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Northwest Heat Pump Water Heater Market Test Assessment

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Final Report

Prepared by Evergreen Economics for the Northwest Energy Efficiency Alliance

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Glossary

ACEEE	American Council for an Energy-Efficient Economy; A nonprofit founded in 1980, acts as a catalyst to advance energy efficiency policies, programs, technologies, investments, and behaviors.[1]
dB	Decibel; a unit used for the measurement of sound.
dBA	A-weighted decibels; used for measuring environmental noise levels.
DHP	Ductless heat pump.
D.O.E.	United States Department of Energy.
EF	Energy Factor; a measure of appliance efficiency.
ENERGY STAR®	U.S. government-backed program helping businesses and individuals protect the environment through superior energy efficiency.[2]
HPWH	Heat pump water heater.
HVAC	Heating, ventilation, and air conditioning.
HZ	Heating zone.
NEEA	The Northwest Energy Efficiency Alliance; a non-profit organization working to effect market transformation through the acceleration and adoption of energy-efficient products, services and practices. NEEA is an alliance of more than 100 Northwest utilities and energy efficiency organizations working on behalf of more than 12 million energy consumers.
Recovery time	Recovery time (or rate) refers to the amount of hot water a water heater is capable of supplying during a period of time.

[1] Source: http://aceee.org/about
[2] Source: energystar.gov

Executive Summary

This report is an assessment of the Northwest Energy Efficiency Alliance (NEEA) Heat Pump Water Heater (HPWH) Market Test. NEEA is a non-profit organization working to effect market transformation through the acceleration and adoption of energy-efficient products, services and practices. NEEA is an alliance of more than 100 Northwest utilities and energy efficiency organizations working on behalf of more than 12 million energy consumers.

Progress towards Goals

From May 2012[3] to April of 2013, the Market Test supported and influenced the purchase and installation of 954 HPWHs in the Northwest. Exactly 639 of these HPWHs meet Tier 1 of the Northern Climate Specification, with the remaining 315 meeting Tier 2[4]. Installations occurred primarily in Oregon and Washington.

Market Test Assessment

Overall, NEEA's Heat Pump Water Heater Market Test has promoted regional and local utility rebate programs, effectively tested promotional strategies, developed relationships with market actors throughout the supply chain, and supported homeowner purchases of energy efficiency products that ultimately meet their expectations. Key findings from our assessment follow:

1. **Key drivers for HPWH purchases are saving energy, lower monthly operating cost, and rebate availability. The main marketing messages to end-users include energy savings and return on investment. Messaging aligns with purchase drivers.**
2. **Barriers to HPWH adoption are typical of new energy efficiency products (first cost, low awareness).**
3. **Market actors have a wide range of views regarding future HPWH sales, HPWH price, and installation price.**
4. **Nearly all Tier 2 HPWHs were installed by contractors, while more than half of Tier 1 units were DIY installations (installed by the homeowner).**
5. **Emergency replacements only accounted for 13 percent of HPWH installations.**
6. **Households that installed Tier 1 and Tier 2 HPWHs report high levels of satisfaction.**
7. **Northwest utility representatives believe HPWHs are well suited for new construction, particularly the Tier 2 models.**

[3] One Tier 2 HPWH was installed in January 2012, but rebates began in earnest in May 2012. Rebates for Tier 1 products began in September 2012.
[4] See Section 1.1.4. Northern Climate Specification for detailed information regarding HPWH performance tiers.

8. **Distributors that do not stock HPWHs believe they are currently too risky to stock (in terms of the barriers preventing installations). Less than half actively market HPWHs.**
9. **At the time of the research, the Market Test had limited engagement small retail stores. The large retailer that worked with NEEA reported that the partnership was very successful – Tier 1 sales seem to corroborate this finding.**
10. **Installers source HPWHs from distributors. Installers do not stock HPWHs, but indicate that this does not hamper their use as an emergency replacement option.**

Recommendations for the HPWH Market Test include:

1. **Continue the Smart Water Heat incentives.** Customers and market actors report that rebates are key to HPWH purchases. They reduce first cost and provide credibility to the product.
2. **Continue to leverage relationships with key large retailers.** Current promotions through one primary retailer proved very successful. Since they have a trained a controlled installation staff, as well, we believe they could be suited to sell Tier 2 HPWHs in addition to Tier 1 models.
3. **Investigate midstream buy-down approach with distributors and contractors – availability may be a constraint.** Financial incentives to contractors or distributors for stocking and promoting HPWHs should be investigated. They may require assistance overcoming the risk associated with stocking HPWHs. While lack of stock may not *prevent* a distributor or contractor from supplying a customer with a HPWH, it may discourage the market actors from actively promoting HPWHs.
4. **Market HPWHs to homeowners with Ductless Heat Pumps (DHPs) and traditional heat pumps.** Awareness and acceptance of heat pump technology in general (in any type of appliance) appears to alleviate key barriers, even across end-uses. Encourage utilities to cross-promote HPWHs to customers who have purchased DHPs or other heat pump technologies.
5. **Target the new construction market.** Most of the technological barriers to HPWH adoption (that is, things other than price and awareness) are related to typical home characteristics. However, homebuilders could design homes with the HPWH in mind, alleviating many technological barriers (sound, space, ducting, and drainage). We acknowledge that the initiative design elements encouraged by this recommendation may be difficult to implement, but evidence from installers and utility representatives suggests that new homes could be particularly well suited to HPWH technology.
6. **Develop a broad based marketing campaign to increase public awareness of HPWHs.** Awareness is a primary barrier to increasing market adoption of HPWHs. Lack of awareness is particularly problematic in emergency replacement situations

when a customer does not typically have sufficient time to research water heaters. Continue training of market actors to leverage their advisory position with end-users.

1 Introduction

The Northwest Energy Efficiency Alliances (NEEA) engaged Evergreen Economics in June 2012 to assess NEEA's Heat Pump Water Heater Market Test.

1.1 Market Test Context

This report is the first assessment of the NEEA Heat Pump Water Heater (HPWH) Market Test. NEEA is a non-profit organization working to effect market transformation through the acceleration and adoption of energy-efficient products, services and practices. NEEA is an alliance of more than 100 Northwest utilities and energy efficiency organizations working on behalf of more than 12 million energy consumers.

1.1.1 HPWH Technology Overview

HPWHs rely on the same technology principals as refrigerators. Both HPWHs and refrigerators use electricity to transfer heat from one location (heat source) to another location (heat sink). Where a refrigerator uses electricity to move heat out of the appliance, a HPWH uses electricity to move heat *into* the appliance. The heat that is transferred from the outside (heat source) to the water tank (heat sink) brings the water to the desired temperature. This technology is significantly more energy efficient than electric resistance water heaters, which rely on electric resistance elements that directly – and relatively inefficiently – convert electricity to heat.

1.1.2 Historical Barriers to HPWH Market Adoption

Historically, two main factors have prohibited an increase in the market share of HPWHs for the Northwest. The first factor is its unique technological attributes. A HPWH is a complex appliance and therefore they are typically more expensive than electric and natural gas storage water heaters. In addition, the technology has had performance issues since the products entered the market in the 1980s – the result of substandard engineering, improper use or installation, and climate-dependent performance.

The second factor that has affected the market share of HPWHs in the Northwest is the way in which water heaters have historically been purchased: by consumers upon emergency replacement via a contractor. Consumers view water heaters as a commodity. Without an obvious way for consumers to differentiate among brands or models (other than capacity and fuel type), water heater purchases are not given much thought before or at the time of purchase.

Until recently, manufacturers were reluctant to produce substantial quantities of HPWHs due to these two primary barriers to adoption, further exacerbating the low market share of HPWHs in the Northwest.

1.1.3 ENERGY STAR® Water Heater Specification

On April 1, 2008, the United States Department of Energy (DOE) released a "Final Criteria Announcement" for residential water heaters.[5] The first certified HPWH products became available in 2009. Following the release of the ENERGY STAR® specification, manufacturers began to approach the utility companies in the Northwest to discuss rebate programs for ENERGY STAR® water heaters. The utilities directed the manufacturers to NEEA in the beginning of 2009.

When manufacturers approached NEEA, NEEA expressed concern that HPWHs meeting the ENERGY STAR® specification would not necessarily suit conditions in the Northwest.

1.1.4 Northern Climate Specification[6]

Later in 2009, NEEA began developing a set of performance criteria for HPWHs, called the Northern Climate Specification. These criteria were created in response to the perceived shortcomings in the general ENERGY STAR® specification as they applied to northern climates, and included parameters to address the following:

- Acceptance and Market issues (e.g., noise, physical size, warranty)
- Ventilation issues
- Condensation

The Northern Climate Specification was first presented in the spring of 2009 at the American Council for an Energy-Efficient Economy (ACEEE) Hot Water Forum. Following the presentation, NEEA reached out to agencies in the Northeast and Midwest regarding the Northern Climate Specification in order to solicit their opinions and garner support. NEEA and the other agencies then released to U.S. manufacturers a set of proposed specifications during a public forum.

The Northern Climate Specification defines three product categories, referred to as HPWH "Performance Tiers" (Tiers). Currently there are products that meet the Tier 1 and Tier 2 requirements, but not the Tier 3 requirements. Below, in Table 1, is a description of the three tiers.

[5] Source: http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeater_CriteriaLetter_Final.pdf
[6] Source: http://neea.org/northernclimatespec

Table 1: Northern Climate Specification – HPWH Tier Descriptions[7]

Tier	Minimum Northern Climate EF[8]	Minimum "Northern Climate" Features	Minimum supported installation locations	Sound levels
Tier 1	1.8	➢ ENERGY STAR® compliance	➢ Semi-conditioned ➢ Unconditioned	dBA[9] < 65
Tier 2	2.0	Tier 1 plus: ➢ Minimal use of electric heating elements ➢ Freeze protection ➢ Exhaust ducting option ➢ Compressor shut-down/notification ➢ 10 year Warranty ➢ Condensate Management	➢ Conditioned ➢ Semi-conditioned ➢ Unconditioned	dBA < 60
Tier 3	2.4	Tier 2 plus: ➢ Intake ducting option ➢ Air Filter Management	➢ Conditioned ➢ Semi-conditioned ➢ Unconditioned	dBA < 55

There has been much attention placed on HPWH rebate programs in the Northwest following the development of the Northern Climate Specification. NEEA collaborated with other agencies to design the specification, with the ultimate goal to address technical market barriers such as noise, physical size, ventilation issues, and condensation. The specification includes a tiered structure approach, with an ultimate goal of a single federal standard.

In May 2012[10], NEEA launched the Heat Pump Water Heater Market Test, providing a limited number of incentives for Tier 2 HPWHs. The market test is similar to a pilot program – it is a small "test" version of a full-fledged initiative or rebate program. The objectives of the market test were to:

- Address potential heat pump water heater cost barriers by offering direct, midstream and upstream incentives

[7] *Ibid.*
[8] Please see Glossary for definition of EF.
[9] Please see Glossary for definition of dBA.
[10] One Tier 2 HPWH was installed in January 2012, but rebates began in earnest in May 2012. Rebates for Tier 1 products began in September 2012.

- Explore and promote existing utility and tax incentives, as well as financing opportunities
- Motivate the supply chain to produce, distribute, stock and promote heat pump water heaters
- Encourage regional parity on utility-based rebates

In addition, Northwest utilities offer downstream consumer HPWH incentives. Some of these rebates are specific to Tier 2 products, while others promote both Tier 1 and Tier 2 water heaters (some are technology neutral, requiring qualifying water heaters to meet an Energy Factor threshold as opposed to promoting specific technologies). Lastly, one major retailer in the Northwest provided point-of-sale rebates to customers for Tier 1 HPWHs during certain promotional periods in 2012.

