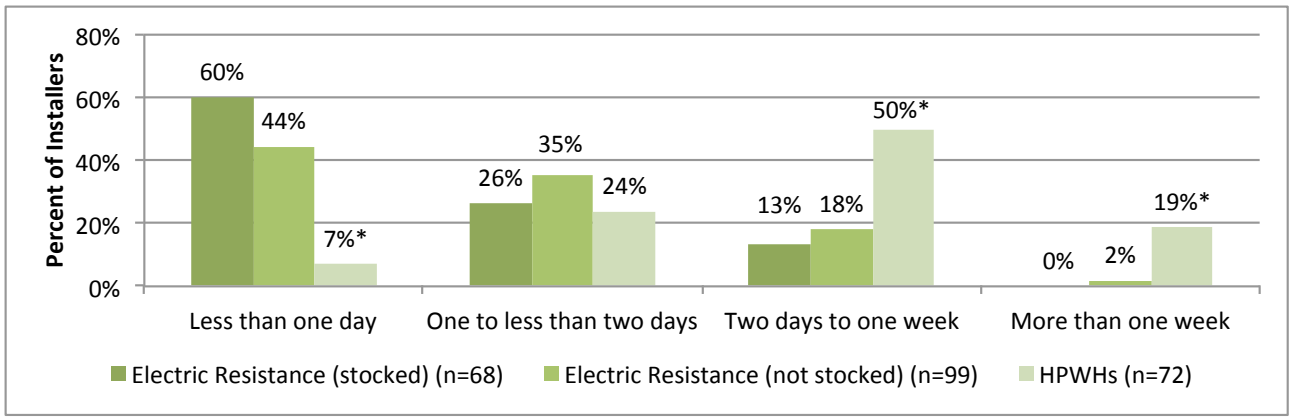
5.7.1.1 HPWH Stocking Practices

Only one installer (a trained installer) reported stocking HPWHs. Overall, 53 percent of all installers said they do not stock water heaters (of any type). The remaining installers indicated they stock a variety of equipment including electric resistance storage water heaters (38%), natural gas storage water heaters (36%), and on-demand water heaters (12%).

The most common brands of electric resistance water heaters offered by general population installers and trained installers include Bradford White (57% and 54%), Rheem (44% each), A.O. Smith (38% and 29%) and State (8% and 10%). While only one installer stocks HPWHs, 53 percent of installers offer HPWHs to their customers. General population installers reported the most common brands they offer include A.O. Smith (13%), Bradford White (12%), and Rheem (11%). The most common HPWH brands offered by trained installers include GE (43%), AirGenerate (18%) and Rheem (12%). More than half of installers reported that the brands they stock do not affect what they recommend to their customers.

As shown in Figure 10, below, HPWH installations typically take longer from order to installation than electric resistance water heaters, regardless of whether the installer stocks electric resistance water heaters. Of the installers that estimated the lag time for a HPWH installation to be two days or more, 8 percent said the lag time has resulted in a customer wanting to change their decision and purchase a different type of water heater that is not a HPWH.

Figure 10: Time from Purchase to Installation Comparison



Q15./Q16. How long does it take from when a customer requests to purchase a standard electric storage water heater / HPWH until you are able to install the unit at their home?
*Difference from electric resistance (both categories) at 90% CI is statistically significant.

5.7.1.2 HPWH Sales and Installations

Prior to the survey, trained installers had installed an average of fifteen HPWHs and general population installers had installed an average of five HPWHs in residential homes across the Northwest. More than two-thirds of installers that had installed HPWHs installed their first HPWH in 2012 or later (69%), while less than 5 percent installed HPWHs prior to 2008.

HPWH installations comprised more than half of 2014 electric water heater installations for 27 percent of trained installers and no general population installers. For 16 percent of trained installers, HPWHs account for more than three-quarters of electric water heater installations.

A majority of all installers reported that all of their HPWH installations were completed in existing homes (66%), accounting for approximately 82 percent of all HPWHs installed. The remaining 18 percent were installed in new construction homes.

Most general population and trained installers who installed HPWHs in 2014 estimated that more than three-quarters of their installations received an incentive from either a utility or through the Smart Water Heat Initiative (71% and 89%, respectively). The majority also expected their HPWH sales to increase over the next two years (64% and 58%, respectively) due to the updated NAECA standard, increased awareness among consumers, increased promotion among market actors, increases in energy costs, technology improvements and increases in price of electric resistance water heaters (thus creating a more favorable incremental cost of HPWHs). Eighteen percent of trained installers believe that future HPWH sales will decrease (no general population installers estimated future decreases in HPWH sales). These installers reported concerns regarding product performance (specifically related to product failures resulting in additional, unpaid work), general concerns regarding the technology, lower return on investment with changes to the incentive amounts, and not actively promoting HPWHs as reasons for future decreases in sales.

5.7.1.3 Installation Costs

Installers estimated the labor cost for installing an electric resistance storage water heater in 2014 to be approximately $400, on average. For HPWH installations in 2014, trained installers estimated the labor cost to be $980 dollars, while general population installers estimated the labor cost to be $727 dollars, although the difference is not statistically significant. Additionally, 65 percent of general population installers and 53 percent of trained installers predicted the labor cost to install a HPWH in unconditioned space to increase either somewhat or significantly over the next two years, while only 9 percent of general population installers and 10 percent of trained installers anticipate a decrease in labor cost. Nearly all installers who reported increasing costs explained that labor costs always go up with time (inflation, cost of living, etc.), while those that believe costs will come down believe that with more experience, installations will be easier and quicker, resulting in lower costs.

5.7.2 Experience with NEEA's Smart Water Heat Initiative

Overall, 45 percent of trained installers said the Initiative training was very or extremely effective, and 47 percent said it was somewhat effective. Additionally, of the installers that received manufacturer training, 40 percent of trained installers and 49 percent of general population installers said they were either very or extremely satisfied with the manufacturer training, and 56 percent of trained installers and 52 percent of general population installers said they were somewhat satisfied.

Almost half of the general population installers were aware of the Smart Water Heat Initiative (45%), of which 32 percent said they were very or extremely likely to have an employee attend a session in the next 12 months (another 32 percent that said they are somewhat likely). Of the general population installers that were not likely to attend an orientation session, three installers said the most common reasons were because there is low customer interest in HPWHs, and two installers reported they are not needed to install HPWHs.

Of the general population installers aware of the Initiative, 22 percent visited the Initiative's website, compared to 58 percent of all trained installers. Nearly all trained installers (97%) and most general population installers (78%) said the website information was at least somewhat useful.

Trained installers were significantly more likely to have contacted Smart Water Heat staff than general population installers (30% versus 2%). Reasons included questions regarding utility rebates (mentioned by eight respondents) or technical installation questions (mentioned by five respondents). Other reasons for contacting Smart Water Heat staff included HPWH eligibility questions, equipment performance problems and incentive clarification questions. Overall, 90 percent of trained installers who contacted Smart Water Heat staff said the initiative staff was very or extremely responsive.

Approximately 40 percent of both general population and trained installers said that the Initiative could provide marketing or technical support to help increase the number of HPWHs their company sells. Installers cited a wide range of desired support, including

increased general marketing to consumers and return on investment estimates based on local electricity costs.

5.7.3 Installers' HPWH Customers

Participating installers were significantly more likely to have recommended HPWHs to their residential customers than general population installers (66% versus 23%). For trained installers that have not recommended HPWHs, cost was the primary reason (34%). For general population installers who have not recommended HPWHs, 32 percent said it was because of cost and 23 percent said it was because they were unfamiliar with the technology.

Both trained and general population installers that sold HPWHs said the primary advantages of HPWHs include their high efficiency and lower operating costs compared to other water heating types (70% and 75%, respectively).

5.7.3.1 Marketing and Outreach

Two-thirds of installers that sold HPWHs said that none of the purchasers came to them in an emergency replacement situation. Installers indicated that a majority of HPWH purchasers came to them specifically seeking a HPWH (56%). Additionally, approximately half of all installers said 50 percent or more of their HPWH sales replaced a functional water heater.

A large majority of participating and general population installers did not market HPWHs in 2014 (75% and 96%, respectively). For the installers that did market HPWHs, the most common types of marketing initiatives included radio, door-to-door marketing (with print fliers), social media and home/trade shows. Additionally, 58 percent of trained installers that market HPWHs use materials distributed by the Smart Water Heat Initiative in addition to materials they produced, and 88 percent use materials from their supplier or a manufacturer.

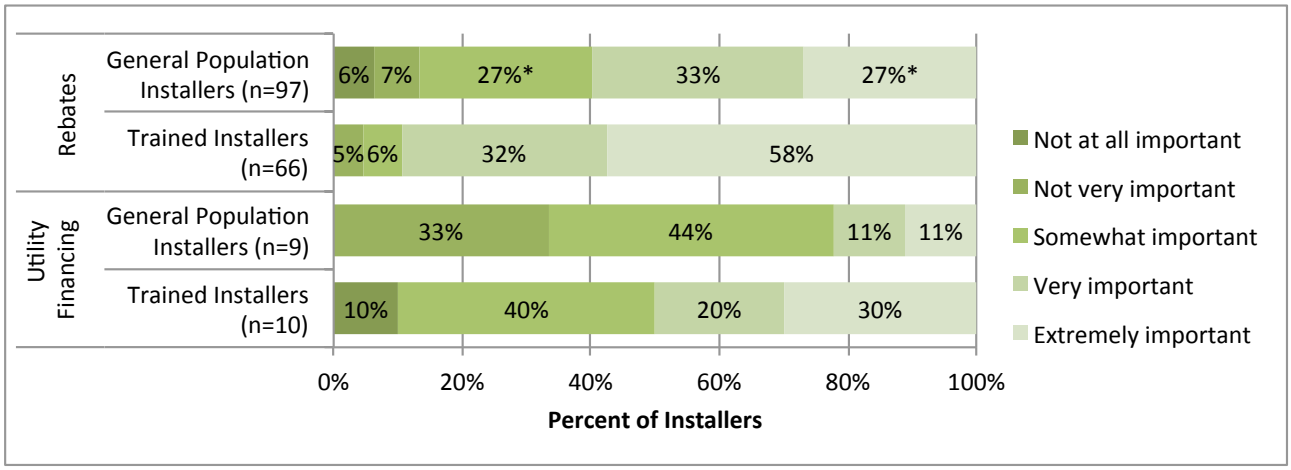
5.7.3.2 Customer Purchasing Decisions

Both general population installers and trained installers indicated the key reason consumers are interested in HPWHs is to reduce their energy consumption (66% and 84%, respectively). Additional reasons customers are interested in HPWHs include available rebates, the desire for the most current technology, and because they heard about them in an advertisement.

Over half of general population and trained installers indicated the primary barrier to HPWH purchases among consumers aware of HPWHs is the overall cost (reported by 56% and 60%, respectively). Additionally, some customers cannot fit the equipment in the existing space allocated for their water heater (reported by 19% of installers).

As shown in Figure 11 below, installers said that utility rebates are important to HPWH sales, especially for trained installers. Utility financing was reported to be very or extremely important by 22 percent of general population installers and half of trained installers (among those aware of utility financing).

Figure 11: Importance of Rebates and Utility Financing



Q72./Q74. How important would you say that utility rebates/utility financing are/is to residential HPWH sales?
* Difference from Trained Installers at 90% CI is statistically significant.

6 Savings Assessment

Among the surveyed installers, three general population and eight Initiative trained installers reported installing HPWHs in the Northwest that did not receive any incentives or manufacturer markdowns. Based on our analysis, approximately 10 percent of 2014 HPWH sales in the Northwest did not receive incentives, with 73 percent sold by Washington installers, 24 percent sold by Oregon installers, and 3 percent sold in Montana (none in Idaho). Table 10 below shows a detailed breakdown of the reported units (in the "#" column) as well as the total non-incented units, weighted to the population (based on the ratio of total known incented HPWHs to self-reported incented HPWHs from installer surveys).

Table 10: Results – Non-incented HPWH Installation Details

Home Type		Space Type	Heating	Vol.	Brand	Ducts	#	Units
Single Family	New Const.	Conditioned	Electric	<55	GE	Yes	5	53.3
			Gas	55+	Rheem	No	1*	10.7
			Electric/ Other	55+	Bradford White	No	1	10.7
		Garage	Unk.	55+	GE	No	1	10.7
			Gas/ Electric	55+	Bradford White	No	1	10.7
		Mech. Room	Electric	55+	AO Smith	No	1	10.7
		Unk.	Unk.	<55	GE	Unk.	10	106.6
				Unk.	Unk.	Unk.	1	10.7
	Retrofit	Conditioned	Unk.	55+	GE	Yes	1	10.7
		Garage	Electric	55+	AO Smith	No	1	10.7
					GE	No	2*	21.3
					AirGenerate	No	1	10.7
		Basement	Electric	<55	GE	No	1	10.7
			Gas	Unk.	Unknown	No	2*	21.3
		Unk.	Unk.	Unk.	GE	Unk.	3	32.0
Unk.							5	53.3
Total							**37**	**394**

* Installed by general population installer

There are three important caveats to this analysis. First, the method relies on the assumption that the ratio of reported non-incented HPWHs to total non-incented units is identical to the ratio of self-reported installer respondent incented units to total incented units for 2014. Second, the total incented HPWHs are estimated, not known, due to an unknown number of Tier 1 HPWHs receiving both manufacturer markdown and utility incentives, as well as an unknown number of Tier 2 HPWHs receiving both a Smart Water Heat and utility incentive (where we did not have utility incentive contact data). Furthermore, we did not extrapolate the utility incented units from utilities that were unable to provide incentive data. Lastly, DIY installations are assumed to mirror installer installations (in terms of the percent that are non-incented and their installation characteristics).

7 Key Findings and Recommendations

NEEA's Smart Water Heat Initiative is performing well and beginning to drive market transformation in the Northwest. Below we present the key findings from this Market Progress Evaluation and recommendations for Initiative improvements and refinements.

Key Findings:

13. **Manufacturers are engaged and eager to meet higher NCS tiers.** There has been some hesitation due to high consumer cost related to the added components and design complexity. The product features of the higher NCS tiers (Tiers 2 and 3) are not relevant to most consumers outside of colder climates such as the Northwest (and the Northwest comprises a relatively small water heater market, nationally).
14. **Most HPWH sales to-date were planned purchases, not emergency replacement situations.** This is indicative of highly educated and high income early adopters, and this will likely change as the market transforms
15. **In the first year and a half of the Initiative (from July 2013 to January 2015) between 430 and 593 Tier 2 HPWHs were installed with Smart Water Heat incentives and/or Northwest utility incentives.**
16. **In the first year and a half, between 4,053 and 4,593 Tier 1 HPWHs were installed with Northwest utility incentives and/or manufacturer markdowns.** Upstream incentives to manufacturers, resulting in a markdown at the point of purchase for consumers, have proven very successful for the Initiative.
17. **HPWH purchasers are comprised of households with higher incomes and education levels than the general population.** This is indicative of a purchaser population currently comprised of early adopters, and is consistent with Finding 2, above.
18. **Installers do not stock HPWHs and it takes longer for HPWHs to be installed than electric resistance water heaters (from the time of purchase to install).** However, more than half of installers do not stock any water heaters of any type. Additionally, many installers who do not stock electric resistance or heat pump water heaters report that it takes longer for HPWHs to be installed (from the time of purchase).
19. **Retailers are either directly engaged with the Initiative (and selling many Tier 1 HPWHs via manufacturer markdowns) or they sell very few or no HPWHs.** This may change as a result of the updated NAECA standards, so it is important to track over the next year.
20. **According to market actors and consumers, brand familiarity is important.**
21. **There is consensus among market actors that the update to the NAECA federal standard for water heaters is likely to have an impact on sales in the near- and long-term,** including some impact on sales of HPWHs below 55 gallons. Market actors are unsure how much "spillover" effect the standards will have in the smaller volume market,

and conversely how many homeowners with large hot water needs will purchase water-heating equipment other than a HPWH (such as on-demand water heaters).