1.2 Research Objectives and Overview of Approach

The goals of the Heat Pump Water Heater Market Test Assessment (the assessment) are to:

- Assess the supply- and demand-side market acceptance of HPWHs in the Northwest
- Assess the implementation strategies of the Heat Pump Water Heater Market Test

The Assessment is designed to inform the implementation of a planned initiative, and provides substantive and actionable process-related recommendations.

The assessment is supported by four primary research tasks:

- Market Data Analysis
- Program Staff / Utility In-depth Interviews
- Trade Ally In-depth Interviews
- Household HPWH Purchaser Phone Survey

A detailed description of our methodology is presented in Section 2 of this report.

2 Research Methodology

2.1 Market Characterization

This assessment includes a HPWH market characterization for the Northwest, both to understand the current market and to track market changes over time. We characterize the market based on the following data:

- Installation location data (i.e., market test and utility program tracking data)
- Trade Ally data (manufacturers, distributors, retailers, and installers)
- Heating zone geographical data (based on NEEA's definitions)
- Urban and rural geographical data (based on NEEA's definitions)

We provide an overview of the market including the numbers of manufacturers, distributors, retailers and installers serving the Northwest (known by the Market Test), and the number of installed HPWHs, differentiated by Northern Climate Specification performance tier ("Tier").

2.2 HPWH Purchaser Telephone Survey

The Evergreen team contracted with CIC Research to conduct computer-assisted telephone interviews (CATI) with households who purchased a HPWH through the Market Test.

2.2.1 Sample Design

The Evergreen team relied on NEEA and retailer tracking databases for contact information for Market Test participating households. The survey included households that have installed HPWHs through the Market Test during the period of January 2012 through April 2013.

We created a stratified sample from the tracking database. We based the stratification on the Tier of the installed HPWH, as there were insufficient installations in certain heating zones to stratify based on geography. We surveyed 150 households, 75 of which purchased Tier 1 and 75 of which purchased Tier 2 HPWHs.

2.2.2 Survey Guide Development and Research Implementation

The Evergreen team developed a Northwest household HPWH purchaser telephone survey with guidance and review from NEEA and Fluid Market Strategies, the Market Test's program management contractor (PMC). The survey included questions related to the following issues:

- Usage and interaction with installed HPWH
- Satisfaction with installed HPWH, and installation/maintenance issues
- Replaced water heater characteristics (e.g., storage capacity, end of life v. early replacement)
- Importance of rebates and other financial incentives (e.g., federal/state tax credits)

- Household and home type information (e.g., new construction, manufactured homes, electric forced air furnaces), to explore detailed submarket issues

CIC Research fielded the survey in April 2013.

2.3 Market Actor and Northwest Utility In-depth Interviews

Evergreen researchers conducted in-depth telephone interviews with HPWH market actors and representatives from seven Northwest electric utilities.[11] The disposition of target and completed interviews with market actors is presented below in Table 2.

Table 2: Market Actor Target and Completed In-Depth Interviews

Market Actor	Target	Completes
Manufacturers	3	3
Distributors	10	11
Retailers	7	8
Installers	10	7
Utility Representative	6 - 8	7
Total	**36 - 38**	**36**

We developed interview guides for the market actor and utility representative interviews with guidance from NEEA staff. The market actor in-depth interview guides focused on the following key areas of interest (there was some variation depending on the market actor type):

- National/regional historical and anticipated HPWH sales
- Equipment pricing trends
- Marketing techniques and challenges
- Stocking practices
- Interactions with other market actors – installers, Northwest utilities, implementation staff
- Key manufacturing decision factors
- Impacts of upcoming building code changes
- Current technology barriers, and anticipated improvements

[11] The sample of utilities was not intended to be representative of the Northwest; Evergreen completed interviews with seven of the most active utilities in terms of HPWH promotion and incentives.

The partner utility interview guides included questions regarding:

- Barriers to market transformation (technical, installation, customer demand issues)
- Perceptions of prevalence of non-incented units
- Installation quality and customer feedback
- Interactions with other market actors (i.e., installers, distributors, retailers, manufacturers, implementation staff)
- Future plans and participation goals
- Desired assistance from NEEA

The in-depth interviews were completed between March and May of 2013.

3 Market Characterization

This section provides an overview of the Heat Pump Water Heater market for Washington, Oregon, Idaho, and Montana through April 2013. These data give a high-level overview of the market and provide context for evaluation results presented in subsequent chapters.

3.1 Target Market and Market Test Achievements

The primary target market for the Heat Pump Water Heater Market Test are single-family homes in the Northwest currently relying on electric resistance storage water heaters for their hot water supply. From the 2011 NEEA Residential Building Stock Assessment (RBSA), approximately 55 percent of water heaters in single-family residences in the Northwest are electric. Table 3 shows the percent and total estimated number of homes in each Northwest state with electric water heaters (this includes instantaneous water heaters, which account for approximately 3 percent of all water heaters in the Northwest).

Table 3: Northwest Homes with Electric Water Heaters, by State

State	Single-Family Homes with Electric Water Heaters	
	Percent[12]	Estimate[13]
Idaho	52%	259,430
Montana	38%	131,503
Oregon	55%	618,450
Washington	59%	1,127,279
Total	**55%**	**2,149,426**

As shown in Table 4, below, 954 HPWHs[14] were installed in the Northwest from January 2012 through April 2013 through the Market Test. Table 4 shows the distribution of Market Test HPWH installations by heating zone (HZ) and urban versus rural. The majority of the HPWHs were installed in urban locations within HZ1 (76 percent overall). There were 639 Tier 1 HPWHs sold through a partnering retailer. There were 315 Tier 2 HPWHs installed by Smart Water Heater trained installers across the four states. There were no Tier 2 HPWHs installed in HZ3 during the study period.

[12] Table 103 from 2011 Residential Building Stock Assessment: Single-Family Characteristics and Energy Use, Ecotope, Inc. and NEEA, September 18, 2012. http://neea.org/docs/reports/residential-building-stock-assessment-single-family-characteristics-and-energy-use.pdf?sfvrsn=8

[13] Estimate based on U.S. Census Bureau, 2007-2011 American Community Survey data, multiplied by the percent of homes with electric water heaters (from 2011 RBSA).

[14] Two Tier 1 HPWHs were installed in Yreka, CA, and are not counted in our market characterization. These HPWHs "leaked" into California. Additionally, one Tier 1 HPWH "leaked" into Vermont.

Table 4: Distribution of Homes that Installed Market Test HPWHs, by Tier

Heating Zone, Urban/Rural	Tier 1		Tier 2		Overall	
	Number of HPWHs	Percent of Tier 1	Number of HPWHs	Percent of Tier 2	Number of HPWHs	Percent of Overall
HZ1						
Rural	70	11%	39	12%	109	11%
Urban	487	76%	269	85%	756	76%
HZ2						
Rural	16	3%	3	1%	19	2%
Urban	41	6%	4	1%	45	5%
HZ3						
Rural	10	2%	0	0%	10	1%
Urban	15	2%	0	0%	15	2%
Total	**639**	**100%**	**315**	**100%**	**954**	**100%**

Table 5, below, shows the number of Tier 1 sales and Tier 2 installations by month from May 2012 through February 3, 2013 for Tier 1 HPWHs, and through April 4, 2013 for Tier 2 HPWHs. As shown, rebates for the Tier 1 HPWHs did not begin until September 2012. The majority of Tier 1 sales occurred between October 2012 and January 2013. Further, the months of October 2012 and December 2012 saw the greatest numbers of both Tier 1 sales and Tier 2 HPWH installations.

Furthermore, the majority of HPWHs installed in the region were Tier 1 models. Tier 2 HPWHs represent approximately 35 percent of all HPWHs sold through the market Test.

Table 5: HPWH Sales and Installations by Year and Month, by Tier

Year	Month	Tier 1 Sales	Tier 2 Installations	Total Sales/ Installations
2012	January	0	1	1
	May	0	7	7
	June	0	14	14
	July	0	22	22
	August	0	13	13
	September	3	10	13
	October	241	59	300
	November	90	50	140
	December	252	112	364
	Total 2012	*586*	*288*	*874*
2013	January	44	13	57
	February	9	7	16
	March		6	6
	April		1	1
	Total 2013 (to-date)	*53*	*27*	*80*
Total		**639**	**315**	**954**

3.2 Supply Side Characteristics

The Market Test established strategic relationships with 296 companies consisting of plumbers, HVAC/plumber installers, and one general contractor. Table 6, below, provides a detailed breakdown of the number of companies and trained installers by both state and role within the industry.

Table 6: Market Actors, by Role and State

Role	State	Number of Companies	Number of Contacts
General Contractor	Washington	1	1
HVAC/Plumber Installer	Idaho	10	15
	Oregon	83	156
	Washington	121	183
Plumber Installer	Idaho	8	11
	Oregon	38	68
	Washington	35	47
Total		296	481

The Market Test established relationships with a number of water heater distributors. Some of the relationships are partnerships developed during the Market Test or previous Northwest initiatives. Other relationships with distributors are less concrete; the Market Test identified these distributors through supply chain research, and keeps them informed with Market Test updates. Table 7 presents the number of overall water heater distributor contacts, by state.

Table 7: HPWH Distributor Companies and Branches, by State[15]

State	Number of Companies	Number of Branches
Idaho	17	46
Montana	11	28
Oregon	25	69
Washington	26	125
Total	**80**	**269**

[15] One distributor location was listed as Nevada in the supply chain contact list provided by Fluid Market Strategies.

4 Research Findings

This section presents our findings from the primary research conducted as part of the assessment. The primary research tasks included a telephone survey of recent HPWH purchasers (through the Market Test) and in-depth interviews with Northwest utility representatives and Northwest HPWH market actors (including manufacturers, distributors, retailers, and installers).

4.1 HPWH Purchaser Telephone Surveys

The Evergreen team completed 150 telephone surveys with homeowners who purchased a HPWH and either received a Smart Water Heat rebate (for Tier 2 HPWHs) or purchased a Tier 1 HPWH at a retail location with an instant savings rebate. We completed 75 surveys with purchasers of both tiers in the Northwest. Table 8, below, provides a breakdown of survey completes, by tier, heating zone, and urban versus rural.

Table 8: HPWH Purchaser Telephone Survey Final Survey Disposition, by Tier

Heating Zone, Urban/Rural	Tier 1		Tier 2		Overall	
	Number of HPWHs	Percent of Tier 1	Number of HPWHs	Percent of Tier 2	Number of HPWHs	Percent of Overall
HZ1						
Rural	6	8%	8	11%	14	9%
Urban	57	76%	67	89%	124	83%
HZ2						
Rural	4	5%	0	0%	4	3%
Urban	5	7%	0	0%	5	3%
HZ3						
Rural	0	0%	0	0%	0	0%
Urban	3	4%	0	0%	3	2%
Total	**75**	**100%**	**75**	**100%**	**150**	**100%**

4.1.1 Purchaser Demographics and Sources of Awareness

In this section, we describe the home and purchaser characteristics of the participant group. Tier 1 and Tier 2 participants shared many home characteristics. An overwhelming majority lived in single-family homes that they owned (98 percent) and the remainder lived in condominiums. Installations most often occurred in existing homes (97%) and in urban areas (89%).

Table 9, below, shows the disposition of home vintage among Tier 1 and Tier 2 purchaser households. As shown, 71 percent of participants' households were built before 1980, and only seventeen percent were built since 2000.

Table 9: Market Test Participant Home Vintage, by Tier

Year	Tier 1 (n=74)	Tier 2 (n=74)	Overall (n=148)
2011-present	3%	4%	3%
2006-2010	9%	0%	6%
2000-2005	11%	4%	8%
1990-1999	11%	12%	12%
1980-1989	16%	19%	17%
1970-1979	12%	26%	17%
1960-1969	9%	12%	10%
Prior to 1960	29%	23%	27%

Q 80. What year was your home built?

Table 10 and Table 11 show household annual income in 2012, by state, for Tier 1 and Tier 2 participants, respectively. A higher proportion of Tier 2 participants had a household income of $80,000 or more. A greater proportion of participants in Washington that purchased Tier 2 units had higher incomes than those who purchased Tier 1 units (64 percent and 33 percent, respectively).

Table 10: Household Income for Tier 1 Participants, by State

Income, Tier 1 Participants	Idaho (n=3)	Montana (n=3)	Oregon (n=10)	Washington (n=43)	Overall (n=59)
Less than $80,000	100%	31%	19%	67%	59%
$80,000 or More	0%	69%	81%	33%	41%

Q 88. Which of the following categories includes your approximate annual household income from all sources in 2012, before taxes?

Table 11: Household Income for Tier 2 Participants, by State

Income, Tier 2 Participants	Idaho (n=1)	Montana (n=0)	Oregon (n=36)	Washington (n=25)	Overall (n=59)
Less than $80,000	100%	N/A	36%	36%*	37%
$80,000 or More	0%	N/A	64%	64%*	63%*

Q 88. Which of the following categories includes your approximate annual household income from all sources in 2012, before taxes?

*Statistically Significant difference at 90% Confidence Interval (CI) between Tiers (from Table 10)

Table 12 shows the education level of participants, by state, for purchasers of both Tier 1 and Tier 2 HPWHs, combined. As shown, the majority of participants had completed college (65 percent), with more than one-quarter obtaining a graduate degree (26 percent).

Table 12: Education Level of Participants, by State

Education Level	Idaho (n=5)	Montana (n=3)	Oregon (n=54)	Washington (n=85)	Overall (n=147)
High school graduate or GED (n=8)	23%	31%	2%	7%	6%
Trade or technical school (n=12)	-	-	6%	10%	8%
Some college (n=28)	36%	-	11%	25%	21%
College graduate (n=52)	23%	69%	28%	36%	34%
Some graduate school (n=70)	-	-	5%	6%	5%
Graduate degree (n=40)	18%	-	49%	17%	26%
Total (n=147)	**100%**	**100%**	**100%**	**100%**	**100%**

Q 87. Which of the following includes the highest level of education you have completed?

Table 13 shows the distribution of primary household heaters by installed HPWH tier. For comparison purposes, we include Northwest general population data from the NEEA Residential Building Stock Assessment (RBSA) study findings. As shown, a significantly higher proportion of participants who adopted HPWHs had prior experience with ductless or ducted heat pumps (54 percent, combined) than the general population of the Northwest (14 percent). This suggests that comfort and familiarity with heat pump technology are indicative of likely HPWH adopters.

Not shown in the table below, electricity is the primary heat source for nearly 60 percent of Market Test participants, compared to only 34 percent of the general population of the Northwest. Only seven percent of participants reported that their primary household heat source was electric baseboard or wall heaters.

Table 13: Participant Primary Household Heater, by Tier and General Population

Household Heating Type	Tier 1 (n=75)	Tier 2 (n=73)	Overall (n=148)	NEEA RBSA[16] (n=1,433)
Forced air furnace	30%	37%	32%*	54%*
Baseboards / Wall heaters	14%**	0%**	9%*	12%*
Radiant heaters	3%	6%	4%	0%
Ductless heat pump (DHP)	11%	16%	13%*	1%*
Heat pump (non-ductless)	42%	38%	41%*	13%*
Non Electricity Primary Heat Source	0%	1%	1%*	19%*
Total	**100%**	**100%**	**100%**	**100%**

Q 82. What is your home's primary heat source?
Q 83. What type of electric heater is your primary heater?
Q 84. What type of gas heater is your primary heater?
*Statistically significant difference at 90% CI between the NEEA RBSA and our overall survey results.
**Statistically Significant difference at 90% CI between Tier 1 and Tier 2 participants.

Initial awareness of HPWHs most often came from the Internet (15 percent) and retail store displays (13 percent) across purchasers of Tier 1 and Tier 2 HPWHs. Shown below in Table 14, Tier 1 participants were significantly more likely to first learn about HPWHs from a newspaper advertisement or retailer (advertisement, in store, or mailing). Tier 2 participants were more likely to first learn about HPWHs from utility advertising or from a contractor or installer.

Internet research was most frequently cited source for information regarding HPWHs once the consumer was aware of the technology. Regardless of how customers initially learned about HPWHs, nearly half (47 percent) sought information from the Internet.

[16] Table 50 from 2011 Residential Building Stock Assessment: Single-Family Characteristics and Energy Use, Ecotope, Inc and NEEA, September 18, 2012. http://neea.org/docs/reports/residential-building-stock-assessment-single-family-characteristics-and-energy-use.pdf?sfvrsn=8

Table 14: Participant Source of Awareness and Information Regarding HPWHs, by Tier

Source of Awareness	First Mention			All Mentions		
	Tier 1 (n=72)	Tier 2 (n=72)	Overall (n=144)	Tier 1 (n=72)	Tier 2 (n=72)	Overall (n=144)
Internet Unspecified	16%	13%	15%	44%	54%	47%
Retail store display / saw it in store	14%	10%	13%	17%	11%	15%
From utility / NEEA / program	7%	19%	11%	16%	22%	18%
Utility print advertising, bill stuffer	6%*	19%*	10%	7%**	22%**	12%
Retail ad / mailing / store	12%*	0%*	8%	16%**	1%**	11%
Newspaper ad	10%*	1%*	7%	14%**	1%**	10%
From employer/work in industry	7%	6%	7%	9%	7%	8%
Friend or acquaintance	7%	4%	6%	7%	7%	7%
Word of mouth	6%	4%	5%	6%	4%	5%
From contractor / installer	1%*	10%*	4%	3%**	14%**	7%
Utility website	4%	3%	4%	6%	7%	6%
"Smart Water Heat" website	0%	0%	0%	1%	0%	0%
Other	9%	11%	10%	13%	17%	14%

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?
*Statistically Significant difference at 90% CI between T1 and T2, First Mentions
**Statistically Significant difference at 90% CI between T1 and T2, All Mentions

As shown in Table 15, Tier 2 participants most often initially learned about the Tier 2 manufacturer from a contractor or installer (26 percent), or from a utility or NEEA program (19 percent). Reportedly, most participants later learned more about the Tier 2 manufacturer through a retail store (in store, ad, or mailing). This is confusing as the Tier 2 HPWH manufacturer reports that they do not sell or promote HPWHs in retail channels (see section 4.3 for further detail). Other common sources of information included contractors or installers (31 percent) and either a utility or NEEA program (21 percent).

Table 15: Source of Tier 2 HPWH Brand Awareness and Knowledge among Tier 2 HPWH Purchasers

Source of Awareness	First Mention (n=73)	All Mentions (n=73)
Retail ad / mailing / store	1%	62%
From contractor / installer	26%	31%
From utility / NEEA / program	19%	21%
Utility print advertising, bill stuffer	16%	16%
Utility website	10%	10%
Retail store display / saw it in store	4%	7%
Internet Unspecified	4%	8%
Friend or acquaintance has one	4%	4%
"Smart Water Heat" website	0%	1%
Tier 2 HPWH Brand Website	0%	4%
Other	15%	16%

Q 3. And how did you first hear about the <Tier 2 Manufacturer> brand of heat pump water heaters?
Q 4. Did you hear about <Tier 2 Manufacturer> heat pump water heaters from anywhere else or learn more about it from any other sources?

4.1.2 Purchase Decision / Importance of Incentives

Tier 1 and Tier 2 participants had similar reasons for interest in HPWHs as opposed to other types of water heaters. As shown in Table 16, the most common reasons for their interest in HPWHs were saving energy and efficiency (62 percent), the lower monthly operating cost (32 percent), and the availability of the rebate (22 percent).

Table 16: Reasons for Interest in HPWH vs. Other Types of Water Heaters, by Tier

Reason	Tier 1 (n=75)	Tier 2 (n=75)	Overall (n=150)
Saving energy / efficiency	64%	59%	62%
The lower monthly operating cost	31%	35%	32%
The availability of the rebate	23%	20%	22%
No natural gas	3%	8%	5%
The payback period	4%	4%	4%
Curiosity / new technology	4%	1%	3%
Concern of carbon footprint / greenhouse gases	1%	5%	3%
Other	9%	11%	9%

Q 13. What initially interested you in a heat pump water heater, as opposed to other types of water heaters?

Table 17 shows that respondents ranked the availability of the rebate as slightly more important than saving energy and lower monthly operating costs (4.7, 4.5 and 4.5 respectively, where five is very important). This finding is not statistically significant.

Table 17: Importance of HPWH Purchase Considerations, by Tier

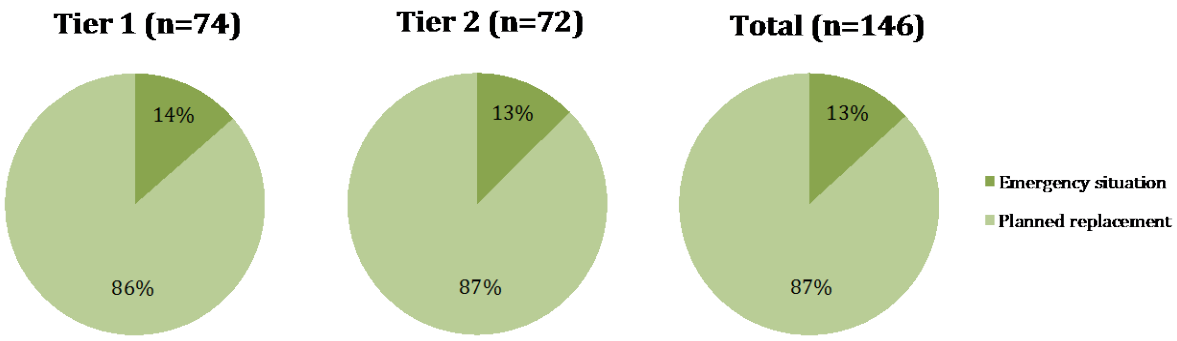
Purchase Consideration	Tier 1 Mean Importance	Tier 2 Mean Importance	Overall Mean Importance
Saving energy	4.5 (n=48)	4.6 (n=44)	4.5 (n=92)
Availability of the rebate	4.6 (n=18)	4.8 (n=15)	4.7 (n=33)
The lower monthly operating cost	4.5 (n=23)	4.6 (n=26)	4.5 (n=49)

Q 14. How important was <response to Q 13> in your decision to purchase a heat pump water heater, where 1 is not at all important, and 5 is very important??

4.1.2.1 Replaced Water Heater Characteristics

As shown in Figure 1, below, similar proportions of Tier 1 and Tier 2 participants replaced their pre-existing water heater in an emergency situation (14 percent and 13 percent, respectively). However, the vast majority of HPWH purchases were planned replacements (87 percent).

Figure 1: Emergency Replacements vs. Planned Replacements, by Tier



Q 9. Did you replace your previous water heater in an emergency situation, for example maybe it broke, or was it a planned replacement?

Table 18 shows a breakdown of Tier 1 and Tier 2 participants' previous water heaters, by tank volume. As shown, the majority of replaced water heaters had a capacity of between 40 and 55 gallons (75 percent).