22. **Despite the perception that the updated NAECA standard will have a large effect on the market, awareness among consumers and retailers remains low.** This presents an opportunity for NEEA and Northwest utilities to get ahead of the issue and provide guidance and education to Northwest consumers and vendors.
23. **The new construction market may be an opportunity worth investigating.** As new home construction steadily increases in the Northwest, this is an important market to consider for the Initiative. While the Next Step Homes Initiative includes HPWHs in the specification, these homes comprise a very small proportion of the new construction market. New homes that do not meet the specification of Next Step Homes are not targeted by the Smart Water Heat Initiative, and comprise a potentially large opportunity. Furthermore, there are specific reasons to target this market, including:
    - ***Cost of inaction* –** every new home in the Northwest that installs an electric resistance water heater will likely not purchase a HPWH as a replacement for a number of years.
    - ***Different purchase considerations* –** for new construction, the urgency barrier is significantly less important (as construction is a longer process than a water heater purchase). This allows more time for the homeowner or builder to consider the benefits of a HPWH, and more time to be influenced by targeted Initiative activities.
    - ***Economies of scale and word of mouth* –** every purchase, regardless of new construction or retrofit, expands the saturation of HPWHs in the Northwest, leading to such benefits as economies of scale (for manufacturing) and word of mouth promotion among residents of the Northwest.
24. **The manufacturer markdown approach changes Initiative evaluability.** The total incentive sales volumes of Tier 1 products are unknown because it is impossible to determine whether households who purchased a HPWH with a markdown apply for and receive a utility incentive. Furthermore, there are two risks related to the evaluability of the Initiative, which include:
    - ***Uncertainty regarding installation location* –** customers can install their HPWH outside of the Northwest unbeknownst to the Initiative; there is no indication that this is occurring frequently.
    - ***Customer research is much more difficult and costly* –** in store research is typically time consuming to administer because evaluators must engage with customers as they are making a purchase (either in person or via an in store handout). During the highest volume month, May 2014, there were 1,160 manufacturer markdowns provided for HPWHs in the Northwest (approximately three per day across the entire region).

Recommendations:

7. **Continue to address low awareness through broad based marketing and through cooperative marketing with supply chain partners.**

8. **Continue support for manufacturer markdowns and utility incentives for Tier 1, Tier 2, and Tier 3 HPWHs.** As with the Market Test Assessment, customers and market actors report that the incentives are key to HPWH purchases.
9. **Consider targeting the new construction market.** Encourage Initiative training among the builder community, and develop collateral specific to the new construction market.
10. **Consider ways to collect replaced water heater volume, such as working with Northwest utilities to add a field on incentive applications.** As the existing supply of large volume electric resistance water heaters are installed and not replenished (due to the updated NAECA manufacturing standard), it will be important for the Initiative to better understand the characteristics of the water heaters that are replaced by Initiative-supported HPWHs. At some point it may become necessary or prudent to cease incentives for high volume HPWHs replacing high volume electric resistance water heaters, as the default replacement choice will become a HPWH. We recommend that NEEA take appropriate steps now to ensure that NEEA is best positioned to make this decision at the appropriate time.
11. **Work with manufacturer and retailer partners to establish an approach for collecting HPWH purchaser data to better understand who are purchasing HPWHs with manufacturer markdowns, to improve accounting accuracy, and for evaluation purposes.** There are a number of possible approaches, including additional incentives for consumers who complete a small form while at a retail location.
12. **Continue to track the rate of emergency replacements through consumer and supplier MRE.** The market moving from a high proportion of planned purchases to higher proportions of emergency replacements may indicate progress towards market transformation, as planned replacements are atypical in the general water heater market in the Northwest (Verinnovation, 2012), and likely indicate high rates of early adopter purchases. Tracking this metric is likely to become more difficult with upstream incentives due to the added complexity of conducting MRE activities with HPWH purchasers.

Appendix B: HPWH Purchaser Survey Supplemental Findings

7.1 Purchaser Demographics and Household Characteristics

Table 11, below, shows the disposition of home vintage among Tier 1 and Tier 2 purchaser households. As shown, one quarter of homes were built between 1990 and 1999, with most (53%) homes being built prior to 1980. Across both Tiers and states, only a small percentage of homes (11% overall) were built since 2000.

Table 11: Initiative Purchaser Home Vintage, by Tier

Year	Tier 1 (n=79)	Tier 2 (n=111)	Overall (n=190)
2011-present	0%	2%	1%
2006-2010	4%	2%	3%
2000-2005	10%	3%	7%
1990-1999	32%	18%	25%
1980-1989	11%	11%	11%
1970-1979	16%	20%	18%
1960-1969	13%	16%	15%
Prior to 1960	14%	28%	20%
Total	**100%**	**100%**	**100%**

Q 88. What year was your home built?

Table 12 and Table 13 show household annual income in 2014, by state, for purchasers of Tier 1 and Tier 2 HPWHs, respectively. Overall, a higher proportion of Tier 2 HPWH purchasers report a household income of $120,000 or more in comparison to Tier 1 purchasers (34% vs. 17%). Oregon and Washington Tier 2 purchasers were similarly distributed across income levels, but Tier 1 purchasers in Oregon reported lower levels of income than Tier 1 purchasers in Washington. Nearly one-third of Oregon Tier 1 purchasers reported household income of less than $40,000, compared to only six percent of Washington households. Furthermore, no Oregon Tier 1 purchaser reported income over $120,000, compared to nearly one quarter of Washington Tier 1 purchasers (22%).

Table 12: Household Income for Tier 1 Purchasers, by State

Income, Tier 1 Purchasers	Oregon (n=12)	Washington (n=67)	Overall (n=79)
Less than $40,000	30%	6%	11%
Between $40,000 and $60,000	10%	18%	16%
Between $60,000 and $120,000	60%	55%	56%
$120,000 or More	0%	22%	17%

Q 96. Which of the following categories includes your approximate annual household income from all sources in 2012, before taxes?

Table 13: Household Income for Tier 2 Purchasers, by State

Income, Tier 2 Purchasers	Oregon (n=59)	Washington (n=39)	Overall (n=98)
Less than $40,000	7%	0%	3%
Between $40,000 and $60,000	8%	10%	9%
Between $60,000 and $120,000	51%	56%	54%
$120,000 or More	34%*	34%	34%*

Q 96. Which of the following categories includes your approximate annual household income from all sources in 2012, before taxes?
* Difference from Tier 1 purchasers at 90% CI is statistically significant.

Table 14 shows the education level of purchasers, by state and purchased HPWH tier. As shown, while the percentage of purchasers with graduate degrees was consistent across tiers and states, in Oregon 78 percent of Tier 2 purchasers were at least college graduates as opposed to only 50 percent of Tier 1 purchasers. A similar trend can be seen in Washington, with 72 percent of Tier 2 purchasers being at least college graduates in comparison to 60 percent of Tier 1 purchasers, although results in both states were not statistically different.

Table 14: Education Level of Purchasers, by State

	Oregon (n=80)		Washington (n=109)		Overall (n=189)	
Education Level	Tier 1 (n=12)	Tier 2 (n=68)	Tier 1 (n=64)	Tier 2 (n=45)	Tier 1 (n=76)	Tier 2 (n=113)
Some high school (n=1)	0%	0%	0%	2%	0%	1%
High school graduate or GED (n=16)	34%	3%	11%	6%	16%*	5%
Trade or technical school (n=11)	0%	3%	8%	9%	6%	6%
Some college (n=32)	16%	17%	21%	11%	20%	13%
College graduate (n=49)	16%	31%	22%	26%	21%	28%
Some graduate school (n=8)	0%	7%	0%	8%	0%	8%
Graduate degree (n=72)	34%	39%	38%	39%	37%	39%
Total (n=189)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Q 95. Which of the following includes the highest level of education you have completed?
* Difference from Tier 2 purchasers at 90% CI is statistically significant.

Table 15, below, shows the distribution of primary household heaters by installed HPWH tier. As shown, the most common heating types across all purchasers included electric forced air furnaces (29%), non-electricity primary heat sources (22%), and ducted heat pumps (19%). Heating types were relatively similar across purchased HPWH tiers, however Tier 2 purchasers were statistically more likely (33%) to have a non-electric heat source as opposed to Tier 1 purchasers (12%).

Table 15: Purchaser Primary Household Heater, by Tier and General Population

Household Heating Type	Tier 1 (n=79)	Tier 2 (n=115)	Overall (n=194)
Forced air furnace	34%	23%	29%
Non Electricity Primary Heat Source	12%*	33%	22%
Heat pump (non ductless)	22%	15%	19%
Ductless heat pump (DHP)	14%	22%	18%
Baseboards/Wallheaters	10%	5%	8%
Electric radiant heaters	4%	0%	2%
Other	1%	1%	1%
Total	**100%**	**100%**	**100%**

Q 90. What is your home's primary heat source?
Q 91. What type of electric heater is your primary heater?
* Difference from Tier 2 purchasers at 90% CI is statistically significant.

7.2 Sources of Awareness

Shown in Table 16, initial awareness of HPWHs most often came from utility print advertising and the Internet (15% of purchasers, each) and retail displays (14%). Tier 1 purchasers were more likely to learn about HPWHs through retail store displays and newspapers advertisements (33% and 12%, respectively) than Tier 2 purchasers (11% and 0%, respectively). Conversely, Tier 2 purchasers were more likely to learn additional HPWH information from a contractor/installer or through their work (26% and 18%, respectively) than Tier 1 purchasers (3% each).

Purchasers without a college degree were more likely to initially learn about HPWHs through a friend or acquaintance (31%) than those with a college degree (8%), while that latter group was more likely to learn about HPWHs from a contractor (20%) than purchasers without a college degree (8%).

Table 16: Purchaser Source of Awareness and Information Regarding HPWHs, by Tier

	First Mention			All Mentions		
Source of Awareness	**Tier 1 (n=76)**	**Tier 2 (n=110)**	**Overall (n=186)**	**Tier 1 (n=76)**	**Tier 2 (n=110)**	**Overall (n=186)**
Utility print ad, bill stuffer	19%	10%	15%	23%	12%	18%
Internet research	14%	16%	15%	38%	42%	40%
Retail display/saw it in store	20%*	6%	14%	33%**	11%	22%
Contractor/installer	2%*	20%	11%	3%**	26%	14%
Friend or acquaintance	9%	10%	10%	13%	13%	13%
Through work (contractor)	0%*	15%	7%	3%**	18%	10%
Retailer ad in mail	15%*	2%	7%	57%	53%	55%
Newspaper ad	10%*	0%	5%	12%**	0%	6%
Other	14%	21%	17%	21%	33%	27%

Q 1. First, how did you first hear about heat pump water heaters?
Q 2. Did you hear about them anywhere else or learn more about them from any other sources?
* Difference from Tier 2 purchaser "First Mention" at 90% CI is statistically significant.
* Difference from Tier 2 purchaser "All Mentions" at 90% CI is statistically significant.

Tier 2 purchasers most often initially learned about the Tier 2 manufacturer from a contractor or installer (20%), compared to only two percent of Tier 1 purchasers. In contrast, Tier 1 purchasers were more likely than Tier 2 purchasers to learn about HPWHs through retail stores (20% and 6%, respectively) or retailer ads in the mail (15% and 2%, respectively). Also, while less than one percent of Tier 2 purchasers indicated they initially learned about the HPWH brand through a call or email with their utility, more than three quarters of Tier 2 purchasers learned more about HPWHs by calling or receiving a call or email from their utility.

7.3 Purchase Decision / Importance of Incentives

As shown in Table 17, the most common reasons for their interest in HPWHs were saving energy and efficiency (65%), the lower monthly operating cost (35%), and the availability of the rebate (18%).

Table 17: Reasons for Interest in HPWH vs. Other Types of Water Heaters, by Tier[20]

Reason	Tier 1 (n=77)	Tier 2 (n=115)	Overall (n=192)
Savings energy/efficiency	62%	68%	65%
Lower monthly operating cost	39%	32%	35%
Rebate	21%	14%	18%
Concern of carbon footprint/greenhouse gases	5%	4%	4%
Payback period	3%	2%	3%
Discount/good deal/cost of unit	3%	1%	2%
Like/have heat pump heating already	3%	1%	2%
Good reputation	1%	2%	2%
Only efficient electric WH	0%	3%	1%
Recommendation by contractor/plumber/utility	0%	3%	1%
Availability of the rebate	2%	1%	1%
Water heater programmability	2%	0%	2%
Other	0%	5%	2%

Q 16. What initially interested you in a heat pump water heater, as opposed to other types of water heaters?

For the purchasers that reported interest in HPWHs based on the reasons above, Table 18shows that overall, those respondents said that the availability of the rebate, saving energy, and the payback period were all very important when considering a HPWH purchase.

Table 18: Importance of HPWH Purchase Considerations, by Tier

Purchase Consideration	Tier 1 Mean Importance	Tier 2 Mean Importance	Overall Mean Importance
Rebates	4.7 (n=16)	4.8 (n=17)	4.7 (n=33)
Saving energy	4.7 (n=44)	4.8 (n=63)	4.7 (n=107)
Payback period	5.0 (n=2)	4.0 (n=3)	4.6 (n=5)
Lower monthly operating cost	4.4 (n=24)	4.2 (n=31)	4.3 (n=55)
Concern of carbon footprint	3.5 (n=2)	4.1 (n=4)	3.8 (n=6)

Q 17. How important was <response to Q 16> in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important?

7.3.1.1 Replaced Water Heater Characteristics

As shown in Table 19, below, a large majority of HPWH purchasers replaced their previous water heater as part of a planned replacement (86%) as opposed to an emergency situation (14%).

[20] Percentages sum to more than 100% because purchasers supplied multiple reasons for interest in HPWHs

Table 19: Emergency Replacements vs. Planned Replacements, by Tier

Installation Type	Tier 1 (n=79)	Tier 2 (n=108)	Overall (n=187)
Emergency Replacement	17%	10%	14%
Planned Replacement	83%	90%	86%

Q 12. Did you replace your previous water heater in an emergency situation, for example maybe it broke, or was it a planned replacement?

Table 20 and Table 21 show the disposition of purchased water heater volumes by the replaced water heater volumes, first for Tier 1 HPWHs and then for Tier 2 HPWHs. As shown, nearly all Tier 1 HPWHs purchased during the study period were 50 gallons in size, regardless of replaced water heater. All Tier 2 HPWHs were larger than 66 gallons (there were no available Tier 2 HPWHs with lower volumes). Most Tier 2 HPWHs were exactly 66 gallons, regardless of replaced water heater volume.

Table 20: Installed Tier 1 HPWH Volume by Replaced Water Heater Volume [21]

	Replaced Water Heater Volume		
Volume (Tier 1)	**< 40 gallons**	**40 - 55 gallons**	**> 55 gallons**
50 gallons (n=63)	100%	95%	100%
60 gallons (n=2)	0%	3%	0%
65 gallons (n=1)	0%	2%	0%
	100%	**100%**	**100%**

Q 8. How many gallons was your previous water heater tank?

Table 21: Installed Tier 2 HPWH Volume by Replaced Water Heater Volume [22]

	Replaced Water Heater Volume		
Volume (Tier 2)	**< 40 gallons**	**40 - 55 gallons**	**> 55 gallons**
66 gallons (n=74)	75%	94%	79%
80 gallons (n=9)	25%	6%	21%
	100%	**100%**	**100%**

Q 8. How many gallons was your previous water heater tank?

7.3.1.2 Reasons for Purchasing a HPWH

As shown in Table 22, over half of the HPWH purchasers replacing an existing water heater did so because it was getting old and was reaching the end of its useful life. Nearly one-third of purchasers wanted to upgrade to a more efficient water heater solution. Overall, the reasons for purchase were statistically consistent across Tier 1 and Tier 2 purchasers.

[21] Water heater weights used.
[22] Water heater weights used.

Table 22: Primary Reasons for Replacing Water Heater, by Tier

Reason	Tier 1 (n=64)	Tier 2 (n=93)	Overall (n=157)
Getting old, time for replacement	53%	54%	54%
Efficiency/wanted a more efficient one	25%	39%	32%
Not enough hot water	8%	14%	11%
Cost to operate existing water heater	4%	10%	7%
Leaky existing water heater	9%	5%	7%
Good rebates/expiring rebates	6%	5%	6%
On sale/good price	8%	0%	4%
Other	18%	18%	18%

Q 13. What was the reason you decided it was time to replace your previous water heater?

As shown in Table 23, 35 percent of all HPWH purchasers said they had no concerns when considering the purchase of a HPWH. Across both Tier 1 and Tier 2, the most common concerns included the perceived reliability of the HPWH (10%), the performance of the HPWH (7%), and the speed of heating by the HPWH (7%). Other concerns reported by purchasers included the ducting and venting, the energy cost savings, the overall physical size of the HPWHs. Results were similar across, however – not shown in the table – Oregon purchasers were more likely to have no concerns about the HPWH purchase (46%) than Washington purchasers (31%), although this result was not statistically significant.

Table 23: Purchaser Concerns when Considering HPWH Purchase, by Tier[23]

Concern	Tier 1 (n=75)	Tier 2 (n=75)	Overall (n=150)
No Concerns	36%	35%	35%
Reliability	8%	12%	10%
Performance	8%	6%	7%
Speed of heating	7%	7%	7%
Noise	9%	3%	6%
New technology/complexity	3%	9%	6%
Space/physical size	8%	9%	5%
Capability/functionality	6%	3%	5%
Installation concerns	4%	5%	4%
Other	23%	29%	29%

Q 30. Was there anything you were concerned about when you were considering a heat pump water heater?

[23] Percentages sum to more than 100% because purchasers supplied multiple concerns regarding HPWH purchases.

7.3.1.3 Financing and Tax Credits

There are no additional findings or tables related to financing or tax credits not contained in the main sections of the report.

7.4 HPWH Installation and Inspection Processes

Overall, 75 percent of HPWHs were installed in unheated areas of the purchasers' homes. Additionally, 71 percent of HPWHs were installed in insulated areas. Forty-seven percent of HPWHs were installed in locations that were both unheated and insulated. For Tier 1 HPWHs, 26 percent were reportedly installed with the exhaust ducted to the outside, compared to 64 percent of Tier 2 purchasers' HPWHs (statistically significant).[24] Only 45 percent of Tier 1 respondents were contacted about a quality assurance inspection, compared to 100 percent of Tier 2 purchasers.

Only five percent of Tier 1 purchasers had contacted someone to service their water heater compared to 21 percent of Tier 2 purchasers. Other reasons for contacting someone included the need to repair a broken part, to replace the water heater completely, and to answer questions about the water heater.

7.5 HPWH Usage and Satisfaction

Table 24 shows that in general, Tier 1 purchasers were just as likely to operate their HPWH in heat pump only mode (43%) as Tier 2 purchasers (43%). Additionally, over half of the Tier 2 purchasers reported that they set their HPWH to Auto mode (53%) compared to only 37 percent of Tier 1 purchasers operating in Hybrid mode. However, this finding was not statistically significant. For Tier 1 purchasers, common other settings included high demand and standard.

Table 24: HPWH Operation Mode, by Tier[25]

HPWH Mode	Tier 1 (n=75)	Tier 2 (n=100)	Overall (n=175)
Heat pump only	41%	42%	42%
Auto/Hybrid (heat pump & resistance element)	40%	54%	45%
Resistance only	3%	1%	2%
Other	16%	3%	11%
Total	**100%**	**100%**	**100%**

Q 66. What setting – or operation mode – is your heat pump water heater set for?

As shown in Table 25, the most common reasons for recommending HPWHs include lower energy bills (57%), energy efficiency (22%), and available rebates (15%). Overall, the reasons

[24] Water heater weights used.
[25] Water heater weights used.

for recommending HPWHs were consistent between tiers, however Washington purchasers were statistically more likely to promote the lower energy bills than Oregon purchasers (63% compared to 43% respectively).

Table 25: Reasons for HPWH Recommendation Among Purchasers, by Tier

Reason	Tier 1 (n=72)	Tier 2 (n=99)	Total (n=171)
Lower energy bills	60%	53%	57%
Energy efficient	21%	22%	22%
Rebates/good deals	16%	15%	15%
Improved hot water supply	5%	15%	10%
Good for the environment	6%	8%	7%
Multiple operating modes/programmability	9%*	1%	5%
Operates reliably	0%*	8%	4%
Requires little maintenance	1%	3%	2%
Other	8%	12%	10%

Q 85. What are some of the reasons you recommended or would recommend a heat pump water heater?

* Difference from Tier 2 purchasers at 90% CI is statistically significant.

Overall, as shown below in Table 26, HPWH purchasers were highly satisfied with the sound level of the HPWHs (4.2 out of 5), the change in electricity bill (4.2 out of 5), the maintenance requirements of the HPWH (4.4), and the HPWH overall (4.6 out of 5).

Table 26: Purchaser Mean Satisfaction with HPWH Attributes, by Tier

HPWH Attribute	Tier 1 Purchaser Satisfaction	Tier 2 Purchaser Satisfaction	Overall Satisfaction
The sound level of the HPWH	4.1 (n=78)	4.4 (n=114)	4.2 (n=192)
Change in electricity bill	4.1 (n=69)	4.4 (n=93)	4.2 (n=162)
Maintenance requirements of the HPWH	4.6 (n=75)	4.2 (n=99)	4.4 (n=174)
HPWH overall	4.7 (n=79)	4.5 (n=115)	4.6 (n=194)

Q 72, Q 74, Q78, Q 80. Since installing your water heater, please rate your satisfaction with the following items on our 5-point scale (where 1 means "very dissatisfied" and 5 means "very satisfied")

Appendix C: General Population Households Telephone Surveys Supplemental Findings

C.1 Northwest General Population Demographics and Water Heater Characteristics

Table 27 shows the disposition of self-reported home vintage in the Northwest general population. As shown, most of the homes (58%) were built between 1970 and 2005 and only 4 percent were built since 2006.

Table 27: Home Vintage, by Home Type

Year	Single-Family Detached (n=180)	Manufactured Home (n=18)	Single-Family Attached (n=9)	Total (n=207)
2011-present	1%	5%		1%
2006-2010	2%		9%	3%
2000-2005	10%	10%		9%
1990-1999	17%	19%	52%	19%
1980-1989	7%	42%		10%
1970-1979	20%	18%	22%	20%
1960-1969	9%		9%	8%
Prior to 1960	34%	7%	9%	30%

Q 80. What year was your home built?

Table 28shows household income in 2012, by state. A higher proportion of respondents from Idaho and Montana reported having household incomes below $60,000 than in other states. Washington had the highest proportion of high-income homes, with 13 percent making $120,000 or more.

Table 28: Household Income, by State

Income	ID (n=19)	MT (n=23)	OR (n=61)	WA (n=65)	Overall (n=168)
Under $40k	53%	51%	34%	23%	32%
$40-60k	18%	12%	21%	21%	20%
$60-80k	25%	25%	20%	19%	20%
$80-120k	2%	13%	22%	25%	21%
$120-250k	2%		2%	10%	6%
Over $250k			2%	3%	2%

Q 41. Which of the following categories includes you approximate annual household income from all sources in 2012, before taxes?

The education levels of the general population are very diverse. As shown below, in Table 29, one-fifth completed some high school or received their GED, 31 percent completed some

college or a trade/technical school degree, 30 completed a college degree or some graduate school, and 20 percent received their graduate degree. Rural areas had more respondents than urban areas who completed some high school or received their GED (30% vs. 16%), more who earned a graduate degree (30% vs. 16%), and fewer with some college or a college degree (40% vs. 68%). These differences are all statistically significant.

Table 29: Education Level, by Urban vs. Rural

Education Level	Total (n=205)	Rural (n=65)	Urban (n=140)
Some high school	5%	4%	5%
High school graduate or GED	15%	26%	12%
Trade or technical school	8%	6%	9%
Some college	23%	15%	26%
College graduate	23%	15%	26%
Some graduate school	6%	5%	7%
Graduate degree	20%	30%	16%

Q 17. Which of the following includes the highest level of education you have completed?

C.1.1 Characteristics of Current Water Heater(s)

We asked each homeowner about the age, size, and location of their current water heaters. Table 30 shows the age of the households' water heaters overall, as well as split out into rural and urban areas. More than one-third of electric water heaters in the Northwest are over 10 years old (38 percent), while equal proportions are five to 10 years old and less than five years old (31 percent).

Table 30: Water Heater Age, by Urban vs. Rural

Age of Water Heater, in Years	Total (n=209)	Rural (n=67)	Urban (n=142)
0-1	4%	1%	5%
1-5	27%	39%	23%
5-10	31%	22%	34%
10+	38%	38%	38%

Q WHAGE. Approximately how old is your water heater? Would you say it is…

Approximately eight percent of the households have more than one water heater. The water heaters ranged in size from 20-180 gallons. The average sizes of their water heaters are very similar, 56 gallons for the primary and 57 for the secondary. As shown in Table 31, the majority of primary water heaters were between 40 and 59 gallons (66%), while only 33 percent of secondary water heaters fell within this range. The secondary water heater was statistically significantly more likely than the primary to be small (under 40) or very large (100 and above).

The size of the water heaters varied by state and home type. Unlike all other states, there were no water heaters below 40 or above 60 gallons in Montana. Similarly, all of the water heaters installed in manufactured homes were between 40 and 55 gallons. All of the water heaters that were above 55 gallons were installed in single-family detached homes (i.e. not single-family attached homes/condos or manufactured homes).

Table 31: Water Heater Size in Gallons, for primary and secondary

Size of Water Heater	Primary (n=209)	Secondary (n=17)
0 – 45 gallons	27%	40%
46 – 55 gallons	48%	21%
Over 55 gallons	26%	39%

Q 27. How many gallons is your water heater tank?

The vast majority of households said their water heater(s) provided sufficient hot water under normal circumstances, 96 percent for the primary and 100 percent for the secondary (if applicable).

Most residential electric storage water heaters in the Northwest are located in heated, insulated areas of homes (60% of primary and 80% of secondary). As shown in Table 32, water heaters are most often located in basements, utility closets (or other types of closets), utility rooms and garages. Some other locations that were less common include the attic, kitchen, bathroom, pantry, and bedroom.

Table 32: Specific Locations of Water Heaters

Location	Primary (n=210)	Secondary (n=17)
Basement	35%	28%
Utility or "other" closet	20%	35%
Utility room	19%	14%
Garage	17%	4%
Attic	0%	10%
Other	9%	16%

Q 29. Where is your water heater located? Is it in a…

C.2 Awareness of the Technology and Programs

In this section, we address the general population's awareness of HPWH technology, their awareness of NEEA and utility program incentives, as well as the sources they trust for information about home appliances.

C.2.1 Awareness of HPWH Technology

When planning to look for information about HPWH as opposed to other appliances in general, respondents were statistically significantly more likely to say they would use Internet research (57% versus 41%) or talk to a contractor/installer (12% versus 7%), they were significantly less likely to say they would visit a store/talk to salespeople (15% versus 37%) or turn to a friend/family/acquaintance (6% versus 26%). Respondents were also statistically significantly more likely to say that they planned to use the utility as a source of information about HPWH in the future (12%) then said they typically use the utility when they are deciding which appliance to purchase (6%).

We asked all respondents whether or not there was anything in particular about HPWH that they wish they knew more about. Twenty percent said yes, and the information they want more about is shown in Table 33, below. The most commonly requested information includes how HPWH technology works (24%), more information about everything/general (22%), efficiency of HPWH compared to other types of water heaters (12%), and payback period (11%).

Table 33: General Population HPWH Information Needs

Information Needed	Total (n=41)
How they work	24%
Want to know more about everything/general info	22%
Efficiency/compare to other water heaters	12%
Payback (including rebates, bill savings)	11%
Best place to install one/impact on temp of room	8%
Installation (e.g. cost, time, how it is done)	8%
Measure life/durability/maintenance	6%
Reviews from homeowners/what to expect (e.g. savings, noise)	4%
Other	3%

Q 25. Is there anything in particular about heat pump water heaters that you with you knew more about? What would that be?

C.2.2 Awareness of Programs

There are no additional findings or tables related to general population program awareness not contained in the main sections of the report.

C.3 Interest in Energy Efficiency, Technology, and HPWHs

There are no additional findings or tables related to general population interest in energy efficiency, technology, and HPWHs not contained in the main sections of the report.

C.4 Barriers and Purchase Triggers

We asked respondents who said they were not interested in HPWH (by rating their interest as a three or below) to tell us why. Overall, the most common reasons were the cost of a HPWH (30%), their existing equipment was still working (25%), or it was new/recently replaced (10%). As expected, cost was reported more often among households with lower incomes. Those with incomes below $40k were statistically significantly more likely than others to say the cost is too high (43%) or that they are too old to invest in their home (20%). Those with the incomes above $120k were statistically significantly more likely than others to say they needed to do more research (34%). They also appear to be more likely to say they have low utility bills already (13%), the payback period is too long (13%), or the installation is more complex/difficult (13%) but these differences are not statistically significant.

Table 34: Reason for Low Interest in HPWH

		HH Income			
Reason for Low Interest	**Total (n=174)**	**<$40k (n=48)**	**$40-60k (n=28)**	**$60-$120k (n=53)**	**>$120k (n=9)**
Cost	30%	43%	25%	24%	16%
Existing equipment still working	25%	19%	25%	33%	16%
Existing equipment new/recently replaced	10%	7%	15%	7%	0%
Believe they are too old to invest in home	9%	20%	4%	5%	0%
Need to do more research	9%	3%	10%	10%	34%
Low utility bills already	7%	2%	9%	11%	13%
HPWH would not fit without a remodel	6%	9%	4%	4%	0%
Prefer other (e.g. solar, tankless, gas)	6%	4%	4%	7%	9%
Payback too long	5%	7%	9%	2%	13%
Concerns about tech (e.g. mineral clogs, filter, maintenance)	5%	8%	5%	3%	0%
Planning/considering a move	4%	6%	5%	5%	0%
Not a priority	3%	2%	4%	3%	0%
Interested in HPWH	3%	2%	4%	4%	0%
More complex/difficult installation	2%	0%	7%	0%	13%
No interest	2%	0%	3%	4%	0%
Other[26]	7%	0%	0%	8%	38%

Q 17. Why do you say that?

The 33 respondents who said they were interested in HPWH (by rating their interest as a four or five) were asked what benefits of HPWH are especially attractive to them (this was an open response question). Overall, lower utility bills/lower monthly operating cost (44%) and saving energy (43%) were the most commonly reported. Households in rural areas appear *more* likely than those in urban to say the benefits of HPWH are rebates (30% versus 9%), cost of the water heater (30% versus 8%), the new equipment (5% versus 20%), their concerns about the environment (20% versus 8%), or low maintenance costs (10% versus 0%). Households in rural areas also appear *less* likely than those in urban to say that lower utility bills/lower monthly operating cost was a benefit of HPWH (20% versus 47%).

[26] For household incomes of over $120k, "other" includes noise (n=1), HPWH not ideal for local weather conditions (n=1), and need to consult spouse (n=1). For household income of $60-120k, "other" includes don't trust bill savings are accurate (n=1), don't want to dig up yard (n=1), don't trust manufacturer/warranty (n=1), and "want to use a storage WH to retain water supply in case of emergencies" (n=1).