Table 18: Previous Water Heater Tank Volume, by Installed HPWH Tier

Previous Water Heater Volume	Tier 1 (n=70)	Tier 2 (n=60)	Overall (n=130)
Less than 40 gallons	2%	2%	2%
40 - 55 gallons	76%	73%	75%
More than 55 gallons	22%	25%	23%

Q 7. How many gallons was your previous water heater tank?

4.1.2.2 Reasons for Purchasing a HPWH

Shown below in Table 19, among participants in existing homes who planned their water heater replacement, the most common reason for replacing the pre-existing water heater was that it was reaching the end of its useful life (48 percent overall). One-third reported that the efficiency of the HPWH drove them to replace their previous equipment, and the availability of rebates influenced approximately 27 percent. Other reasons for planning replacement include wanting a larger volume water heater (10%), and the cost to operate the old unit (6%). These reasons were consistent across Tier 1 and Tier 2 participants.

Table 19: Primary Reasons for Replacing Water Heater, by Tier

Reason	Tier 1 (n=64)	Tier 2 (n=63)	Overall (n=127)
Getting old, time for a replacement	44%	56%	48%
Efficiency / to save energy	33%	32%	33%
Promotion / rebate	27%	26%	27%
Not enough hot water / wanted larger tank	12%	8%	10%
Cost to operate	7%	5%	6%
Rusted	6%	2%	5%
Leaky	4%	5%	4%
Other	6%	3%	5%

Q 10. What was the reason you decided it was time to replace your previous water heater?

The majority of participants believed that the installation of a HPWH has increased the value of their home. This is true for 55 percent of Tier 1 participants, 65 percent of Tier 2 participants, and 59 percent overall. Despite this, participants indicated the importance of the rebate in their decision to invest in a HPWH: only 25 percent of Tier 2 participants would have purchased the Tier 2 HPWH if the rebate were $500, instead of $1,000.

As shown in Table 20, approximately 42 percent of participants reported no concerns when they were considering a HPWH purchase. Remaining participants' top concerns were related to the performance of the HPWH (i.e., capability, functionality, recovery time, and amount of hot water) and reliability (reported by 14 percent and 12 percent of participants, respectively). Tier 1 and Tier 2 participants shared the same concerns in approximately the

same proportions. "Other" concerns mentioned by participants include the physical size of HPWHs, ducting requirements, maintenance needs, warranty, product efficiency, HPWH upfront cost, and doubts regarding whether they would receive a rebate (each reported by less than 3% of respondents).

Table 20: Participant Concerns when Considering HPWH Purchase, by Tier

Concern	Tier 1 (n=75)	Tier 2 (n=75)	Overall (n=150)
No concerns	44%	37%	42%
Performance*	12%	17%	14%
Reliability	12%	12%	12%
Noise	14%	7%	11%
Location	10%	8%	9%
Installation	6%	4%	6%
Quality / Lifetime	3%	5%	4%
Other	19%	27%	21%

Q 25. Was there anything you were concerned about when you were considering a heat pump water heater?
* "Performance" includes capability, functionality, recovery time, and hot water supply

4.1.2.3 Financing and Tax Credits

We asked HPWH participants about various types of financial assistance they may have received to assist with their HPWH purchase, including: federal tax credits (used by 51 percent of participants), state tax credits (29 percent), and loans (10 percent). Table 21 shows that similar proportions of Tier 1 and Tier 2 participants have or will take advantage of the federal tax credit.

Table 21: Federal Tax Credit Recipients, by Tier

Federal Tax Credits	T1 (n=62)	T2 (n=69)	Total (n=131)
Have received federal tax credit	35%	45%	39%
Will receive federal tax credit	12%	12%	12%
Have not done taxes yet / Don't know	2%	0%	1%
No	51%	43%	48%

Q 32. Did you, or will you, receive a federal tax credit for your new water heater?

The federal tax credit was more important to Tier 2 participants than to those who purchased Tier 1 HPWHs (among those who received the credits). As shown in Table 22, Tier 2 purchasers rated the importance of the tax credit 3.5 out of 5 (with "1" being "not at all important" and "5" being "very important"). Tier 1 purchasers rate the level of importance of the tax credit at 2.6 out of 5 (on the same scale).

Table 22: Mean Importance of Federal Tax Credit, by Tier

Importance of Federal Tax Credit	Mean
Tier 1 Purchasers (n=28)	2.6*
Tier 2 Purchasers (n=38)	3.5*
Overall (n=66)	**3.0**

Q 33. 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.
*Statistically Significant difference at 90% CI

As shown in Table 23 the vast majority of Tier 1 purchasers did not receive state tax credits for their HPWH purchase. Nearly half of Tier 2 purchasers did not receive a state tax credit (48 percent), but the remainder did or will. Overall, a smaller proportion of participants took advantage of state tax credits (29%) than those that took advantage of federal tax credits (shown above in Table 21).

Table 23: State Tax Credit Recipients, by Tier

State Tax Credits	T1 (n=66)	T2 (n=65)	Total (n=131)
Have received state tax credit	11%*	45%*	22%
Will receive state tax credit	6%	8%	7%
Have not done taxes yet / Don't know	2%	0%	1%
No	81%*	48%*	70%

Q 35. Did you, or will you, receive a state tax credit for your new water heater?
*Statistically Significant difference at 90% CI

Table 24 shows that the state tax credits were more important to Tier 2 purchasers who received (or will receive) the state tax credit than for Tier 1 purchasers. On a scale of 1 to 5, with 5 being very important, Tier 2 tax credit recipients rated the tax credit a mean importance of 4.1, compared to 2.8 for Tier 1 participants who received similar tax credits.

Table 24: Mean Importance of State Tax Credit, by Tier

Importance of State Tax Credit	Mean
Tier 1 Purchasers (n=12)	2.8*
Tier 2 Purchasers (n=32)	4.1*
Overall (n=44)	**3.6**

Q 36. Please rate how important the availability of the <u>state</u> 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.
*Statistically Significant difference at 90% CI

Table 25 shows that Tier 1 participants used loans more frequently than Tier 2 participants did (this finding is not statistically significant, however). Overall, loans were used by only approximately 10 percent of participants.

Table 25: Percentage of Participants Using Loans, by Tier

Loans	Tier 1 (n=59)	Tier 2 (n=62)	Overall (n=121)
Received Loan	13%	4%	10%
Did not Receive Loan	87%	96%	90%

Q 27. Did you use a loan to pay for your new water heater?

4.1.3 Installation and Inspection Processes

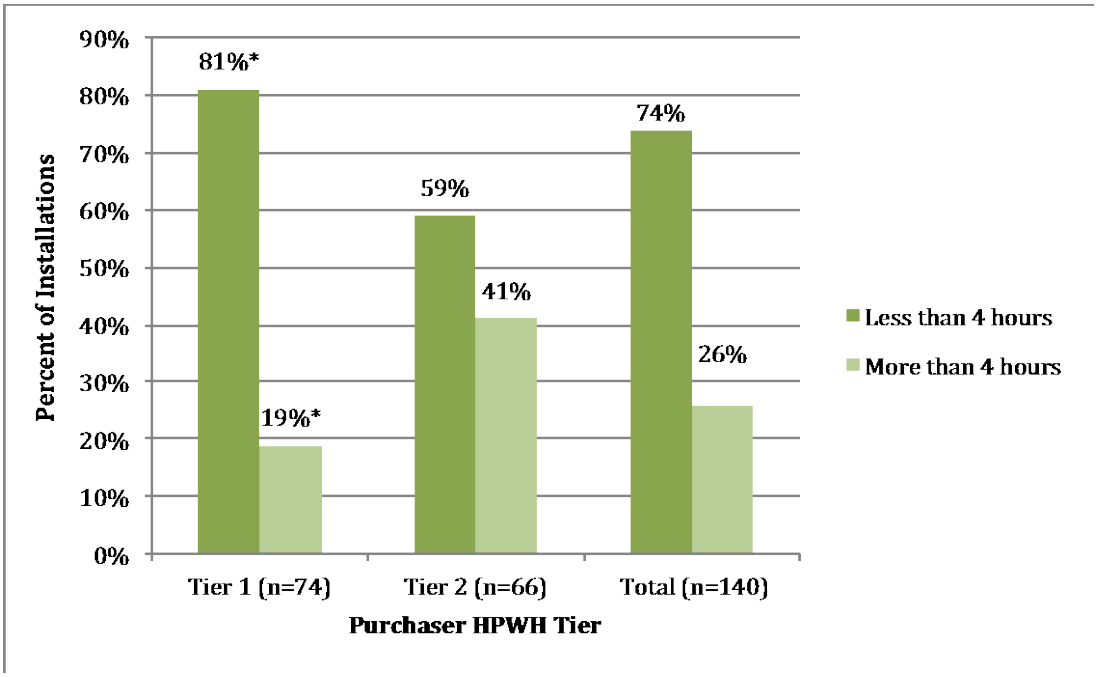
Installation processes varied between Tier 1 and Tier 2 participants. Importantly, Tier 2 participants were significantly more likely to have hired an installer (96 percent) than their Tier 1 counterparts (44 percent).

Contractors play a significant role in influencing participant choices and behavior, particularly for Tier 2 participants. All Tier 1 participants who hired an installer claimed that the installation was their idea. Only 77 percent of Tier 2 participants who hired an installer made the same claim. Another 19 percent gave credit for the idea to their contractor. This is consistent with Table 14, which shows that Tier 2 participants were significantly more likely to have received information regarding HPWHs from their contractor than Tier 1 participants.

Contractors were also helpful in educating participants regarding HPWH settings. This was especially true for Tier 2 participants (who hired an installer) who were significantly more likely than Tier 1 participants to be educated by their contractor regarding appropriate water heater settings (87 percent and 56 percent, respectively). Satisfaction with the installer was high across both Tier 1 and Tier 2 participants (4.5 where 5 is very satisfied).

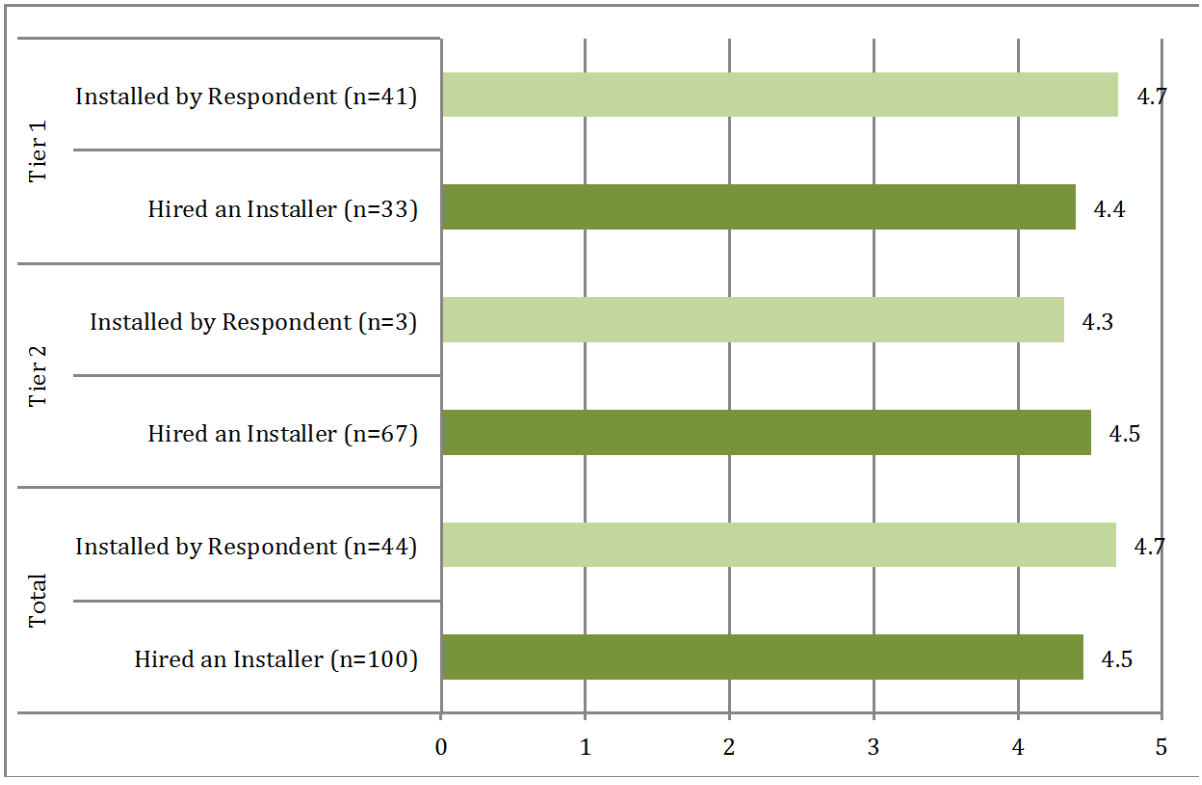
Tier 2 installations generally took more time than Tier 1 installations. Figure 2 shows 41 percent of Tier 2 installations took longer than four hours, compared to only 19 percent of Tier 1 installations. Despite this, participant satisfaction with installation times did not vary significantly between Tiers (Figure 3).

Figure 2: Length of HPWH Installation, by Tier



Q 44. How long did the actual water heater installation take, in total?
*Statistically significant difference at 90% CI from Tier 2 purchaser installation time

Figure 3: Mean Satisfaction with HPWH Installation Time, by Tier



Q 45. 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.

The most common place where customers installed HPHWs was in their garage (51 percent overall), as shown in Table 26. Other common locations include basements (28 percent) and utility rooms (16 percent). There were no statistically significant differences across HPWH Tiers.

Table 26: HPWH Installation Location, by Tier

Installation Location	Tier 1 (n=75)	Tier 2 (n=75)	Overall (n=150)
Garage	47%	59%	51%
Basement	29%	25%	28%
Utility Room	20%	8%	16%
Other	4%	8%	5%
Total	**100%**	**100%**	**100%**

Q 47. Where is your new water heater located?

Nearly three-quarters of HPWH installations did not include ducting of the exhaust (73 percent of homes). However, ducting was more prevalent for Tier 2 HPWHs (46 percent) than for Tier 1 HPWHs (16 percent), as reported by participants.

Seventy-five percent of Tier 1 respondents had a Quality Assurance Inspection (and all Tier 2 participants had an inspection). Of those that had the Quality Assurance Inspection, mean levels of satisfaction were very high for Tier 2 and Tier 1 participants (4.6 and 4.7 with 5 being very satisfied, respectively).

Unrelated to the Quality Assurance Inspections, significantly fewer Tier 1 participants (9 percent) contacted someone regarding their unit compared to Tier 2 participants (41 percent). The most common reasons for participants to reach out included: to repair a broken part of the water heater, to service the water heater, to respond to a manufacturer's field service campaign, and to answer questions about the water heater.

4.1.4 HPWH Usage and Satisfaction

Table 27 shows that there are significant differences in the selected HPWH operation mode among Tier 1 and Tier 2 HPWHs. Tier 2 participants were more likely to report that their HPWH was in the heat pump only mode than Tier 1 participants (51 percent and 23 percent, respectively). More Tier 1 participants used the hybrid setting (67 percent) than Tier 2 participants (38 percent).

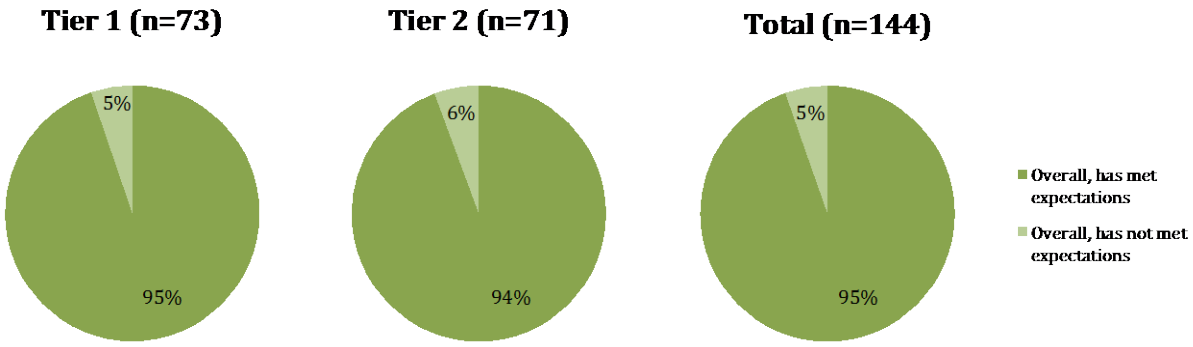
Table 27: HPWH Operation Mode, by Tier

HPWH Mode	Tier 1 (n=28)	Tier 2 (n=57)	Overall (n=85)
Heat pump only	23%*	51%*	42%
Hybrid	67%*	38%*	48%
Resistance only	8%	0%	3%
Other	2%	11%	8%
Total	**100%**	**100%**	**100%**

Q 58. What setting – or operation mode – is your heat pump water heater set for?
*Statistically Significant difference at 90% Confidence Interval between T1 and T2

Figure 4 shows that HPWHs have met the expectations of an overwhelming 95 percent of participants. Overall, satisfaction was given a mean rating of 4.5 where 5 is very satisfied (Table 28). Among the few participants whose HPWHs did not meet expectations, issues with hot water supply (i.e., low output water temperature and long recovery time) were common complaints.

Figure 4: Ability of HPWH to Meet Participant Expectations, by Tier



Q 74. Overall, has the heat pump water heater met your expectations?

As shown below in Table 28, participants were slightly less satisfied with the HPWHs maintenance requirements (4.3 out of 5) and sound level (3.9 out of 5) than with the HPWH overall (4.5 out of 5). Satisfaction levels are similar across both Tiers, and there were no statistically significant differences among responses within Tiers.

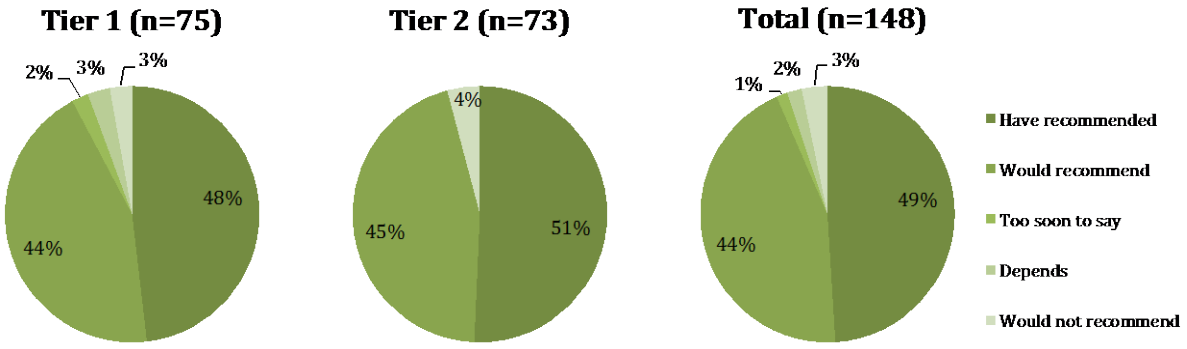
Table 28: Participant Mean Satisfaction with HPWH Attributes, by Tier

HPWH Attribute	Tier 1 Purchaser Satisfaction	Tier 2 Purchaser Satisfaction	Overall Satisfaction
The sound level of the HPWH	3.8 (n=75)	4.0 (n=75)	3.9 (n=150)
Maintenance requirements of the HPWH	4.4 (n=66)	4.2 (n=68)	4.3 (n=148)
HPWH overall	4.6 (n=75)	4.4 (n=75)	4.5 (n=150)

Q 64., Q 70., Q 72., 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")

Another way that we can infer high satisfaction levels of participants is their decision to recommend the unit to friends, colleagues or family members. As shown below in Figure 5, an overwhelming majority of participants either has recommended (49 percent) or would recommend (44 percent) the unit.

Figure 5: HPWH Purchaser Likelihood to Recommend HPWHs, by Tier



Q 76. Have you, or would you, recommend a heat pump water heater to a friend, colleague or family member?

The most common reasons for recommending the units can be seen in Table 29 and include lower energy bills or cost savings (67 percent), efficiency (21 percent), and the availability of rebates (15 percent). Only Tier 1 participants state that they would recommend HPWHs because of the easy installation and only Tier 2 participants state that they would recommend them because of environmental reasons. "Other" reasons include that HPWHs are a "new technology / high tech", suitability for electric-only homes, extended warranty, and reasonable upfront cost with rebate (all mentioned by less than 3% of respondents).

Table 29: Reasons for HPWH Recommendation Among Participants, by Tier

Reason	T1 (n=69)	T1 (n=70)	Total (n=139)
Lower energy bills / cost savings	72%	59%	67%
Efficiency / To save energy	18%	27%	21%
Rebates	17%	12%	15%
General satisfaction	7%	3%	5%
Improved hot water supply	2%	7%	4%
Operates reliably	3%	4%	4%
Easy installation	5%*	0%*	3%
Good for the environment	0%*	7%*	3%
Other	11%	23%	15%

Q 77. What are some of the reasons you recommended or would recommend a heat pump water heater?

Lastly, contractors and installers influence HPWH maintenance practices among end-users through educating participants. Overall, 85 percent of participants were aware that HPWH air filters must be cleaned. Of those who were aware of the need for air filter cleaning (and who had a contractor install the HPWH), 86 percent of participants learned about the need to clean the filter from their installer. Fewer than 20 percent of participants had cleaned their air filter. This is likely because many people have had their HPWH for less than a year. When asked why they had not cleaned their air filter, 83 percent of respondents said that the reason was that the unit was still new.

4.2 Northwest Utility In-depth Interviews

This section provides findings from in-depth interviews with seven representatives from Northwest electric utilities.

4.2.1 Utility Program Characteristics

We asked questions related to many aspects of utility rebate programs. Findings are presented in this section, and broken out by topic.

4.2.1.1 Goals

Utility representatives were asked about the goals and purpose of their HPWH incentive programs. Two respondents stated that their utilities initiated HPWH incentive programs to explore the technology's potential and "test the waters." These respondents noted that funding from BPA for provisional measures facilitated this type of trial. Another utility started their program to be current with regional rebate trends and to allow early adopters to test this emerging technology, while another utility was promoting HPWHs because they are an important measure in the Northwest Power Council's Sixth Plan (and the utilities are expected to produce anticipated savings). Three respondents were more confident that HPWHs will be a source of large regional energy savings (based on BPA studies and manufacturer

conferences) and want to impact distributor and contractor markets to affect market transformation.

Three utilities have no formal goals and instead are focused on increasing familiarity among retailers, contractors, and customers, with the goal to assess market acceptance based on the outcome of their programs. The other utilities have goals to complete between 200 and 400 installations in 2013 (in addition to developing supply side infrastructure). The utilities with informal "familiarity" and "test the waters" goals say they are satisfied with their installation activity and the information they had gleaned through the experience. The utilities with quantitative goals expect to exceed their goals, except for one that only promotes Tier 2 models.