However, due to the small number of rural respondents for this question, none of these differences are statistically significant.

Table 35: Attractive Benefits of HPWH, Among Interested General Population

Benefits of HPWH	Urban (n=26)	Rural (n=7)	Total (n=33)
Lower utility bills/lower monthly operating cost	47%	20%	44%
Saving energy	43%	40%	43%
Rebates	9%	30%	11%
Cost of the water heater	8%	30%	10%
Tax credits	9%	10%	9%
Concern about carbon footprint/greenhouse gases/environment	8%	20%	9%
New equipment	5%	20%	6%
Payback period	5%		4%
Water heater programmability	5%		4%
Continuous hot water	5%		4%
Low maintenance costs		10%	1%
Don't know	8%		7%

Q 18. What benefits of heat pump water heaters are especially attractive to you?

Appendix D: Additional In-depth Interview Findings

D.1 Utility Future Assistance Needs

Beyond what was presented in Section 5.3.5, the following suggestions were offered by only one utility each:

1. Rather than rely on changing retail staff to accurately describe HWPHs to store customers, provide easily accessible technical information to customers – that is, phone numbers for local utility energy advisors and/or a video web link, versus "stacks of papers buried behind plexi-glass." Store and department managers also need to emphasize that Tier 1 models are as easy to install as standard water heaters.
2. Consider exclusive installer agreements with stocking and installation bonuses to further serve the emergency replacements market.
3. Enhance installation contractor engagement by informing them of increasing retail/distributor stocking.
4. Ensure that any regional NEEA incentives for Tier 2 or Tier 3 products, if offered, are easy for customers to discover.
5. Encourage upstream approaches so rebate applications go direct to utilities and bypass customers.
6. Enhance the website by including information about the GE GeoSpring Tier 2 and Tier 3 ducting options, and add a video on how a HWPH works.

Appendix E: Trained Installer Business Type Inconsistencies

The industry listed for each installer was not consistent across all data sources. Table 36 compares the role in NEEA's HPWH installer data (rows) to the industry in InfoUSA's databases of HVAC and plumbing contractors (columns) for 243 businesses included in both databases.[27] Only one percent of NEEA's five Initiative trained HVAC installers had HVAC-related industries indicated by their Standard Industrial Classification (SIC) code. Most of the HVAC/plumbing installers (95 of 159) were listed as either HVAC or plumbing but not both. The SICs for NEEA's plumbing installers indicated that the primary industries of these businesses were plumbing (45 of 79), a combination of HVAC and plumbing (2 of 79), or some other industry (32 of 79). These findings suggest that the industry role listed in NEEA's HPWH installer data in Table 5 may not accurately reflect the primary activity of the business.

Table 36: Comparison of Installer Role and Industry from Separate Data Sources

Installer Role (from Initiative Database)	Industry, based on SICs				
	HVAC	Plumbing	HVAC & Plumbing	Other[28]	Total
HVAC	1	0	0	4	5
Plumbing	0	45	2	32	79
HVAC/Plumbing	71	24	9	55	159
Total	**72**	**69**	**11**	**91**	**243**

[27] This table does not include all of NEEA's trained HPWH installers, only those that we found in InfoUSA's general population database with the same business name and branch location (i.e. must match on both criteria to be included in this analysis).

[28] Some examples of "other" SIC industries for these business include: remodeling & repairing building contractors, landscape contractors or designers, sheet metal work contractors, lawn & grounds maintenance, and commercial refrigerating equipment wholesale.

Appendix F: Additional Literature Review Findings

In 2012, the DOE calculated the cost of installing and operating a standard HPWH and standard electric resistance water heaters of the same size (50 gallons). They estimated the installation cost of 50 gallon HPWHs and electric resistance water heaters to be $2,100 and $590, respectively. Assuming annual energy savings of 3,023 kWh and energy costs of $0.107 per kWh, they determined the payback period to range from 5.3 to 6.6 years, depending on the house size (by number of bedrooms).[29] Given the same assumptions for installed HPWH cost and annual energy savings, but using average statewide April 2014 electricity prices[30] in the Northwest states of $0.0966/kWh (ranging from $0.0875/kWh in Washington to $0.1037/kWh in Oregon)[31] the average payback period is approximately five years.

In its market strategies report, NEEP argued that market adoption rates would increase significantly if the payback/financial benefits began within two years instead of five. One theory it presented in the report was that driving sales in the short-term would saturate the market with the technology and experience needed to reduce long-term costs of the technology. Until this payback period can be shortened, NEEP believes HPWHs should be marketed for their other positive characteristics: finer level of control, environmentally responsible technology, benefits for air conditioning and dehumidification, and others (NEEP, 2012).

ENERGY STAR's 2010 market profile for water heaters provided information about the distribution channels typically used for water heaters, indicating that market actors play a significant role in these transactions, shown in Figure 12.[32] According to this distribution chart, wholesalers/distributors and retailers are involved in the largest number of water heater transactions (50 percent each), followed by plumbers (involved in 86 percent of all water heater sales from wholesalers/distributors and 34 percent of sales from retailers to homeowners), remodelers (3 percent overall), and builders (2 percent overall). Only 31 percent of water heaters do not involve a plumber, remodeler, or builder; instead, the homeowner or property owner installs them. Even in the case of a self-install, a market actor is involved when the homeowner purchases the equipment from a retailer or wholesaler/distributor (D&R International, Ltd., 2010).

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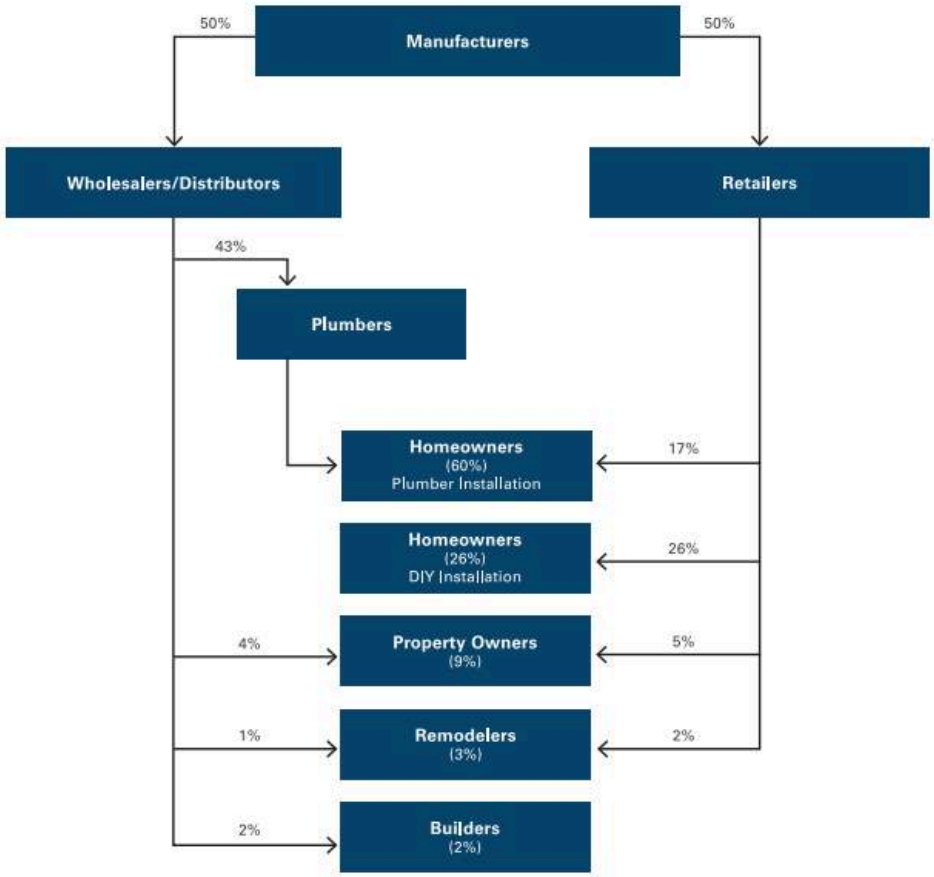
[29] US Department of Energy. Measure Guideline: Heat Pump Water Heaters in New and Existing Homes. 2012. http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_hpwh.pdf

[30] We used a straight average of statewide electricity price and did not consider the different populations of the four Northwest states; these results are not intended to inform an assessment of impacts but rather to apply DOE's assumptions to the Northwest context (significantly lower electricity costs).

[31] US Energy Information Administration, Form EIA-826, Monthly Electric Sales and Revenue Report with State Distributions Report. http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

[32] ENERGY STAR. Water Heater Market Profile: Efficiency Sells. 2010. http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/Water_Heater_Market_Profile_2010.pdf?0544-2a1e

Figure 12: Water Heater Distribution Channels (D&R International, Ltd., 2010)



According to NEEP's research, many water heaters are not early replacements, but are installed during emergencies when their existing water heater fails. They argued that during emergencies, people are less likely to adopt new technologies that they are unfamiliar with so midstream market actors can play a key role in these scenarios by introducing the option of HPWH technology when purchasers are rushed and unable to do extensive research before making their purchasing decision. Research conducted on behalf of NEEA suggests this may not apply to the Northwest, as it shows that only 10 percent of consumer purchases are influenced by sales associates and that consumers are most influenced by peer reviews, contractors, and other reliable sources such as utilities before they get into an emergency situation (ILLUME, 2015).

NEEP's report also argued that energy efficiency programs can act as a validation for consumers, pointing to technologies that they can trust as worthwhile investments. However, if programs market technologies that are not reliable, this effect can backfire and damage the consumer's view of the technology by saturating the market with an inferior product. Similarly, overpromising financial benefits of a technology can damage consumer perceptions, making accurate energy savings estimates especially important.

Appendix G: Survey Instruments/ Interview Guides

G.1 Homeowners with HPWHs Telephone Survey Tool

Recruitment:
Hi. This is _____ with CIC Research. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) for a survey on heat pump water heaters.
We're surveying households who recently purchased and installed a heat pump water heater and received a financial incentive from either "Smart Water Heat", NEEA or a local utility. The information you give will help NEEA improve the program for homeowners in the future.

Q 1. First, how did you first hear about heat pump water heaters? [DO NOT READ; CHOOSE ONE - THE FIRST PLACE THEY HEARD OF IT]
1. Previously owned one
2. Friend or acquaintance
3. Utility print advertising, bill stuffer
4. Utility website
5. "Smart Water Heat" website
6. Retail store display / saw it in store
7. Retail store salesperson
8. Newspaper ad
9. Newspaper story
10. Television ad
11. Social media
12. From contractor/installer
13. Internet research
14. Internet advertising
15. Installed prior to respondent moving in to the home (TERMINATE)
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 2. Did you hear about them anywhere else or learn more about them from any other sources? [DO NOT READ; ACCEPT MULTIPLES]
1. Previously owned one
2. Friend or acquaintance has one
3. Utility print advertising, bill stuffer
4. Utility website
5. "Smart Water Heat" website
6. Retail store display / saw it in store
7. Retail store salesperson
8. Newspaper ad
9. Newspaper story
10. Television ad

11. Social media
12. From contractor/installer
13. Internet research
14. Internet advertising
15. Installed prior to respondent moving in to the home (TERMINATE)
16. Nowhere else
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 3. And how did you first hear about the AirGenerate brand of heat pump water heaters? [DO NOT READ; CHOOSE ONE, THE FIRST PLACE THEY HEARD OF IT]

1. Previously owned one
2. Friend or acquaintance has one
3. Utility print advertising, bill stuffer
4. Utility website
5. "Smart Water Heat" website
6. Retail store display / saw it in store
7. Retail store salesperson
8. Newspaper ad
9. Newspaper story
10. Television ad
11. Social media
12. From contractor/installer
13. Internet research
14. Internet advertising
15. Installed prior to respondent moving in to the home (TERMINATE)
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 4. Did you hear about AirGenerate heat pump water heaters from anywhere else or learn more about it from any other sources? [DO NOT READ; ACCEPT MULTIPLES]

1. Previously owned one
2. Friend or acquaintance has one
3. Utility print advertising, bill stuffer
4. Utility website
5. "Smart Water Heat" website
6. Retail store display / saw it in store
7. Retail store salesperson
8. Newspaper ad
9. Newspaper story
10. Television ad
11. Social media

12. From contractor/installer
13. Internet research
14. Internet advertising
15. Installed prior to respondent moving in to the home (TERMINATE)
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 5. When making an appliance purchase decision, what are your typical sources of information regarding which product to purchase?
1. Friends or acquaintances
2. Utility print advertising, bill stuffers
3. Utility website
4. Retail store – general
5. Retail store displays
6. Retail store salespeople
7. Newspaper ads
8. Newspaper stories
9. Television ads
10. Social media
11. From contractor/installer
12. Internet research / Internet reviews
13. Internet advertising
14. Specific Internet website, please specify: _____
77. Other, please specify: _____
88. Refused
89. Don't Know

Replaced Water Heater Characteristics

Now I would like to ask you some questions about the water heater that you replaced, and your reason for replacing it.

Q 6. What was the brand of your previous water heater? [DO NOT READ; ACCEPT ONE RESPONSE]
1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux

12. Rheem
13. Bradford White
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 7. Do you think it was a … [READ LIST; ROTATE LIST; ACCEPT ONE RESPONSE]
1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 8. How many gallons was your previous water heater tank?
Gallons: _____
7777. Tankless / On demand / Instantaneous
8888. Refused
9999. Don't Know

Q 9. Under normal circumstances, was your old water heater able to provide sufficient hot water for your household?
1. Yes
2. No
88. Refused
89. Don't Know

Q 9.a. How many gallons is your new heat pump water heater tank?
Gallons: _____
88. Refused
89. Don't Know

Q 10. Why did you choose to install a larger heat pump water heater?
RECORD VERBATIM: _____

90. Refused
91. Don't Know

Q 11. Why did you choose to install a smaller heat pump water heater?
RECORD VERBATIM: _____
92. Refused
93. Don't Know

My next question is about your decision to install ANY new water heater. The question includes the term "emergency replacement", which we are defining as the need to replace your previous water heater because it became non-functional and incapable of providing hot water for your home. If your water heater was in working condition – even if it wasn't working very well or you didn't like it for one reason or another – we want to consider that a planned replacement.

Q 12. Did you replace your previous water heater in an emergency situation, for example maybe it broke, or was it a planned replacement?
1. Emergency situation
2. Planned replacement
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 13. What was the reason you decided it was time to replace your previous water heater? [DO NOT READ LIST; ACCEPT MULTIPLE]
1. Not enough hot water
2. Getting old, time for a replacement
3. Occasional malfunction
4. Rusted
5. Noisy
6. Leaky
7. Cost to operate
8. Efficiency ("it was inefficient")
77. Other, please specify: _____
88. Refused
89. Don't Know

Purchase Decision / Importance of Incentives

Next I would like to ask you some questions about your decision to purchase a heat pump water heater.

Q 14. Where did you get information about the heat pump water heater before you made your purchase? [CHECK ALL THAT APPLY]
1. NEEA website

2. Smart Water Heat website
3. Utility website
4. Internet (general)
5. Contractor provided materials
6. Spoke to the contractor
7. Spoke to someone who already had a heat pump water heater installed
8. Did not look for any information
9. Utility provided information
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 15. What specific information did the contractor provide before the water heater was purchased?
RECORD VERBATIM: _____
90. Refused
91. Don't Know

Q 16. What initially interested you in a heat pump water heater, as opposed to other types of water heaters? [DO NOT READ, PROBE TO CODE, CHECK ALL THAT APPLY]
1. The rebates
2. The payback period
3. The lower monthly operating cost
4. Saving energy
5. Concern of carbon footprint / greenhouse gases
6. The product's appearance
7. The availability of the rebate
8. Past participation in similar program
9. The recommendation by contractor / plumber
10. The water heater's programmability
11. A bad experience with previous water heater
12. The product warranty
13. A desire to be high tech
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 17. How important was <Q 16> in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important?
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 18. Why do you say that?

RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 19. How important were the Smart Water Heat rebates from NEEA in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important?
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 20. How important were the rebates from your utility in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important?
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Now I am going to ask you to rate how important each of the following factors was in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important.

How important was…	[Rating of Importance]	[If = 1 or 2] Why do you say that?
Q 21 …. the ENERGY STAR® label?	1 2 3 4 5 77 88 99	Q 22
Q 23. … the information on the Smart Water Heat website?	1 2 3 4 5 77 88 99	Q 24
Q 25. … your familiarity with the water heater brand?	1 2 3 4 5 77 88 99	Q 26

Q 27. Were there any other factors that were important in your decision to install a heat pump water heater?
1. Yes, please specify: _____
2. No
88. Refused
89. Don't Know

Q 28. Do you believe the heat pump water heater increased, decreased, or had no effect on the value of your home?
1. Increased the value
2. Decreased the value
3. No effect on value of home

77. Other, please specify: _____
88. Refused
89. Don't Know

Q 29. Would you have purchased the same water heater if the Smart Water Heat rebate were half as much, that is, [1/2 INCENTIVESWH$] instead of [INCENTIVESWH$]?
1. Yes
2. Maybe
3. No
88. Refused
89. Don't Know

Q 30. Was there anything you were concerned about when you were considering a heat pump water heater? [DO NOT READ; CHECK ALL THAT APPLY]
1. No concerns
2. Appearance
3. Performance
4. Energy savings
5. Capability/functionality
6. Cost
7. Reliability
8. Brand
9. Noise
10. Physical size
11. Ducting
12. Maintenance needs
13. Equipment warranty
14. Manufacturer customer service/support
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 31. How did you overcome the <Q 30> concern?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 32. Did you use a loan to pay for your new water heater?
1. Yes
2. No
88. Refused
89. Don't Know

Q 33. From which of the following sources did you get that loan? Was it from a… [READ CHOICES]
1. Local bank or credit union
2. Utility company
3. Installation contractor
4. Manufacturer
5. Retailer credit
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 34. Please rate how important the availability of the loan was in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important.
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 35. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 36. What was the interest rate of the loan you received for the new water heater?
RATE: _____%
88. Refused
89. Don't Know

Q 37. Did you, or will you, receive a federal tax credit for your new water heater?
1. Yes – received already
2. Yes – will receive
3. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 38. Please rate how important the availability of the federal tax credit was in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important.
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 39. Why do you say that?
RECORD VERBATIM: _____
88. Refused

89. Don't Know

Q 40. Did you, or will you, receive a state tax credit for your new water heater?
1. Yes – received already
2. Yes – will receive
3. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 41. Please rate how important the availability of the state tax credit was in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important.
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 42. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Installation, Inspections, Experience and Satisfaction
Now I would like to ask a few questions about the installation itself.
Q 43. [If CONST_SR = EXISTING or UNK] Did you install the new water heater yourself, or did you hire an installer to do it?
1. Installed by respondent
2. Hired an installer
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 44. Did you install the new water heater yourself, did you hire an installer to do it separate from your home build, or did the general contractor building your home manage the installation?
1. Installed by respondent
2. Hired an installer separate from home build
3. General contractor managed installation
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 45. Whose idea was it to purchase a heat pump water heater rather than another type of water heater? Was it your idea or was it the installer or contractor's suggestion?
1. Was customer's idea

2. Was contractor suggestion
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 46. How did you find the person or company that installed your new water heater? [DO NOT READ; ACCEPT MULTIPLE]
1. Smart Water Heat website / contractor finder
2. Angie's List
3. Craigslist
4. Personal recommendation
5. Retailer recommendation
6. Manufacturer recommendation
7. Previous relationship with contractor
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 47. What was the most important source for finding the person or company that installed your new water heater? [DO NOT READ; ACCEPT ONE]
1. Smart Water Heat website / contractor finder
2. Angie's List
3. Craigslist
4. Personal recommendation
5. Retailer recommendation
6. Manufacturer recommendation
7. Previous relationship with contractor
78. Other, please specify: _____
88. Refused
89. Don't Know

Q 48. Please rate your level of satisfaction with the installer who installed your new water heater, where 1 is not at all satisfied, and 5 is very satisfied.
SATISFACTION: 1 2 3 4 5
88. Refused
89. Don't Know

Q 49. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 50. How long did the actual water heater installation take, in total? Did it take… [READ LIST; ACCEPT ONE]

1. Less than 2 hours
2. 2-4 hours
3. 4-6 hours
4. 6-8 hours
5. 8-10 hours or
6. Over 10 hours?
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 51. Please rate your level of satisfaction with the amount of time it took to install the new water heater, where 1 is not at all satisfied, and 5 is very satisfied.
SATISFACTION: 1 2 3 4 5
88. Refused
89. Don't Know

Q 52. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 53. Where is your new water heater located? Is it in a… [READ LIST; ACCEPT ONE]
1. Basement
2. Garage
3. Utility room
4. Utility closet
5. Kitchen
6. Other closet inside your home
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 54. Was your previous water installed in the same location as your new HPWH?
1. Yes
2. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 55. Where was your previous water heater located? Was it in a⋯ [READ LIST; ACCEPT ONE]
1. Basement
2. Garage
3. Utility room

4. Utility closet
5. Kitchen
6. Other closet inside your home
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 56. Is your new water heater installed in a part of your house that is heated?
1. Yes – heated
2. No – unheated
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 57. Is your new water heater installed in a part of your house that is insulated?
1. Yes – insulated
2. No – not insulated
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 58. Is your new water heater installed with the exhaust ducted to the outside? This would have required a 6-inch hole be drilled into the wall of your house.
1. Yes – exhaust is ducted
2. No – exhaust is not ducted
77. Other, please specify: _____
88. Refused
89. Don't Know

And now I would like to talk about inspections that may have taken place since the new water heater was installed.

Q 59. Did someone contact you and come to your home after the heat pump water heater was installed to conduct a quality assurance inspection?
1. Yes
2. No
88. Refused
89. Don't Know

Q 60. Please rate your level of satisfaction with the quality assurance visit, where 1 is not at all satisfied, and 5 is very satisfied.
SATISFACTION: 1 2 3 4 5
88. Refused
89. Don't Know

Q 61. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 62. After your heat pump water heater installation, someone contacted you and came to your house to conduct a quality assurance visit. Please rate your level of satisfaction with the quality assurance visit, where 1 is not at all satisfied, and 5 is very satisfied.
SATISFACTION: 1 2 3 4 5
88. Refused
89. Don't Know

Q 63. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 64. Other than the quality assurance visits, did you have to contact anyone for any of the following reasons? How about … [READ LIST; ACCEPT MULTIPLE]
1. To service the water heater?
2. To repair a broken part of the water heater?
3. To replace the entire water heater?
4. To answer questions about the water heater performance?
5. [No]
77. Other, please specify: _____
88. Refused
89. Don't Know

Next, I'd like to ask about your experiences with your heat pump water heater.
Q 65. Did the installer/contractor educate you regarding which water heater settings to use?
1. Yes
2. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 66. What setting – or operation mode – is your heat pump water heater set for?
1. Econ (heat pump only)
2. Auto (heat pump and resistance element)
3. Heater (resistance element only)
4. Heat Pump (only)
5. Hybrid (heat pump and resistance element)
6. Standard
7. Vacation

8. High Demand
9. Efficiency Mode
10. Electric Mode
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 67. Prior to now, were you aware that the heat pump water heater's air filter must be cleaned?
1. Yes
2. No
88. Refused
89. Don't Know

Q 68. Did the installer inform you that the air filter must be cleaned?
1. Yes
2. No
88. Refused
89. Don't Know

Q 69. Has the air filter in your new water heater ever been cleaned, either by you or by someone you hired?
1. Yes
2. No
88. Refused
89. Don't Know

Q 70. How often is the air filter cleaned? Would you say it's cleaned… [READ LIST; ACCEPT ONE]
1. Every other year
2. Every year
3. More than once a year
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 71. Now I'll read a list of possible reasons why people don't clean their heat pump water heater's air filter. Can you tell me which of these apply to you?
1. Didn't know I needed to
2. It's too new, haven't had to yet
3. Not sure how
4. Too difficult
5. Just haven't gotten around to it
6. Forgot to

7. Need to find someone to do it
77. Other, please specify: _____
88. Refused
89. Don't Know

Since installing your water heater, please rate your satisfaction with the following items on our 5-point scale (where 1 means "very dissatisfied" and 5 means "very satisfied") How about …?

	[Rating of Satisfaction]	[If = 1 or 2] Why do you say that?
Q72. … the sound level of the heat pump water heater?	1 2 3 4 5 88 99	Q73
Q74…. the change in your electricity bill?	1 2 3 4 5 88 99	Q75
Q76. … your hot water supply?	1 2 3 4 5 88 99	Q77
Q78 … the maintenance requirements of the heat pump water heater?	1 2 3 4 5 88 99	Q79
Q80 … the heat pump water heater overall?	1 2 3 4 5 88 99	Q81

Q 82. Overall, has the heat pump water heater met your expectations?
1. Yes
2. No
88. Refused
89. Don't Know

Q 83. Where did it fall short of meeting your expectations?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 84. Have you, or would you, recommend a heat pump water heater to a friend, colleague or family member?
1. Yes, have
2. Yes, would
3. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 85. What are some of the reasons you recommended or would recommend a heat pump water heater? (DO NOT READ, ACCEPT MULTIPLES)
1. Lower energy bills
2. Improved hot water supply
3. Equipment cost is reasonable
4. Appearance is good/acceptable
5. Good for the environment
6. Operates reliably
7. Requires little maintenance
77. Other, please specify: _____
88. Refused
89. Don't Know

Household Demographics

Lastly, I would like to ask a few questions about you and your household.
[IF NEEDED] The questions are for classification purposes only. All your answers will be kept confidential.

Q 86. What type of home do you live in? Is it a . . . [READ LIST; ACCEPT ONE]
1. Single-family detached home
2. Single-family attached home
3. Mobile home
4. Apartment
5. Condo
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 87. Do you own or rent your home?
1. Own
2. Rent
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 88. What year was your home built?
YEAR: _____
88. Refused
89. Don't Know

Q 89. Would you say… [READ LIST; ACCEPT ONE]
1. 2011 to present?
2. 2006 – 2010?
3. 2000 – 2005?

4. 1990 – 1999?
5. 1980 – 1989?
6. 1970 – 1979?
7. 1960 – 1969?
8. Prior to 1960?

8888. Refused
9999. Don't Know

Q 90. What is your home's primary heat source? Is it… [READ LIST; ACCEPT ONE]

1. Electricity
2. Natural gas from a utility
3. Kerosene
4. Wood/Wood pellet
5. Propane gas

77. Something else? (Please specify:) _____
88. Refused
89. Don't Know

Q 91. What type of electric heater is your primary heater? [DO NOT READ LIST UNLESS NECESSARY; CHECK ONE ONLY]

1. Forced air furnace
2. Baseboards
3. Wall heaters
4. Electric radiant heaters
5. Ductless heat pump (DHP)
6. Space heaters

77. Other, please specify: _____
88. Refused
89. Don't Know

Q 92. What type of gas heater is your primary heater? [DO NOT READ LIST UNLESS NECESSARY; CHECK ONE ONLY]

1. Forced air furnace
2. Wall heaters
3. Natural gas radiant heaters

77. Other, please specify: _____
88. Refused
89. Don't Know

Q 93. How many people live in your household, including yourself?
NUMBER OF PEOPLE: _____
88. Refused
89. Don't Know

Q 94. Which of the following groups includes your age? How many people in your household are in each of the following age groups? Be sure to include yourself.
[Age Group] Number of People
A. 5 years and under
B. 6 - 17 years old
C. 18 - 24 years old
D. 25 - 34 years old
E. 35 - 44 years old
F. 45 - 54 years old
G. 55 - 64 years old
D. 65 and older
88. Refused
89. Don't Know

Q 95. Which of the following includes the highest level of education you have completed? [READ LIST; ACCEPT ONE]
1. Some high school
2. High school graduate or GED
3. Trade or technical school (2 year degree)
4. Some college
5. College graduate
6. Some graduate school
7. Graduate degree
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 96. Which of the following categories includes your approximate annual household income from all sources in 2012, before taxes?
1. Less than $40,000
2. Between $40,001 and $60,000
3. Between $60,001 and $80,000
4. Between $80,001 and $120,000
5. Between $120,001 and $250,000
6. Over $250,000
88. Refused
89. Don't Know

Q 97. Do you consider yourself Hispanic or Latino?
1. Yes
2. No
88. Refused
89. Don't Know

Q 98. Which of these ethnicities describe you? I'll read a list and you can tell me all that apply. [READ ALL, ACCEPT MULTIPLES]
1. White
2. Black or African American
3. American Indian or Alaska Native
4. Asian
5. Native Hawaiian or Other Pacific Islander
77. Or another ethnicity? (Please specify:) _____
88. Refused
89. Don't Know

Q 99. What is the ZIP code of your home, where the heat pump water heater was installed?
ZIP code: _____
88. Refused

Q 100. For verification purposes only, may I have your name? [BE SURE TO GET BOTH FIRST AND LAST NAMES IF THEY'LL GIVE IT]
NAME: _____
88. Refused

Q 100. [Interviewer: Record Gender]
1. Male
2. Female
89. Don't Know

Thank you VERY MUCH for your time!

G.2 General Population Homeowners Telephone Survey Tool

Recruitment:
Hi. This is _____ with CIC Research. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) to talk with you about water heaters. The research will help NEEA better understand the Northwest water heating market and they would very much appreciate your input.

Awareness, Interest, and Perceptions
Q 1. Before today, had you heard of the Northwest Energy Efficiency Alliance, or NEEA?
1. Yes
2. No
88. Refused
89. Don't Know

Q 2. Before today, had you heard the term "heat pump" related to any appliances?
1. Yes
2. No
88. Refused
89. Don't Know

Q 3. Before today, had you heard the term "heat pump water heater"?
1. Yes
2. No
88. Refused
89. Don't Know

Q 4. Heat pump water heaters use an electric heat pump to transfer heat from outside of the unit to the water in the tank rather than generating heat directly. This method of heating works like a refrigerator, but in reverse. Have you heard of these?
1. Yes – aided
2. No
88. Refused
89. Don't Know

Q 5. Have you ever seen a heat pump water heater in person?
1. Yes
2. No
88. Refused
89. Don't Know

Q 6. How did you first hear about heat pump water heaters? [DO NOT READ; ACCEPT ONE - THE FIRST PLACE THEY HEARD OF IT]

1. Currently own one [SWITCH TO HPWH USER SURVEY]
2. Previously owned one
3. Friend or acquaintance
4. Utility print advertising, bill stuffer
5. Utility website
6. "Smart Water Heat" website
7. Retail store display / saw it in store
8. Retail store salesperson
9. Newspaper ad
10. Newspaper story
11. Television ad
12. Social media
13. From contractor/installer
14. Internet research
15. Internet advertising
16. Installed prior to respondent moving in to the home (TERMINATE)
77. Other, please specify: _____
88. Refused
89. Don't Know

Q6a. We are also conducting interviews with those people who currently have Heat Pump Water Heaters. We would like to include you in that survey but I don't have that survey in front of me at the moment.

Could we arrange a date and time to call you back to do that survey?

1. Yes – Arrange a callback on paper (then terminate)
2. No - TERMINATE

Q 7. Did you hear about them anywhere else or learn more about them from any other sources? [DO NOT READ; ACCEPT MULTIPLES]

1. Previously owned one
2. Friend or acquaintance has one
3. Utility print advertising, bill stuffer
4. Utility website
5. "Smart Water Heat" website
6. Retail store display / saw it in store
7. Retail store salesperson
8. Newspaper ad
9. Newspaper story
10. Television ad
11. Social media
12. From contractor/installer
13. Internet research
14. Internet advertising

15. Installed prior to respondent moving in to the home (TERMINATE)
16. Nowhere else
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 8. When making an appliance purchase decision, what are your typical sources of information regarding which product to purchase? [DO NOT READ; ACCEPT MULTIPLES]
1. Friends or acquaintances
2. Utility print advertising, bill stuffers
3. Utility website
4. Retail store – general
5. Retail store displays
6. Retail store salespeople
7. Newspaper ads
8. Newspaper stories
9. Television ads
10. Social media
11. From contractor/installer
12. Internet research / Internet reviews
13. Internet advertising
14. Specific Internet website, please specify: _____
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 9. Have you ever considered installing a heat pump water heater in your home?
1. Yes
88. No
89. Refused
90. Don't Know

Q 10. What was the primary reason you chose not to install one (yet)? [DO NOT READ; ACCEPT ONE]
1. Existing equipment works fine
2. Can't find a local installer
3. Doesn't work in my climate
4. Aesthetics/they are ugly
5. They cost too much
6. They are too noisy
7. Maintenance hassles
8. Don't believe savings claims
77. Other, please specify: _____
88. Refused

89. Don't Know

Q 11. Were there other reasons why you chose not to install a heat pump water heater? [DO NOT READ; ACCEPT MULTIPLES]
1. Existing equipment works fine
2. Can't find a local installer
3. Doesn't work in my climate
4. Aesthetics/they are ugly
5. They cost too much
6. They are too noisy
7. Maintenance hassles
8. Don't believe savings claims
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 12. Were you aware that many utilities in the Northwest offer their customers cash rebates or point-of-sale rebates for purchasing and installing a heat pump water heater?
1. Yes
2. No
88. Refused
89. Don't Know

Q 13. Can you tell me the amount of your utility's rebate for heat pump water heaters? [IF NOT SURE: Can I get your best estimate?]
1. Yes – GET AMOUNT (code $0 for "none offered")
2. No
88. Refused
89. Don't Know

Q13amt. What is/was the amount of your utility's rebate for heat pump water heaters?

Q 14. Were you aware that the Smart Water Heat program offers cash rebates for purchasing and installing specific types of heat pump water heaters?
1. Yes
2. No
88. Refused
89. Don't Know

Q 15. Can you tell me the amount of the Smart Water Heat rebate for heat pump water heaters? [IF NOT SURE: Can I get your best estimate?]
1. Yes – GET AMOUNT (code $0 for "none offered")
2. No
88. Refused

89. Don't Know

Q15amt. What is/was the amount of the Smart Water Heat rebate for heat pump water heaters?

Q 16. Now I would like to tell you a little more about heat pump water heaters. How interested would you be in installing a heat pump water heater in your home? Please rate your level of interest on a five-point scale, with 1 being not at all interested, and 5 being very interested.
INTEREST: 1 2 3 4 5
88. Refused
89. Don't Know

Q 17. Why do you say that?
RECORD VERBATIM: _____
88. Refused
89. Don't Know

Q 18. What benefits of heat pump water heaters are especially attractive to you? [DO NOT READ; ACCEPT MULTIPLES]
1. The rebates
2. The tax credits
3. The cost of the water heater
4. The payback period
5. Lower utility bills / The lower monthly operating cost
6. Saving energy
7. Concern of carbon footprint / greenhouse gases / environment
8. The product's appearance
9. The availability of the rebate
10. Past participation in similar program
11. The recommendation by contractor / plumber
12. The water heater's programmability
13. A bad experience with previous water heater
14. The product warranty
15. A desire to be high tech
16. New equipment
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 19. Have you heard of any brands that make heat pump water heaters?
1. Yes
2. No
88. Refused

89. Don't Know

Q 20. What heat pump water heater brands have you heard of? [DO NOT READ; ACCEPT MULTIPLES]
1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 21. What heat pump water heater brands would you consider buying? [DO NOT READ; ACCEPT MULTIPLES]
1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
14. None
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 22. Would you consider buying a heat pump water heater made by: [READ BRANDS BELOW NOT ALREADY MENTIONED IN Q 21, RANDOMIZE]
[Note: For each brand, record Yes=1, No=2, or Don't Know=89]

1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White

Q 23. Which of these reasons – if any – would make you much more likely to buy a new heat pump water heater? [READ EACH ITEM AND GET A YES OR NO BEFORE CONTINUING TO NEXT ITEM; RANDOMIZE]
1. The cost of heat pump water heaters declines
2. Your current water heater breaks down
3. A contractor or retail business offers a special promotion
4. Your household finances improve
5. Your local utility rebate increases
77. Some other reason (GET DETAILS)

Q 24. Is there any combination of these things that would make you much more likely to buy a heat pump water heater for your home?
1. Yes (READ OPTIONS ABOVE AND RECORD WHICH COMBINATION OF CHANGES)
2. No
77. Other, please specify: _____
88. Refused
89. Don't Know

Q24a. What combinations of these things that would make you much more likely to buy a heat pump water heater for your home? (Put ANSWER on paper)

Q 25. Is there anything in particular about heat pump water heaters that you wish you knew more about?
1. Yes (What would that be? RECORD DETAILS)
2. No
88. Refused
89. Don't Know

Q 26. Where would you go if you wanted more information about heat pump water heaters? (NOTE: If they say "contractor" or "installer" ask them to specify HVAC or Plumbing) (DO NOT READ; MULTIPLES OK)
1. Utility
2. HVAC contractor
3. Plumbing contractor
4. Electrical contractor
5. Contractor – unknown / general
6. NEEA / Smart Water Heat Initiative
7. Manufacturer
8. Friends/family I trust
9. Internet/online
77. Other, please specify: _____
88. Refused
89. Don't Know

Water Heater Characteristics
Now I have a few questions about your current water heater.

Q 27. How many gallons is your water heater tank?
Gallons: _____
8888. Refused
9999. Don't Know

Q 28. Under normal circumstances, is your water heater able to provide sufficient hot water for your household?
1. Yes
2. No
88. Refused
89. Don't Know

Q 29. Where is your water heater located? Is it in a… [READ LIST; ACCEPT ONE]
1. Basement
1. Garage
2. Utility room
3. Utility closet
4. Kitchen
5. Other closet inside your home
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 30. Is your water heater located in a part of your house that is heated?
1. Yes – heated

2. No – unheated
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 31. Is your water heater located in a part of your house that is insulated?
1. Yes – insulated
2. No – not insulated
77. Other, please specify: _____
88. Refused
89. Don't Know

Household Demographics
Lastly, I would like to ask a few questions about you and your household.
[IF NEEDED] The questions are for classification purposes only. All your answers will be kept confidential.

Q 32. How important is it for you to have an energy-efficient home? Please rate your level of importance on a five-point scale, with 1 being not at all important, and 5 being very important.
IMPORTANCE: 1 2 3 4 5
88. Refused
89. Don't Know

Q 33. Now I'd like you to think about how quickly you, personally, adopt new technology. Which of the following do you think best describes you? (READ; ONE ANSWER ONLY?)
1. I am the first among my friends to purchase new technology
2. I purchase new technology sooner than most of my friends
3. I am typically in the middle of the group when purchasing new technology
4. I purchase new technology after most of my friends have purchased it
5. I am one of the last people to purchase new technology
88. Refused
89. Don't Know

Q 34. What type of home do you live in? Is it a . . . [READ LIST; ACCEPT ONE]
1. Single-family detached home
2. Single-family attached home
3. Mobile home
4. Apartment
5. Condo
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 35. Do you own or rent your home?

1. Own
2. Rent
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 36. What year was your home built?
YEAR: _____
88. Refused
89. Don't Know

Q 37. Would you say… [READ LIST; ACCEPT ONE]
3. 2011 to present?
4. 2006 – 2010?
5. 2000 – 2005?
6. 1990 – 1999?
7. 1980 – 1989?
8. 1970 – 1979?
9. 1960 – 1969?
10. Prior to 1960?
8888. Refused
9999. Don't Know

Q 38. How many people live in your household, including yourself?
NUMBER OF PEOPLE: _____
88. Refused
89. Don't Know

Q 39. Which of the following groups includes your age?
How many people in your household are in each of the following age groups? Be sure to include yourself.
[Age Group] Number of People
A. 5 years and under
B. 6 - 17 years old
C. 18 - 24 years old
D. 25 - 34 years old
E. 35 - 44 years old
F. 45 - 54 years old
G. 55 - 64 years old
D. 65 and older
88. Refused
89. Don't Know

Q 40. Which of the following includes the highest level of education you have completed? [READ LIST; ACCEPT ONE]
1. Some high school
2. High school graduate or GED
3. Trade or technical school (2 year degree)
4. Some college
5. College graduate
6. Some graduate school
7. Graduate degree
77. Other, please specify: _____
88. Refused
89. Don't Know

Q 41. Which of the following categories includes your approximate annual household income from all sources in 2014, before taxes?
1. Less than $40,000
2. Between $40,001 and $60,000
3. Between $60,001 and $80,000
4. Between $80,001 and $120,000
5. Between $120,001 and $250,000
6. Over $250,000
88. Refused
89. Don't Know

Q 42. Do you consider yourself Hispanic or Latino?
1. Yes
2. No
88. Refused
89. Don't Know

Q 43. Which of these ethnicities describe you? I'll read a list and you can tell me all that apply. [READ ALL, ACCEPT MULTIPLES]
1. White
2. Black or African American
3. American Indian or Alaska Native
4. Asian
5. Native Hawaiian or Other Pacific Islander
77. Or another ethnicity? (Please specify:) _____
88. Refused
89. Don't Know

Q 44. What is the ZIP code of your home?
ZIP code: _____
88. Refused

Q 45. For verification purposes only, may I have your name? [BE SURE TO GET BOTH FIRST AND LAST NAMES IF THEY'LL GIVE IT]
NAME: _____
88. Refused

Q 46. [Interviewer: Record Gender]
1. Male
2. Female
89. Don't Know

Thank you VERY MUCH for your time!

G.3 Water Heater Installers Telephone Survey Tool

HPWH Awareness Screener
Q 1. Have you heard of heat pump, or hybrid, water heaters?
1. Yes
2. No
88. Don't know
89. Refused

Q 2. Heat pump water heaters use an electric heat pump to transfer heat from outside of the unit to the water in the tank rather than generating heat directly. This method of heating works like a refrigerator, but in reverse. Have you heard of these?
1. Yes
2. No
88. Don't know
89. Refused

Q 3. Is there someone else at your company who might know about heat pump water heaters?
1. Yes – Restart survey with new contact
2. No – Thank and Terminate
88. Don't know – Thank and Terminate
89. Refused – Thank and Terminate

Installer Background
OK, let's start by getting a little information about your company.
Q 4. Does your firm install water heaters in residential locations in… [READ CHOICES; ACCEPT MULTIPLE]
1. Washington?
2. Oregon?
3. Idaho?
4. Montana?
88. Don't know
89. Refused

Q 5. First, about what percentage of your company's revenues at the location we have called are from any type of residential water heater installation?
____% 888=Don't know 999=Refused

Q 6. About what percentage of your company's revenues at the location we have called are from residential electric storage water heater installations, as a whole? [IF NEEDED: electric heat pump water heaters and other electric storage water heaters]
____% 888=Don't know 999=Refused

Q 7. About what percentage of your company's revenues at the location we have called are from residential heat pump water heater installations?
____% 888=Don't know 999=Refused

Q 8. Some of the electric utilities in this region, as well as NEEA offer incentives for qualifying heat pump water heaters as part of the Smart Water Heat Initiative. Are you familiar with this Initiative?
1. Yes
2. No
88. Don't know
89. Refused

Q 9. Which brands of electric resistance storage water heaters – excluding heat pump water heaters – does your firm currently offer to customers? (DO NOT READ LIST, ACCEPT MULTIPLE ANSWERS)
1. None
2. General Electric ("GE")
3. A.O. Smith
4. American
5. Kenmore
6. Reliance
7. State
8. Stiebel Eltron
9. U.S. Craftmaster
10. Whirlpool
11. AirGenerate
12. Electrolux
13. Rheem
14. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 10. Which heat pump water heater brands does your firm currently offer to customers? (DO NOT READ LIST, ACCEPT MULTIPLE ANSWERS)
1. None
2. General Electric ("GE")
3. A.O. Smith
4. American
5. Kenmore
6. Reliance
7. State
8. Stiebel Eltron

9. U.S. Craftmaster
10. Whirlpool
11. AirGenerate
12. Electrolux
13. Rheem
14. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 11. Are you planning to offer any other heat pump water heater brands in the next 12 months? (IF YES:) Which brands? (DO NOT READ LIST, ACCEPT MULTIPLE ANSWERS)
1. No
2. General Electric ("GE")
3. A.O. Smith
4. American
5. Kenmore
6. Reliance
7. State
8. Stiebel Eltron
9. U.S. Craftmaster
10. Whirlpool
11. AirGenerate
12. Rheem
13. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 12. Does your company maintain a stock of… (READ CHOICES; ACCEPT MULTIPLE)
1. Electric resistance storage water heaters?
2. Natural gas storage water heaters?
3. On-demand or tankless water heaters?
4. Heat pump water heaters?
5. None (Skip to Q15)
88. Don't know
89. Refused

Q 13. Does what you have in stock affect what you recommend to your customers?
1. Yes
2. No
88. Don't know
89. Refused

Q 14. Which heat pump water heater brands does your firm currently have in stock? (DO NOT READ LIST, ACCEPT MULTIPLE ANSWERS)
1. None
2. General Electric ("GE")
3. A.O. Smith
4. American
5. Kenmore
6. Reliance
7. State
8. Stiebel Eltron
9. U.S. Craftmaster
10. Whirlpool
11. AirGenerate
12. Rheem
13. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 15. How long does it take from when a customer requests to purchase a standard electric storage water heater until you are able to install the unit at their home? Does it take… [READ CHOICES; ACCEPT ONE]
1. Less than one day?
2. One to less than two days?
3. Two days to one week?
4. One to two weeks?
5. More than two weeks?
88. Don't know
89. Refused

Q 16. And how long does it take from when a customer requests to purchase a heat pump water heater until you are able to install the unit at their home? Does it take… [READ CHOICES; ACCEPT ONE]
1. Less than one day?
2. One to less than two days?
3. Two days to one week?
4. One to two weeks?
5. More than two weeks?
88. Don't know
89. Refused

Q 17. Has this resulted in any customers wanting to change their decision and not purchase a heat pump water heater?

1. Yes
2. No
88. Don't know
89. Refused

Q 18. How many water heater installation staff are employed by your firm at this location?
#____ 8888=Don't know 9999=Refused

Q 19. Has anyone at your company attended a Contractor Orientation session for the Smart Water Heat Initiative? This could have been either in person or via a webinar.
1. Yes
2. No
88. Don't know
89. Refused

Q 20. About how many of your company's staff attended a Contractor Orientation session for the Smart Water Heat Initiative? (IF DK or REF, ASK:) Can you just give me your best estimate? (If 0, Change to NP)
#____ 8888=Don't know 9999=Refused

Q 21. Overall, how would you rate effectiveness of the orientation training offered by the Initiative? Would you say the trainings are:
1. Extremely effective
2. Very effective
3. Somewhat effective
4. Not very effective
5. Not at all effective
88. Don't know
89. Refused

Q 22. Why do you say that? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Q 23. Do you have any plans to send staff to a Contractor Orientation session for the Smart Water Heat Initiative in the next year?
1. Yes
2. No
88. Don't know
89. Refused

Q 24. About how many of your company's staff have received manufacturer training on heat pump water heaterss?