4.2.1.2 Challenges

The respondents described a wide range of perceived challenges that they believe will need to be overcome. These include technical issues, regulatory issues, and market issues, and are presented below by sub-topic. In many cases, the Northern Climate Specification addresses their concerns related to technical issues. Utility representative perceptions regarding HPWH market challenges include the following:

Technical issues:

- Need for larger install rooms;
- HVAC interaction – cold air should be exhausted to the outside to prevent indoor cooling (which reduces energy savings);
- Noise;[17]
- Complexity – installers do not realize *how much* HPWHs are different than standard models;
- Complexity – Tier 2 models are typically not do-it-yourself (DIY) installs (more prevalent for Tier 1 HPWHs); and,
- Hot water demand – there is no consistent guidance to ensure that Tier 1 models provide enough hot water to serve different family sizes.

Regulatory issues:

- Washington permit requirements – customers, installers, and retailer staff are confused about the requirements and costs (in King County in particular), as the rules are not clear and consistently applied; and,

[17] One utility program respondent stated that several surveyed Tier 1 customers experienced noise and cooling issues, although they were still satisfied with their HPWHs.

- Contractor requirements – Some jurisdictions in the region require water heater replacements that involve "touching" copper (adjustments to the plumbing infrastructure) to use a licensed plumber.

Market issues:

- Household education – as reported by utility representatives, many households do not know that water heating consumes energy, and have low awareness of HPWHs and efficiency gains;
- Rebate confusion – households do not understand how multiple rebates and tax credits can and should be applied;
- Technology history – some contractors are still wary of the HPWH failures during the 1980s (households are less aware and less concerned);
- Installation costs – some utilities are concerned about inflated costs and others are not. Contractors are still learning the process and early adopters may be less cost conscious. One utility has seen many DIY installs, indicating that contractor costs may be high. One utility has reduced local labor costs by working with retailers to train their contracted installers. One utility speculates that a new type of specialized water heating contractor may be needed, since both plumbers and HVAC contractors are expensive; and,
- Brand variety – additional makers of Tier 2 models are needed to grow the market.

4.2.1.3 Program Characteristics

Most utilities give rebates of $300-$500 for Tier 1 models and $500 for Tier 2 (one offers $800). One utility provides $500 for both Tiers, while another utility only rebates Tier 2. The respondents generally expect their rebates to remain level in the next few years, but this will depend on BPA funding, results from current impact studies, and cost effectiveness calculations after more installations are completed (due to refinements in install cost and energy saving inputs to cost effectiveness calculations).

Most utilities expect improving cost effectiveness as electric rates rise and HPWH manufacturing costs decline. However, one utility representative expects findings of reduced savings from small conditioned spaces and installation variations, as they believe studies will show lower savings than previously anticipated. All of the programs are targeting single-family retrofits and new construction generally, and one is implementing more specific targeting of 1970s and older homes with garages.

Five utilities offer no equipment financing due to policies and/or limited staffing. Among this group, one refers customers to an affiliated credit union, and another informs customers that financing is available from local banks. Another respondent noted that some HPWH buyers are using retailer credit card financing (e.g., zero-percent interest for the first 12 months).

One utility offers $500 interest free loans for electric measures, but financing and measure promotions are not integrated, and financing for HPWHs will not be emphasized until they are proven cost effective. Another utility matches installers with lender trade allies so installers can promote financing as an option. This respondent thinks some Tier 2 installs have used bank loans.

Most of the utilities are trying to keep their marketing costs low until HPWHs are proven cost effective. One respondent clarified that they are "educating on" and not promoting HPWHs; their website has rebates and technical information but they use no mass media. All of the utilities have website information with links to the Smart Water Heat website, and two also rely on more sophisticated Internet advertising.

Some utilities are also using various combinations of bill inserts, newsletters, radio advertisements and/or social media (e.g., Twitter, Facebook). The most proactive utility uses bill inserts, mailers to households, co-branding with manufacturers, signage in retail stores, press releases and local daytime TV (e.g., New Day Northwest). Two utilities have displays in their offices and three utilities are working with large appliance and home improvement retailers in their territories to include their rebate information and by referring inquiring customers to these stores.

The interviewees reported that their most effective marketing channels are retailers (which can account for up to 80 percent of projects), a regional magazine, and direct mail to households with garages for Tier 2 models. Currently the most effective marketing message is the low out-of-pocket cost when utility, retail and/or manufacturer rebates are applied, in addition to state tax credits. Reportedly, some customers have been able to buy Tier 1 models for under $200.

4.2.1.4 Market Interactions

Four utilities are actively working with combinations of manufacturers, distributors, and contractors. One utility had recently hosted technical training for 25 installers, and another was trying to develop a coordinated marketing campaign with a manufacturer, large distributor, and selected installers to offer specific fixed-price models to customers. A different utility had already implemented a similar campaign with the Tier 2 manufacturer and a contractor partner that received utility customer lists and co-branded mailers. The last utility regularly works with retailer and manufacturer "trade allies" and was planning a new Tier 2 marketing campaign with high-volume contractors for Q3 2013.

Except for the utility that hosted installer training, most are relying on NEEA and the manufacturers to provide technical training. In this regard, the materials on the Smart Water Heat website (e.g., Install Best Practices) are considered very useful, as are the 15-minute installation videos developed manufacturers.

All of the utilities are familiar with the retail promotions but only a few respondents had actually been in stores to see materials. Three respondents noted that the promotions are

increasing customer awareness and installations, with one noting that "customers could see which ones are on sale quickly, the sales associates were very informed and knew to send technical questions to (our utility); there was good coordination overall." Conversely, one respondent found that some information was far away from products, some was on the wrong product, and the counter cards were small. This respondent recommended installing more cutouts and bigger banners in stores. A different respondent was concerned that sales staff may not be good at sizing HPWHs for different households.

4.2.1.5 Expectations

Two respondents thought the emergency replacement market will always be challenging, because HPWHs require more installation planning and require permits in Washington, and because they will still cost at least $1,000 out of pocket after rebates (one offered that "failures are usually among those less willing to spend"). Another respondent thought emergency replacements could increase as more households become aware of HPWHs and prices go down in the long-term. One interviewee believed that multiple, high volume contractors need to be recruited to target emergency replacements, with contractual obligations to serve a minimum number of water heater emergencies annually with HPWH installations. Another utility recently implemented this strategy, by awarding a contract to a single, high-volume ("savvy") contractor for emergency replacements. The utility gives the contractor mailing lists and approved mailers that are sent to households with stickers with the contractor's information (the respondent did not have information on the effectiveness of this approach and did not disclose the contractor's obligations). Another respondent suggested focusing on distributor stocking incentives, since they want to move product quickly and would train their installers to promote HPWHs, and also early retirements and do-it-yourself (DIY) installs.

Most utilities are observing an upward trend in installations and inquiry calls, which typically increase with promotion activities (i.e., utility newsletters, direct mail, retail campaigns). In addition, most are cautiously optimistic or confident that installations will continue to increase; as key regional actors (e.g., NEEA, BPA, large utilities) are promoting HPWHs aggressively, consumer education will increase and word-of-mouth referrals will grow. One interviewee was hopeful that the region could build on the success of federal code changes for larger models to create new standards for smaller tanks too, perhaps by 2020. Two respondents stated that additional Tier 2 models are required to grow the market, and one speculated that manufacturers may be focused on southern states where many hot attic installations are possible. A different respondent noted that future market growth will depend on tapping the emergency replacement market, since few homes do planned replacements.

Regarding optimal target markets, four respondents thought all electric homes could potentially install HPWHs, while three believed that they should mainly be installed in garages or basements to increase savings and/or reduce indoor noise. One respondent thought NEEA should target upper middle class homes in the longer term (as rebates decline). Another noted that mostly two-person homes were installing HPWHs, and speculated that larger families

may be concerned about hot water supply. Lastly, most of the respondents felt that HPWHs are ideally suited for new construction, particularly the Tier 2 units with additional ductwork.

4.2.2 Interactions with NEEA and Heat Pump Water Heater Market Test

Regarding communications from NEEA and Fluid, the interviewees reported that the quality of technical information and promotion materials has been very high. Two respondents, however, indicated that they learned about the retail promotion much later than desired, and they did not have time to develop complementary bill stuffers or adequately inform field staff and utility call centers. One of these respondents noticed that the timing of communications had been improving via a new webpage dedicated to "emerging promotions."

Most interviewees believed that NEEA had responded well to an unexpected issue with Tier 2 HPWH supply, and they were confident that the technical issues had been resolved. Going forward, one utility would prefer that NEEA coordinate closer with them to schedule affected home visits, while another utility would like more collaboration on messaging, perceiving that some mailers were unduly alarming to customers.

Most of the respondents had difficulty finding at least one information item they had tried to research on the Smart Water Heat website, and recommended improved navigation. Respondents had difficulty locating information on: the list of qualified products, the Northern Climate Specifications, how to obtain Smart Water Heat's $1,000 rebate, and the retail promotion.

The utilities were very satisfied with the HPWH inspections that were occurring. Two respondents believed that Market Test staff should conduct more Tier 1 inspections. One respondent mentioned that it might be beneficial to receive reporting from the Market Test on inspection findings.

4.3 HPWH Manufacturer In-depth Interviews

Evergreen Economics interviewed representatives from all three HPWH manufacturers currently producing HPWHs that meet Tier 1 or Tier 2 of the Northern Climate Specification. Only one manufacturer produces a HPWH that meets Tier 2 at the time of this report.

4.3.1 Business Scope and Practices

The three manufacturers are very different in their business scope and practices related to the production of HPWHs.

The Tier 2 manufacturer only produces HPWHs. The began selling add-on heat pumps for water heaters in 2007, and field-tested integrated HPWHs beginning in late 2011. Their integrated HPWHs were available for purchase in 2012. One hundred percent of this manufacturer's revenue comes directly from HPWH sales, and their current production capacity is approximately 10,000 units per year.

One of the Tier 1 manufacturers produces many types of water heaters (and no other products types). They have been producing water heaters for over 70 years, and heat pump water heaters since 2010. Approximately one to two percent of this manufacturer's revenue (from residential water heater sales) comes from HPWHs. The representative mentioned that they currently supply approximately 40 percent of the residential U.S. water heater market, but could easily supply 100 percent of the storage tanks, provided there was sufficient demand for their models. They rely on a third-party compressor unit for their HPWHs, and mention that there may be a very slight lag in the ramp up for compressor supply, should demand for HPWHs increase to account for a significant proportion of the U.S. water heater market. They noted that they would have no issue meeting demand once their compressor supplier increased capacity.

The other Tier 1 manufacturer began producing HPWHs four years ago. They had not produced any water heaters since the 1970s, and currently do not produce any water heaters other than HPWHs. This company produces a wide range of appliances and other white goods. Their representative reported that HPWHs account for an immeasurably small proportion of their overall revenues. They were unable to discuss production capabilities, but have recently opened a facility in the U.S. that only produces HPWHs. Reportedly, they are "highly vested in growing the HPWH market" in the Northwest and throughout the country.

4.3.2 Marketing Strategies

Once again, the manufacturers reported significantly different marketing strategies for HPWHs in the Northwest, underpinning their vastly different approach to this emerging market.

4.3.2.1 Marketing Strategies – Tier 2 HPWHs

The Tier 2 manufacturer primarily markets to the distributor and contractor channels. Their product is not available in retail locations, and thus they do not focus on marketing to the end-user. The reason they take this approach – marketing to actors as opposed to end-users – is that they believe their product requires controlled installations. They require plumbers to be certified to install their product.

In terms of their specific marketing approach, the Tier 2 focus on trade shows and direct marketing to distributors and installers. They even have a reward program through one larger distributor, where contractors receive "reward points" for every HPWH they purchase for installation (it is unclear what purpose the points serve). They have also marketed with utilities, primarily relying on direct mail-outs to distributors and contractors, and have done limited television and radio advertising (again, with the target market being distributors and contractors, not end-users).