#____ 0 = NONE (IF NONE, SKIP TO Q27) 8888=Don't know 9999=Refused

Q 25. Overall, how would you rate your level of satisfaction with the manufacturer training? Would you say you are:
1. Extremely satisfied
2. Very satisfied
3. Somewhat satisfied
4. Not very satisfied
5. Not at all satisfied
88. Don't know
89. Refused

Q 26. Why do you say that? (DO NOT READ)
(RECORD ANSWER)
88. Don't know
89. Refused

Q 27. Do you have any plans to send staff to heat pump water heater manufacturer training in the next year?
1. Yes
2. No
88. Don't know
89. Refused

Heat Pump Water Heater Experience
Next, I'd like to ask about your firm's experiences with HPWHs.

Q 28. About how many total heat pump water heater s has your firm ever installed in residential homes in <List of States from response to Q 4>?
[IF DK/REF, ASK:] Can I get your best estimate?
TotResHPWHs: _____ 8888=Don't know 9999=Refused

Q 29. Do you think it's … [READ CHOICES]
1. None
2. 1 to 4
3. 5 to 10
4. 11 to 25
5. 26 to 50
6. 51 to 75
7. 76 to 100
8. 101 to 150
9. 151 to 200
10. Over 200

88. Don't know
89. Refused

Q 30. In what year did your company install its first residential heat pump water heater?
INSTALLSTART: _____ as YYYY, or 8888=Don't know 9999=Refused

Q 31. Thinking about 2014 sales, about what proportion of your residential electric storage water heater installations were heat pump water heater installations [IF NEEDED: as a percent of all electric storage water heaters]?

Thinking about 2015 sales so far, about what proportion of your residential electric storage water heater installations were heat pump water heater installations [IF NEEDED: as a percent of all electric storage water heaters]?
HPWH%: _____ as YYYY, or 8888=Don't know 9999=Refused
(IF Q30 = 2015, SKIP TO Q52)

Q 32. Excluding all equipment costs – so ONLY considering labor – how much did it cost your residential customers, on average, to install a heat pump water heater in 2014, labor costs only? Please consider a typical installation in unconditioned space that did not require any wall modifications or additional ducting or venting. And how much did the labor cost for a typical electric resistance storage water heater?

[IF DK/REF, ASK:] Can I get your best estimate?
HPWHInstLaborCost: _____ 8888=Don't know 9999=Refused
ERInstLaborCost: _____ 8888=Don't know 9999=Refused

Q 33. Again excluding all equipment costs – so ONLY considering labor – how much did it cost in 2014 for a typical heat pump water heater installation in conditioned space, in an installation that required some modifications and ducting or venting?

[IF DK/REF, ASK:] Can I get your best estimate?
InstLaborCostDuct: _____ 8888=Don't know 9999=Refused

Q 34. Compared to your estimate of <InstLaborCost> labor cost to install a heat pump water heater in unconditioned space without any wall modifications or additional ducting or venting in 2014, how do you think the cost of labor will change in the next 2 years? Do you think it will… (READ LIST; ACCEPT ONE)
1. Increase significantly
2. Increase somewhat
3. Remain about the same as 2014
4. Decrease somewhat
5. Decrease significantly
88. Don't know
89. Refused

Q 35. Why do you say that? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Q 36. How many of your total residential heat pump water heater installations were completed just in the year 2014?
Tot2014HPWHs: _____ 8888=Don't know 9999=Refused

Q 37. Do you think it's . . . [READ CHOICES]
1. None
2. 1 to 4
3. 5 to 10
4. 11 to 25
5. 26 to 50
6. 51 to 75
7. 76 to 100
8. 101 to 150
9. 151 to 200
10. Over 200
88. Don't know
89. Refused

Incented vs. Non-incented

Q 38. How many of those [# FROM Q 36 or Q 37] heat pump water heater installations in 2014 received incentives from a utility or Smart Water Heat Initiative? In your estimate of incented installations, please do not count projects that received only a manufacturer, retailer or distributor markdown,.
[IF DK/REF, ASK:] Can I get your best estimate?
#IncentedInstalls: _____ 8888=Don't know 9999=Refused

Q 39. Do you think it's . . . [READ CHOICES]
1. None
2. 1 to 4
3. 5 to 10
4. 11 to 25
5. 26 to 50
6. 51 to 75
7. 76 to 100
8. 101 to 150
9. 151 to 200
10. Over 200
88. Don't know

89. Refused

Q 40. How many of those [# FROM Q 36 or Q 37] heat pump water heater installations in 2014 received NO incentives from a utility or the Smart Water Heat Initiative?
[IF DK/REF, ASK:] Can I get your best estimate?
#Non-incentedInstalls: _____ 8888=Don't know 9999=Refused

Q 41. Do you think it's … [READ CHOICES]
1. None
2. 1 to 4
3. 5 to 10
4. 11 to 25
5. 26 to 50
6. 51 to 75
7. 76 to 100
8. 101 to 150
9. 151 to 200
10. Over 200
88. Don't know
89. Refused

Now I have some questions specifically about your 2014 HPWH installations that did not receive utility or Smart Water Heat incentives.

Q 42. Why did some installations not get incentives through a utility or Smart Water Heat Initiative? [DO NOT READ; PROBE TO CODE; MARK ALL THAT APPLY]
1. Installer (respondent) unaware of incentives
2. Homeowner unaware of incentives
3. Water heating fuel did not qualify
4. Installation location did not qualify
5. Brand or model did not qualify
6. Building type did not qualify (commercial, multifamily, etc.)
7. No local HPWH program/utility incentives
8. Installer (respondent) disliked utility program requirements
9. Homeowner disliked utility program requirements
77. Other 1 (please specify) _____
78. Other 2 (please specify) _____
88. Don't know
89. Refused

Q 43. How many of your 2014 non-incented, heat pump water heater installations were in the following types of projects:

Residence/Occupancy Type	Number	Don't Know	Refused

a. Newly built single family homes?			
b. Newly built multifamily homes			
c. Single-family home retrofits?			
d. Multifamily home retrofits?			
e. Manufactured home retrofits?			
f. Nonresidential locations?			

Q 44. How many of your [Q 43 Number] non-incented heat pump water heaters installed in [Q 43 Residence/Occupancy Type] were installed in the following space types? [READ LIST; PROBE UNTIL NUMBERS TOTAL TO Q 43 Number]
1. Conditioned space?
2. A garage?
3. A basement?
88. Don't know
88. Refused

Q 45. How many of your [Q 44 Number] non-incented heat pump water heaters installed in [Q 43 Residence/Occupancy Type] in [Q 44] were installed in homes with the following heating fuels? [READ LIST; PROBE UNTIL NUMBERS TOTAL TO Q 44 Number]
1. Utility supplied natural gas?
2. Electricity?
3. Any other heating fuel?
88. Don't know
89. Refused

Q 46. How many of your [Q 45 Number] non-incented heat pump water heaters installed in [Q 43 Residence/Occupancy Type] in [Q 44] in a home with [Q 45] had storage tanks of the following volumes? [READ LIST; PROBE UNTIL NUMBERS TOTAL TO Q 45 Number]
1. Less than 55 gallons
2. 55 gallons or larger
88. Don't know
89. Refused

Q 47. Of the [Q 46 Number] non-incented heat pump water heaters [Q 46] what brands were those? [IF Q 46 Number > 1 say: "Please tell me how many were of each brand] (DO NOT READ LIST)
1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron

8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 48. Of those [Q 47 Number] [Q 47] heat pump water heaters, for how many did you install ducting?

____ 8888=Don't know 9999=Refused

Q 49. [How many of your [Q 43 Number] non-incented heat pump water heaters installed in nonresidential locations had storage tanks of the following volumes?

1. Less than 55 gallons #
2. 55 gallons or larger #
88. Don't know
89. Refused

Q 50a. Of the [Q 49 Number] non-incented heat pump water heaters [Q 49] <55 gallons that were installed in nonresidential locations, what brands were those? [Q 49 Number > 1 say: "Please tell me how many were of each brand] (DO NOT READ LIST)

1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

Q 51b. Of the [Q 49 Number] non-incented heat pump water heaters [Q 49] >/= 55 gallons that were installed in nonresidential locations, what brands were those? [Q 49 Number > 1 say: "Please tell me how many were of each brand] (DO NOT READ LIST)

1. General Electric ("GE")
2. A.O. Smith
3. American
4. Kenmore
5. Reliance
6. State
7. Stiebel Eltron
8. U.S. Craftmaster
9. Whirlpool
10. AirGenerate
11. Electrolux
12. Rheem
13. Bradford White
77. Other (specify): _____
88. Don't know
89. Refused

HPWH Sales in the Future

Q 52. Compared to your total 2014 sales of residential HPWHs, do you think your sales in the next 2 years will… (READ LIST)

1. Increase significantly
2. Increase somewhat
3. Remain about the same as 2014
4. Decrease somewhat
5. Decrease significantly
88. Don't know
89. Refused

Q 53. Why do you say that? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Q 54. For which tank sizes do you expect heat pump water heater sales to increase? Do you expect an increase among heat pump water heaters that are… (READ AND ACCEPT MULTIPLES)

1. Less than 55 gallons?
2. 55 gallons or greater?
88. Don't know
89. Refused

Q 55. For which tank sizes do you expect heat pump water heater sales to decrease? Do you expect a decrease among heat pump water heaters that are… (READ AND ACCEPT MULTIPLES)

1. Less than 55 gallons?
2. 55 gallons or greater?
88. Don't know
89. Refused

HPWH Customers

Q 56. Have you recommended heat pump water heaters to any of your residential customers?

1. Yes
2. No
88. Don't know
89. Refused

Q 57. Why have you not recommended heat pump water heaters to any of your residential customers? [DO NOT READ. PROBE TO CODE. ACCEPT MULTIPLE]

1. Cost
2. Noise
3. Lack of interest
4. Installer unfamiliar with the technology
5. Familiar but lack confidence in the technology - generally
6. Don't perform well enough in cold climate
7. Another technology is better suited to customer needs
8. Existing water heating equipment still working
77. Other (please specify): _____
88. Don't know
89. Refused

Q 58. Do you plan to recommend heat pump water heater s to your residential customers going forward?

1. Yes
2. No
3. Maybe
88. Don't know
89. Refused

Q 59. Briefly, what advantages do you think heat pump water heaters offer? [DO NOT READ, ACCEPT MULTIPLE]

1. More efficient/lower operating costs than other water heating types
2. Lower installation costs than other water heating types
3. Better setting controls
4. Easy to operate
5. Longer operating life than other water heating types
6. Reliability
7. Warranty

8. Save energy
77. Other (specify): _____
88. Don't know
89. Refused

Q 60. What are the disadvantages of heat pump water heaters? [DO NOT READ, ACCEPT MULTIPLE]
1. None
2. High cost / expensive – general
3. Poor performance – general
4. Appearance
5. Installation challenges
6. Hard to locate / place units
7. Unfamiliar technology
8. Reliability
9. Warranty
10. Don't work well in cold weather
11. Noise
77. Other (specify): _____
88. Don't know
89. Refused

Q 61. Have you faced any technical challenges with installing heat pump water heaters in residential locations?
1. Yes
2. No
88. Don't know
89. Refused

Q 62. What technical installation challenges have you faced? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Marketing and Outreach

Now I have some questions about your company's marketing.

Q 63. About what percentage of your heat pump water heater purchasers came to you in an emergency replacement situation – where their water heater had failed and they required a new water heater immediately – and what percentage came to you to replace a functional water heater? [PERCENTAGES MUST ADD UP TO 100%]
A. Emergency replacement ___%
B. Functional replacement ___%
C. New Construction ___%
8888=Don't know 9999=Refused

Q 64. Has the percentage of your heat pump water heater customers purchasing in emergency replacement situations been higher in the past 12 months, compared to years past?
1. Yes
2. No
88. Don't know
89. Refused

Q 65. About what percentage of your heat pump water heater purchasers came to you seeking a heat pump water heater specifically, and what percentage came to you seeking a water heater but didn't specifically request a bid for a heat pump water heater? [PERCENTAGES MUST ADD UP TO 100%]
A. Asked for HPWH ___%
B. Didn't specifically request HPWH ___%
8888=Don't know 9999=Refused

Q 66. Has the percentage specifically asking for heat pump water heaters been higher in the past 12 months, compared to years past?
1. Yes
2. No
88. Don't know
89. Refused

Q 67. What types of HPWH marketing, if any, have your company done since the start of 2014? [DO NOT READ, ACCEPT MULTIPLES]
1. None → Skip to Q 70
1. Print – fliers, brochures, case studies or other marketing collateral
2. Print – newspaper ads
3. Print – magazine ad/article
4. Print – direct mail outreach
5. Radio
6. TV
7. Online advertising or Google AdWords
8. Outdoor advertising, including billboards and buses
9. Company webpage
10. Social media
11. Home/trade shows
12. Door-to-door marketing and neighborhood canvasing
13. Phone calls
14. Emails
77. Other (specify): _____
88. Don't know

89. Refused

Q 68. Which of these marketing methods have you found to be the most effective? [DO NOT READ; ACCEPT ONE]
1. N/A
2. Print – fliers, brochures, case studies or other marketing collateral
3. Print – newspaper ads
4. Print – magazine ad/article
5. Print – direct mail outreach
6. Radio
7. TV
8. Online advertising or Google AdWords
9. Outdoor advertising, including billboards and buses
10. Company webpage
11. Social media
12. Home/trade shows
13. Door-to-door marketing and neighborhood canvasing
14. Phone calls
15. Emails
77. Other (specify): _____
88. Don't know
89. Refused

Q 69. Who does your company target in its marketing? (DO NOT READ; ACCEPT MULTIPLES)
Record TARGETS: _____ or 8888=Don't know 9999=Refused

Q 70. When talking with a customer who is not familiar with the technology, which of the following marketing tools do you use? [READ AND MARK YES OR NO FOR EACH ONE]

		Yes	No	Don't know	Refused
a.	Marketing materials distributed by the Smart Water Heat Initiative?	1	2	88	99
b.	Marketing materials your firm created?	1	2	88	99
c.	Marketing materials your supplier or manufacturer created?	1	2	88	99
d.	Show them a display unit?	1	2	88	99
e.	Discuss HPWHs with them?	1	2	88	99
f.	Anything else? (SPECIFY) _____	1	2	88	99

Customer Purchase Decision

Q 71. What are the key reasons your customers are interested in HPWHs? [DO NOT READ; PROBE TO CODE; MARK ALL THAT APPLY]

1. To replace existing unsatisfactory/failing equipment
2. Energy efficiency/lower heating costs/lower energy bills
3. Want the most current technology
4. To add water heating capacity
5. Improved operational settings
6. Available rebates
7. Affordability

77. Other (specify:)_____
88. Don't know
89. Refused

Q 72. What are the primary barriers to HPWH sales among customers that are aware of them? [DO NOT READ; PROBE TO CODE; MARK ALL THAT APPLY]

1. None
2. Size, fitting into existing spaces
3. Cost too high
4. Effectiveness (general)
5. Effectiveness in cold weather
6. Noise
7. Maintenance
8. Rebates unavailable
9. Don't understand technology
10. Lack of interest (reason not stated)

77. Other (specify:)_____
88. Don't know
89. Refused

Q 73. How important would you say that utility rebates are to residential HPWH sales? Would you say they are:

1. Extremely important
2. Very important
3. Somewhat important
4. Not very important
5. Not at all important
6. (Do not read) Rebates not available in my service areas

88. Don't know
89. Refused

Q 74. Is financing for HPWHs available through utilities in your service area?