The Tier 2 manufacturer relies on the availability of rebates, energy efficiency, and return on investment (ROI). They also promote the lifetime warranty of their product. Specific to the Northwest, they focus a lot on the available rebates as they help in two key ways:

- Reduces first cost to the distributor, installer, and end-user; and
- Validates their product / credibility.

The Tier 2 manufacturer believes that NEEA is a bit reluctant to market their Tier 2 HPWH. They believe NEEA wants more experience with their water heater before ramping up marketing efforts. They recommended using existing mailing systems maintained by northwest utilities and NEEA to deliver marketing to end-users, and to focus on "reintroducing the product category to customers," noting that people with prior HPWH experience are particularly cautious (but may also be a good opportunity).

4.3.2.2 Marketing Strategies – Tier 1 HPWHs

The Tier 1 HPWH manufacturer that only produces water heaters reports that they market to wholesalers (distributors and contractors) and to end-users. For marketing to end-users, they rely on retail promotions, retail staff training, and point-of-purchase (POP) materials.

This manufacturer focuses on three main strategies to market to distributors and contractors. First, they market through trade publications. Second, they rely on manufacturer representatives to call homebuilders, plumbers, and other potential HPWH installers. Third, they have a contractor rewards program similar to the one mentioned by the Tier 2 manufacturer (above). In addition to the contractor rewards program, they believe one of the best marketing strategies is to stoke competition among contractors. They have had success when they bring numerous contractors together to train them on the technology and educate them about rebate programs. Reportedly, this develops not only awareness, but a competitive eagerness and a fear of losing future sales among contractors.

This manufacturer reports that it is more effective to market through retail as opposed to directly to end-users. Their most effective messages to end-users (via retail) are the product's ROI and the societal benefit of energy efficiency (e.g., reducing carbon footprint, less wasteful, etc.). For their ROI calculations, they rely on national DOE estimates (they noted these are problematic, but will likely change soon). This manufacturer also tries to overcome a product knowledge gap by providing simplistic explanations of how the HPWHs work. Reportedly, their messaging is consistent across the country, except in cases where they are promoting specific rebates.

The other Tier 1 HPWH manufacturer – who produces a wide variety of products, but only HPWHs in the water-heating sector – considers residential end-users their primary target for marketing efforts. However, depending on the information they need to communicate, they will also target plumbers, homebuilders, utilities, and distributors. To end-users, the main messages are consumer benefits, energy savings, and cost savings (ROI). Typically, the cost savings is the most prominent component of the message to end-users.

For the supply chain market actors, the messages focus on the value proposition for their business, and how their companies would benefit from selling HPWHs. For utilities, they focus

on offering benefits to the utility customers and the ability to take load off the grid. They described the reason for their different approaches to their different target markets by saying:

> *"At the end of the day, everyone needs to know the benefit to the customer. But, for instance, if you talk to a plumber they have a different set of motivations than the customer. And there are different motivations among the market actors, as well."*

This manufacturer's core messaging is consistent across the country, but they did note that they change their ROI math depending on regional incentive levels. They went on to say that while they do not count on rebates, they certainly improve the value proposition for the trade allies and the ROI for the end-users, so they make sure to highlight them in their marketing.

4.3.3 HPWH Sales

The Tier 2 HPWH manufacturer reports that NEEA's HPWH Market Test has had a significant impact in the number of HPWHs they manufacture and sell, going as far to say that the rebates are, "probably the single reason we have been selling [HPWHs]." They also noted that NEEA's efforts would affect which HPWH tank volumes they manufacture and sell.

The Tier 2 manufacturer was conflicted with respect to the price of HPWHs in the future. Typically, they noted, as production and sales volume increases for a product, the price decreases. However, they report that the raw material costs are increasing, which may mute the benefits of ramping up production (economies of scale). They predict that the price for HPWHs will remain steady for the next few years, but were unsure what would occur thereafter.

At the time of the interviews, both Tier 1 HPWH manufacturers believed that NEEA had a modest impact on sales of their HPWHs in the Northwest, but had not had a significant impact in the design of their products. However, they varied in their beliefs about whether NEEA could affect the types of HPWHs produced. One mentioned that they must discount the effects of rebate programs on product design – unless they can count on them for a longer period of time – because of their upfront tooling costs (manufacturing or purchasing the tools they need to produce the HPWHs). Additionally, they reported that their focus is on meeting a certain price point, so even if they could reach a certain specification level, if the price of the product without a rebate is too high they do not believe it will sell. The other Tier 1 manufacturer believes that NEEA could influence their HPWH design in the future. However, the main barrier to a successful product design relationship between this manufacturer and NEEA is that they believe NEEA focuses on specifying equipment solutions rather than performance outcomes. They contrasted the noise level requirement (performance outcome) with the requirement for ducting (equipment solution).

The Tier 1 HPWH manufacturer producing HPWHs and other types of water heaters reported that the market is largely price-driven, sometimes to a fault. Customers focus more on price

than they do on water heater capacity / volume, and therefore they may not buy the correct size unit for their needs.

Both Tier 1 manufacturers believe that the price of HPWHs will decrease overall. One mentioned that newer products will be at a lower price, but existing products might see a price increase (they are selling some at a loss). Regardless, both agree that any decrease in price is believed to be relatively small due to material costs. They noted that it is essentially impossible to make a HPWH at the same price point as a resistance water heater because a HPWH is a resistance water heater, with the added heat pump components.

Regarding the expiration of tax credits, the Tier 2 manufacturer saw a limited impact on sales. They attributed the relatively small effect to utilities across the country filling the void left by expiring tax credits with rebate programs. However, both Tier 1 manufacturers reported that the expiration of tax credits were detrimental to HPWH sales. One reported that it damaged their perception of the market because they had to work to counteract the effects of the expiration. The other manufacturer said that they had influenced sales in 2011, and the expiration in 2012 hurt sales for that year. Furthermore, they mentioned the ineffectiveness of the retroactive tax credit on inducing sales (when the credit was reintroduced in 2013, households who purchased a HPWH could apply for a retroactive credit for 2012 HPWH purchases). This manufacturer believes that the expiration of credits again at the end of 2013 will also have a negative impact on HPWH sales. Interactions with Other Market Actors

4.3.4 Interactions with Other Market Actors

None of the HPWH manufacturers have had issues with installers. However, this is not because installations are necessarily easy, but rather the manufacturers have adapted approaches to mitigate potential issues. For example, the Tier 2 manufacturer reported that they have been very cautious, requiring all contractors to participate in trainings to install their product. The contractors must also go through a Smart Water Heat training in order to be eligible to install units that qualify for the Smart Water Heat rebate. They acknowledge that the trainings are needed because the installation is complex. In particular, ducting is not a skill for most plumbers, and thus they require training.

Both Tier 1 manufacturers also provide training and certification for contractors. However, they noted that their installations are typically less complicated, but that space and condensate management are potential issues. One Tier 1 manufacturer reported that they designed their product to be as easy to install as possible, taking up a similar amount of physical space as the water heaters they are designed to replace and infrequently requiring plumbing changes.

All of the manufacturers quoted wide ranges in installation costs, and all believe that the cost will come down over time. Reportedly, some Tier 1 installations are very affordable. This is entirely dependent on installation location characteristics, and thus would be difficult to control or affect.

The Tier 2 manufacturer and one of the Tier 1 manufacturers work directly with contractors to promote HPWHs to end-users. The other Tier 1 manufacturer does not directly engage with contractors to assist them in their marketing efforts to customers.

All three HPWH manufacturers work with distributors to market their HPWHs. They provide trainings and product collateral. Some distributors bring their preferred contractors to the trainings, as well.

The Tier 2 manufacturer believes they have good coverage in the Northwest with their current set of distributors (they work with five distributor firms in the Northwest). One of the Tier 1 manufacturers reported a need to expand their distribution in the Northwest for inventory to be available to wider geographies. The other Tier 1 manufacturer reports that they have good representation in the Northwest, but are never opposed to expanding. This manufacturer also mentioned that they have had challenges working with distributors (the other two had no challenges). Specifically, this manufacturer believes that the distributors should push the education they receive regarding HPWHs down the supply chain to the contractors. However, since the distributors typically sell a wide range of products (not just water heaters or HPWHs), they are not focused on learning specific product attributes or challenges.

The Tier 2 manufacturer does not currently work with any retailers. They believe that they ultimately will work with retailers, largely because NEEA views this as a way to drive down cost (through competition and do-it-yourself installations).

The two Tier 1 manufacturers work with large and small retailers. Both provide marketing assistance to retailers, and one reported working with retailers to train their staff. This manufacturer did not that frequent employee turnover at retailers can have a negative impact on the effect of training retailer employees.

4.3.5 Interactions with NEEA and Market Test

The level of interaction with NEEA and the market test varied among manufacturers. One of the Tier 1 HPWH makers has only had two or three discussions with NEEA, and has not done any direct co-marketing. The other Tier 1 manufacturer reported that they participate in weekly calls with NEEA and engage NEEA staff at trade shows and conferences. The Tier 2 manufacturer talks with NEEA staff at least every two weeks, and noted that they were directly engaged with NEEA since before they had developed an integrated HPWH.

The Tier 2 manufacturer reported no challenges working with NEEA and the Market Test. The other manufacturers are not currently facing challenges working with NEEA, but both mentioned that prior differences of opinion (regarding specifications) were problematic at first. Currently, they report that the focus of their relationship with NEEA is on engaging in mutually beneficial areas, such as marketing and trainings.

All HPWH manufacturers plan to work with NEEA during the rest of 2013 and beyond. However, the Tier 2 manufacturer reported a stronger focus on this than the other manufacturers. One Tier 1 manufacturer reported that they will continue to promote and market HPWHs regardless of NEEA, but hopes to collaborate. The other mentioned that their collaboration with NEEA would likely be focused on marketing only, but that they may engage more in the future, as they view the rebates in the Northwest favorably.

4.3.6 HPWH Barriers and Challenges

All three manufacturers mentioned HPWH first cost as a barrier to increased adoption. The Tier 2 manufacturer said that rebates minimize the cost barrier. All three manufacturers also mentioned awareness, however one of the Tier 1 manufacturers was most concerned with contractor awareness (and training), while the other two believed customer awareness was the barrier. Lastly, all three manufacturers also mentioned installation concerns as a barrier – currently available HPWHs are not suited for all installation situations. The Tier 2 HPWH manufacturer also mentioned physical size and weight of HPWHs, as well as the need for ducting.

All three manufacturers believe that HPWHs will gain acceptance in emergency replacement situations. They all report that this is an awareness and familiarity issue among contractors, and all suggested that local stock or contractors carrying HPWHs on their trucks are critical to success in the emergency replacement market. All three manufacturers suggested midstream buy down approaches could be successful at encouraging distributors to stock and contractors to promote HPWHs in these situations. Cost was also mentioned as a barrier, as customers typically have not considered a new water heater at the time their old one fails, and thus tend to go for the lower cost product (other reasons for this include limited capital and limited understanding of the technology among end users).

4.3.7 Future Expectations

The Tier 2 HPWH manufacturer believes that there will be some upcoming technological developments for HPWHs, but that they will add to the cost of the product. Additional cost will be a significant barrier, so they are unsure of the outcome of technological developments. They do plan to develop a Tier 3 HPWH model, but there is no specific timeline for production. Their focus is on reducing the current barriers of awareness and cost.

The Tier 1 manufacturer focused their discussion regarding the future of the HPWH market on lowering the cost of the HPWH components. They believe that lower cost compressors are on the horizon, which will have a significant impact on the overall price of the water heaters. They are less focused on meeting Tiers 2 or 3 than they are on driving costs down to reach a broader consumer base.