1. Yes
2. No

88. Don't know
89. Refused

Q 75. How important would you say that this utility financing is to residential DHP sales? Would you say it is… (READ LIST)
1. Extremely important
2. Very important
3. Somewhat important
4. Not very important
5. Not at all important
88. Don't know
89. Refused

Initiative Services

Q 76. Earlier you said that no one from your company had attended a Contractor Orientation session on HPWHs. How likely do you think it is that you will have someone attend in the next 12 months? Would you say it is:
1. Extremely likely
2. Very likely
3. Somewhat likely
4. Not very likely
5. Not at all likely
88. Don't know
89. Refused

Q 77. Why are staff not likely to attend an Orientation session? [DO NOT READ; probe to code; mark all that apply]
1. Too busy
2. Not local
3. Not needed to install HPWHs
4. Received information from manufacturer or distributor
5. Heard orientation not useful
6. Low customer interest in HPWHs
7. Too expensive/don't want to incur costs
77. Other 1, please specify:_____
78. Other 2, please specify:_____
88. Don't know
89. Refused

Q 78. Have you visited the Smart Water Heat website? [Note: the address is smartwaterheat.org]
1. Yes
2. No
88. Don't know
89. Refused

Q 79. How useful did you find the website information to be? Would you say it was:

1. Extremely useful
2. Very useful
3. Somewhat useful
4. Not very useful
5. Not at all useful
88. Don't know
89. Refused

Q 80. Have you contacted Smart Water Heat staff?
1. Yes
2. No
88. Don't know
89. Refused

Q 81. Regarding what issues or questions? [DO NOT READ; probe to code; mark all that apply]
1. HPWH equipment eligibility
2. Utility rebates
3. Marketing/promotional assistance
4. Technical installation/best practices
5. Dissatisfied customers
6. Poor performing water heaters
77. Other 1, please specify:_____
78. Other 2, please specify:_____
88. Don't know
89. Refused

Q 82. How responsive was the Initiative staff? Would you say they were:
1. Extremely responsive
2. Very responsive
3. Somewhat responsive
4. Not very responsive
5. Not at all responsive
88. Don't know
89. Refused

Q 83. Overall, how would you rate your level of satisfaction with the heat pump water heater Initiative? Would you say you are:
1. Extremely satisfied
2. Very satisfied
3. Somewhat satisfied
4. Not very satisfied
5. Not at all satisfied
88. Don't know

89. Refused

Q 84. Why do you say that? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Q 85. Is there any marketing or technical support that the Initiative could provide that might help you to increase the number of HPWHs you sell? [PROBE:] Specifically, are there any resources that the Initiative could provide?
1. Yes
2. No
88. Don't know
89. Refused

Q 86. What support or resources do you need? (DO NOT READ)
(RECORD ANSWER; PROBE WELL)
88. Don't know
89. Refused

Q 87. Would you like to offer any comments, either positive or negative, about the Smart Water Heat Initiative or HPWH technology?
(RECORD ANSWER; PROBE WELL)
_____
_____
_____

Thank you very much for helping us with this important study! Have a good day/evening.

G.4 HPWH Market Actor In-depth Interview Guide

Program Characteristics
First, I'd like to get some general information about you and your company.

Q1. Which of the following best describes your employment status? Are you:
a. A company owner or key manager
b. An employee of a private company
c. A contractor to a private company
d. Other (Specify)

Q2. How long have you been [selling/making] water heaters, in general? And how long have you been [selling/making] heat pump water heaters?

Q3. When did your company start [selling/making] heat pump water heaters?

Q4. (RETAILERS & DISTRIBUTORS) Considering all types of water heaters, which brands do you stock?

Q5. (RETAILERS & DISTRIBUTORS) And which brands and models of heat pump water heaters do you stock?

Q6. (RETAILERS & DISTRIBUTORS) Which of these brands meet NEEA's Northern Climate Specification, either Tier 1,Tier 2, or Tier 3? [Probe for which brands/models meet each Tier]

Q7. (RETAILERS & DISTRIBUTORS) About what percent of your business revenues come from heat pump water heater sales and installations vs. other water heaters? And overall?

Q8. (MANUFACTURERS) About what percent of your business revenues comes from heat pump water heater sales vs. all other water heaters? And overall?

Supply (Manufacturers SKIP to Marketing Section)
Now I would like to ask you a few questions about your supply of heat pump water heaters.

Q9. From what company or companies do you source your heat pump water heaters?

Q10. Does your company maintain a stock of heat pump water heaters, or do you always purchase them upon receiving an order?
IF THEY MAINTAIN STOCK:
a. What motivated you to stock heat pump water heaters? (PROBE for demand, rebates, NEEA/utilities, etc.)
b. What year did you begin stocking heat pump water heaters?
c. What brands and models do you keep in stock?

IF THEY DO NOT MAINTAIN STOCK:
d. Why don't you stock heat pump water heaters?
e. What, if any, impact does this have on the number of heat pump water heaters that get installed, in emergency replacement situations in particular? How so?

Q11. What changes, if any, do you foresee for your heat pump water heater stocking practices in the near- or mid-term (2 to 5 years)?

Q12. Do you have a sense for the percentage of your heat pump water heater sales that are going into new residential homes, versus retrofits in existing homes? (If YES, get estimates)

Q13. Do you have any problems getting the heat pump water heaters you need from the companies you work with? (If YES get details)

Marketing
Now let's discuss your marketing activities.

Q14. How does your company currently market heat pump water heaters for the residential market? (IF NECESSARY: For instance, do you have info in building trade publications, have info on a website, or use social media or newspaper/radio/TV advertising, or trade shows?) Anything else?
a. (If NO marketing) Why do you choose not to market heat pump water heaters for households?

Q15. Who do you consider your primary target markets for heat pump water heaters? For instance, do you focus on general households or specific demographics, new homebuilders, home remodelers, realtors or other groups?

Q16. And what are your key marketing messages? (PROBE on energy savings, more control over settings, desire for improved technology, bill savings, rebates, etc.)

Q17. (RETAILERS) For your homeowner customers, what messages or information is most persuasive in getting them to purchase a heat pump water heater?

Q18. Is your marketing any different in the Pacific Northwest than the rest of the country?
a. If YES: How is it different, and why is this?
b. (IF NEEDED) Has NEEA influenced your marketing efforts in any way? (PROBE to see if more marketing focused in NW due to rebates, if focusing more on specific home types, new messages, etc.)

Q19. In the past year, have you changed your marketing for heat pump water heaters in any way?
a. IF YES: What changes have you made? (Probe for messaging, channels and amounts)
b. Why did you make these changes?

Q20. Have there been any times when NEEA's and/or a utility's heat pump water heater messaging or marketing efforts have conflicted with your company's marketing?
a. If YES: What was done to resolve the issue?

Q21. What types of marketing support, if any, have you received from NEEA's Initiative? (PROBE on ad templates, sales fact sheets, signage, website or publication content, co-op ad funding, other)
a. Are there any types of support you would like going forward? (If YES: Get details and probe for how it will be useful to the respondent)

Q22. Do you have any recommendations for NEEA or the Northwest utilities regarding how best to market heat pump water heaters to homeowners?
Marketing

Q23. What are your most popular heat pump water heater models in the Northwest?
a. Why are these sales highest? [Probe for rebate amount, brand recognition, physical characteristics including volume, etc.]

Q24. What impact have NEEA's efforts in the Northwest had on your sales of residential heat pump water heaters in the past year?
a. Have NEEA's efforts affected the types – for example the design or size – of heat pump water heaters that you [manufacture/sell]? How so?
b. Have NEEA's efforts affected the number of heat pump water heaters that you [manufacture/sell]? How so? (PROBE for numerical estimates)

Q25. How do you expect the expiration of federal tax credits to influence your heat pump water heater business?

Q26. What are your expectations regarding your company's overall heat pump water heater sales volume or market share in the Northwest in 2015?
a. How about in the next 3 years?
b. How much does this depend on the availability of utility incentives?
c. Do you think that your company will be able to keep up with market-demand for heat pump water heaters?

HPWH Pricing

Q27. (NOT MANUFACTURERS) In the past 2 years, have there been any changes in the prices that you pay to obtain your heat pump water heaters?
If YES:
a. How have prices increased or decreased, and for which models (get details on percentage changes)?

b. Why have these prices have increased/decreased (PROBE on changing manufacturer/materials costs, bulk purchase discounts, improved features, etc.)?

Q28. (MANUFACTURERS) In the past 2 years, have the prices you charge to heat pump water heater distributers and retailers changed in any way?
If YES:
a. How have prices increased or decreased, and for which models (get details on percentage changes)?
b. Why have these prices have increased/decreased (PROBE on changing manufacturer/materials costs, strategic product positioning, bulk purchase discounts, improved features, etc.)?

Q29. In the past 2 years, have the prices paid by residential customers for heat pump water heaters changed in any way?
If YES:
a. How have prices increased or decreased, and for which models (get details on percentage changes)?
b. Why have these prices have increased/decreased (PROBE on changing manufacturer/materials costs, strategic product positioning, bulk purchase discounts, improved features, etc.)?

Q30. Do you think prices that residential customers pay for heat pump water heaters will increase or decrease in the next two years? (PROBE for percentage increase/decrease) And how about five years?
a. Why do you say that? (PROBE on specific tiers and potential reasons: changing manufacturer costs, supply chain changes, etc.)

Q31. What is the average installation price charged by installers?
a. Do you have any concerns about installation prices charged by contractors? (Probe for too high or variable price; to see if NEEA/utility rebates are being "captured" by installers; too few installers; other issues)
b. Do you think the price for heat pump water heater installations will increase or decrease in the next two years? (PROBE for percent increase/decrease) And how about five years?

Interaction with Other Market Actors
Now let's talk about the contractors that install heat pump water heaters.

Q32. Do you have any concerns about how your heat pump water heaters are being installed?
a. If YES: get details on known or potential issues, prevalence, if related to plumbers and/or HVAC contractors.

Q33. (FOR DISTRIBUTORS AND MANUFACTURERS) What technical training do you provide to installers?

Q34. Are there any technical issues that installers have more difficulties with?

Q35. (FOR DISTRIBUTORS AND MANUFACTURERS) Do you also rely on contractors to promote your HPWHs?
a. If YES: How do you work with contractors, to ensure that they use appropriate messaging to households?

Q36. (MANUFACTURERS) How do you work with Northwest distributors to promote your heat pump water heaters? (PROBE to see if co-funding advertising, teaming on technical training to installers, just sending them product literature to distribute, other.)
a. How many distributors are you working with? Which ones?
b. Are you trying to get additional distributors to carry your products?
c. Have you had any challenges working with specific distributors? (If YES get details)

Q37. (DISTRIBUTORS) How is it going working with the manufacturers that sell to you?
a. What is working well?
b. What could be improved?
c. Have you had any challenges working with specific manufacturers? (If YES get details)

Q38. (FOR DISTRIBUTORS AND MANUFACTURERS) Do you work with any Northwest retailers to promote heat pump water heaters?
IF YES, or have worked with retailers in past (adjust questions for past experience):
a. Which retailers do you work with?
b. How do you work with these retailers? (Probe to see if coordinating discounts/rebates, co-funding advertising, giving them technical sales training, etc.)
c. Have you had any challenges working with specific retailers to promote your heat pump water heaters? (If YES get details)
IF NO:
d. Is there any particular reason why your company doesn't work with retailers on heat pump water heaters?

Q39. (RETAILERS) Do you source heat pump water heaters directly from manufacturers, or do you go through distributors?

Q40. (RETAILERS SOURCING DIRECTLY FROM MANUFACTURERS) How is it going working with the manufacturers that sell to you?
a. What is working well?
b. What could be improved?
c. Have you had any challenges working with specific manufacturers? (If YES get details)

Q41. (RETAILERS SOURCING FROM DISTRIBUTORS) How is it going working with the distributors that sell to you?
a. What is working well?

b. What could be improved?
c. Have you had any challenges working with specific distributors? (If YES get details)

Interactions with NEEA and CLEAResult

Q42. What interactions have you had with NEEA or its implementation contractor, CLEAResult, in the past year? (Get name of primary contact if they are unsure of affiliation)

Q43. How has this coordination helped your efforts in the heat pump water heater market?

Q44. Thinking of 2014 only, did you have any challenges working with these organizations? (PROBE on rebates eligibility, NEEA/CLEAResult delivery, training or marketing issues)

Q45. How has NEEA's Initiative influenced your view of the heat pump water heater market in the Northwest, if at all?

Q46. Do you plan to assist the Initiative in any way in 2015? (Probe on technology training, marketing, funding, etc.)

Q47. Overall, how satisfied would you say you are working with NEEA and CLEAResult? Would you say you are:
a. Extremely satisfied
b. Very satisfied
c. Somewhat satisfied
d. Not very satisfied
e. Not at all satisfied

Q48. Why do you say that?

Barriers and Challenges

We're almost done and I'd like to get your feedback on challenges for HPWHs…

Q49. What are the most common consumer barriers to purchasing heat pump water heaters? (PROBE on new technology concerns, lack of familiar brands, local codes, capital costs, install time/costs, availability for emergency replacement)

Q50. Are there any consumer segments that are most amenable to purchasing heat pump water heaters? Any segments that are particularly resistant?

Q51. Have you had any consumers call you after an installation and need assistance with their water heater? (If YES get details)
a. Was their situation resolved? How so?

Q52. What are the main technological challenges associated with the installation and use of heat pump water heaters?

a. What impacts do these challenges have, both in terms of demand and ease of installation and use?

Q53. (MANUFACTURERS) What are the main the main manufacturing challenges associated with producing heat pump water heaters?
a. What impacts do these challenges have? (PROBE on price, availability, quality assurance, etc.)

Q54. Have any of your heat pump water heaters been returned due to technical failures?
a. If YES: Get details (percentage and typical models, reasons)

Q55. Do you think heat pump water heaters will gain acceptance in emergency replacement situations? Why or why not?
a. Are there any ways that NEEA or utilities could increase the rate at which heat pump water heaters are selected in emergency replacement situations? How?

Future Expectations
Let's finish by talking about the future potential for heat pump water heaters.

Q56. What technological trends are you seeing with heat pump water heaters?
a. Are there any new developments with heat pump water heaters in cold climate applications?
b. (MANUFACTURERS) Is your company considering or planning to make future models that meet the more rigorous Northern Climate Specification Tier(s)? Why is that? (PROBE for return on investment, timeframe)

Q57. What do you think will be the impact of upcoming federal standards that will prohibit installations of electric resistance water heaters 55 gallons or larger? (IF NEEDED: Starting in 2015, consumers will not be able to purchase electric resistance water heaters that are above 55 gallons in size)
a. How is your firm planning for this?

Q58. Are homeowners aware of the standard?
a. (If NO) What will be their reaction when they try to purchase a large electric resistance water heater, either in an emergency replacement situation or as a planned upgrade?

Q59. Thinking of homeowners who want or need to purchase a high-capacity electric water heater after the standard is in effect – do they have any other options besides purchasing a heat pump water heater? Like what? [PROBE for on-demand water heaters, sizing down, and purchasing two or more small water heaters to supply their needs]
a. If OTHER OPTIONS AVAILABLE: Thinking about these options, how often do you expect consumers who require 55 gallon or more equivalent hot water capacity to opt for HPWH technologies to fulfill their water heating needs?

Q60. Will the federal standard have any effect on the smaller volume electric water heater market? What effect?
a. How is your firm planning for this?

Q61. Are residential heat pump water heaters a high priority market for your company?

Q62. What are the fastest growing market segments for heat pump water heaters, such as new residential construction, major remodels, upgrades during home sales, manufactured housing, etc.?

Is there anything else that you think would be important for us to know regarding heat pump water heaters, NEEA, the Smart Water Heat program, or anything else?

Thank you VERY MUCH for your time!

Appendix H: Urban/Rural Markets Definitions

2003 Rural-Urban Continuum Codes	
Code	**Description**
Urban Counties:	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Higher-Density Rural Counties:	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
Lower-Density Rural Counties:	
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

Appendix I: References

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