Regarding the 2015 federal legislation that will require all electric storage water heaters over 55 gallons to have comparable efficiencies to HPWHs (the specification is technology-neutral, but current resistance water heaters do not meet the requirements), manufacturers believe that the impact will not be very widespread. They both noted that the majority of storage

water heaters are around 50 gallons, and thus exempt from the specification. In addition, the Tier 1 manufacturer mentioned that customers have the options to size down to a 55 gallon tank (if they previously had a larger tank), purchase two smaller resistance tanks, or purchase a commercial water heater (80 gallons) with a higher wattage resistance element (which would actually *increase* demand, reportedly).

Manufacturers predict that HPWH sales in the Northwest in 2013 will surpass sales in 2012, but they were reluctant to provide specific estimates. Incentives remain a significant factor driving sales of HPWHs in the Northwest.

4.4 HPWH Distributor In-depth Interviews

The Evergreen team conducted in-depth interviews with representatives from 11 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.

4.4.1 Business Scope and Practices

Six of the 11 distributor respondents were owners or key managers of their business and five were employees. Respondents reported selling HPWHs for three years, on average (compared to an average of 11.6 years selling water heaters in general).

Five interviewees reported stocking Tier 2 HPWHs, three stock Tier 1 HPWHs, and three did not stock HPWHs. Among those that did not stock HPWHs, one mentioned that he had access to the Tier 1 HPWHs and another mentioned they sell a non-qualifying HPWH as well as Tier 2 HPWHs.

All respondents reported that HPWHs make up five percent or less of their business revenue. Six respondents reported between one and five percent. The other five respondents attributed less than one percent of their business revenue to HPWHs.

4.4.2 HPWH Supply

Seven distributors source HPWHs directly from manufacturers. Of those, five source from one manufacturer only and two source from multiple manufacturers. Three of the distributors who do not source HPWHs directly from manufacturers source their HPWHs from manufacturer representative agencies (one of these agencies is directly affiliated with the manufacturer and two are independent, commission based agencies). The final distributor reported sourcing HPWHs from another distributor/wholesaler.

Distributors reported sufficient demand (four respondents), rebates (two mentioned rebates and one specifically mentioned NEEA rebates) and law/code changes (one respondent) as the main reasons for stocking HPWHs. Those distributors that do not stock HPWHs indicated lack of demand, technical issues, low company focus on plumbing activities, and too many

fluctuations in trends (of technology and rebates) as the main factors that discourage stocking, and encourage ordering HPWHs as needed (a risk mitigation strategy).

In regards to future stocking practices, two distributors will continue stocking HPWHs as long as there are rebates, one stated that they will increase stocking (given current demand), two mentioned they would start stocking if technical flaws were addressed, and one will switch from stocking one brand of HPWH to another due to better design. One distributor mentioned that the company would not stock but would always order as needed. Another distributor that does not currently stock HPWHs reported that they have no plans to change their stocking practices due to the lack of demand for HPWHs. Three distributors indicated that their stocking practices depend on how HPWHs perform in the market.

All five of the distributors that sell Tier 2 HPWHs mentioned supply chain issues. Four of these respondents experienced major shipping delays from the manufacturer (between six and 18 months) due to production issues and one stated that they, "couldn't get [Tier 2 HPWHs] in stock for a bit as we were selling them quicker than we got them." Among those that experienced shipping delays, two mentioned issues related to only one manufacturer meeting Tier 2 of the Northern Climate Specification. Specifically, they mentioned that the manufacturer could not keep up with the sharp increase in demand associated with the Smart Water Heat incentives. Another mentioned that the Tier 2 HPWH manufacturer had to perform a comprehensive service campaign on many of their units. The other distributors (of Tier 1 HPWHs) reported no supply chain issues.

4.4.3 Marketing Strategies

Four distributors mentioned that they are actively involved in marketing HPWHs in the Northwest. Among these distributors, two provide information on their websites and in their electronic newsletters (via emails). One of these same distributors also markets HPWHs using fliers, a direct sales team, and displays in their showroom. A third distributor markets at trade shows and through weekly advertisements. The final respondent's firm has their own marketing strategy that they use to promote discount and incentive programs, relying heavily on mailers for their marketing implementation. This respondent also hosts HPWH trainings for their contractors.

One of the six respondents that did not actively market to the residential market mentioned that the Smart Water Heat program got the word out about HPWHs and that a local utility came out with a mailer (this was powerful because of the utility's large territorial coverage). This respondent indicated that while plumbers are not typically keen on energy efficiency, they had to "jump onboard" because demand for HPWHs was "taking off". He also added that it was a "no brainer to end-users because it was cheaper than standard water heaters!"

Three respondents consider the residential market their target market, whereas eight promote to and target contractors and plumbers. Among those that target residential households, two mentioned that they focus primarily on newly constructed homes. One of these distributors also mentioned that a lot of HPWHs go into emergency replacement

situations. The third respondent mentioned that HPWHs are particularly suited for higher-end residences where the mechanical rooms are more spacious, and where the household may have the income to afford newer technologies such as HPWHs. Of the distributors who target contractors and plumbers, one mentioned that they work specifically with contractors to target customers who have ductless heat pumps (DHPs), as they are also very likely to buy HPWHs.

None of the respondents indicated that NEEA or utility HPWH messaging or marketing have conflicted with their company's marketing efforts. Seven respondents have not received marketing support from NEEA's Market Test (one mentioned that NEEA representatives were present for an information session). Four interviewees receive some form of marketing material from NEEA.

On distributor sought information about DHP Initiative participants to target them with HPWH marketing (saying, "the market segments that have taken part in the DHP program are the low hanging fruit and would be the fastest to adopt HPWHs").

Seven interviewees expressed that marketing the availability of rebates is crucial to driving HPWH sales in the Northwest. The four other distributors focused on recommendations regarding the marketing channels, and suggested television and radio advertisements, utility bill stuffers, and social media presence. They also mentioned more marketing could be done through local utilities.

4.4.4 HPWH Sales

Eight out of 11 respondents indicated that the Tier 2 HPWH is the most popular HPWH model in the Northwest (three of them further commented that those were the only ones qualifying for rebates). Three distributors would not comment on the popularity of HPWH brands.

Four distributors report that NEEA's efforts – including the incentives and the Northern Climate Specification – have heavily influenced HPWH sales in the Northwest. However, the seven other distributors reported that NEEA's Market Test had no or minimal impact on sales (many of these distributors have not sold many HPWHs).

Seven distributors mentioned that the expiration of federal tax credits had little or no effect on their HPWH sales. One other distributor indicated that the expiration of federal tax credits highly negatively affected their HPWH sales, and the final three mentioned slightly weakened HPWH sales.

In regards to future HPWH prices, four distributors expect increasing prices and four expect decreasing prices (three were unsure or said that it depends on other factors such as market demand). Those reporting likely increases in HPWH prices cited knowledge from other water heater market trends, increasing costs of raw materials, and rising costs of warranties as failure ratios increase. The four distributors who believe the price will decrease cited the commoditization of the appliance, increased competition in the Tier 2 market (as more

manufacturers produce HPWHs that reach the Tier 2 specification), and general decrease in prices as HPWHs gain more momentum.

Six distributors predicted that HPWH installation cost will increase in the future (mainly due to increasing labor costs) and two interviewees mentioned that installation prices would go down (because of price competition and increased familiarity with installations of HPWHs). One respondent indicated that installation charges would remain constant for two years and decrease in the next five to ten years.

4.4.5 Interactions with Other Market Actors

Four distributors reported that they provide general water heater training to installers. Only three distributors had concerns about the way in which installers are installing HPWHs, and mentioned technical challenges (such as space and ventilation controls) and maintenance of HPWHs as specific concerns.

4.4.6 Interactions with NEEA and Fluid

Nine distributors mentioned that they had never (or very infrequently) worked directly with NEEA. One of the two distributors who have worked with NEEA reportedly requested DHP program participant data from Fluid, but was rejected because of the confidential nature of the information. This distributor indicated that DHP participant information would help define their target – noting that participants of the DHP program were energy conscious and knew how NEEA incentive initiatives worked. Both of the distributors that interacted with the Market Test were somewhat satisfied with their relationship with NEEA.

Two interviewees stated the NEEA's efforts have made them more aware that there is consumer interest in HPWHs. Another distributor mentioned that NEEA's market test "made sales explode," and the remaining eight respondents were not sure (or didn't comment on) how NEEA's project influenced their view of the HPWH market in the Northwest.

4.4.7 HPWH Barriers and Challenges

The main barriers to HPWH adoption mentioned by distributors include high initial price, concerns about new technology, lack of awareness and knowledge of HPWHs (among end-users and market actors), the size of the unit, supply issues and negative market impressions leftover from poor-performing products in the 1980s. Four respondents mentioned that homes fueled by gas are unlikely to qualify for rebates and so are more resistant to HPWHs.

Seven distributors reported that some end-users might accept HPWHs in emergency replacement situations. Situational factors dictate when a HPWH may replace a broken electric resistance water heater, including whether the home has sufficient space for the HPWH in a location acceptable to the end-user, and whether the installation contractor stocks HPWHs. Other factors that may increase the number of emergency replacements to HPWHs include lower prices, more contractor awareness and training, and the general prevalence of the technology in the market (end-user familiarity). One interviewee stated that households in

the Northwest would never accept HPWHs in such scenarios because during emergency replacements people usually go with the path of least resistance and not a top-of-the-line product. Three respondents did not comment.

4.4.8 Future Expectations

HPWH technology trends predicted by distributors include reductions in the overall size of HPWH units, increasing efficiency, and general improvements (each mentioned by four respondents). Four other respondents foresee no technological trends with HPWHs (one mentioned that he hadn't seen any since the Tier 2 model came out). One interviewee predicted that the next big step will be a trend towards using a combination product where one heat pump delivers house heating and water heating. This respondent suggested that the combination product would gain traction once builders start designing spaces around the product.

Six respondents indicated that the upcoming building code changes will lead to an increase in HPWH sales. Three distributors suggested there would be no or minimal effect on HPWH sales (two interviewees did not comment). Distributors that mentioned little or no effect of the code stated that people would buy multiple electric water heaters to maintain the same water heating capacity, and that most electric water heaters they sell are below the 55-gallon threshold.

Five distributors expect an increase in HPWH sales in 2013, assuming rebates remain available. Those five distributors, along with one other who was unsure about sales trends, report that HPWH sales are heavily correlated with the availability of incentives. All 11 respondents expressed that their companies would be able to keep up with market demand for HPWHs.

4.5 HPWH Retailer In-depth Interviews

Evergreen interviewed eight water heater retailers. Of the eight interviewed businesses, only four had sold HPWHs.

4.5.1 Business Scope and Practices

Among the interviewed firms that sold HPWHs, three were smaller retailers and one was a large retailer. The interviewees from the three smaller retailers are owners or key managers and the interviewee from the large retailer was a manager of their Green Leadership team.

The retailers have been selling HPWHs for an average of three and a half years. Two small retailers sell one brand of Tier 1 HPWHs and one sells two brands of Tier 1 HPWHs. The larger retailer typically does not stock any HPWHs but sells HPWHs from two Tier 1 brands.

Interviewees from the larger retailer and two of the smaller retailers reported very small portions of their overall revenue from HPWHs sales. The other smaller retailer reported that eight percent of their revenues come from sales of HPWHs.

4.5.2 HPWH Supply

The large retailer sources HPWHs directly from the manufacturer and each of the small store retailers source from big name distributors. Two of the small retailers stock HPWHs (around two units each) and the other orders HPWHs as needed.

Respondents from two of the smaller retail stores expect HPWH sales to increase in the future (remaining interviewees did not answer). None of the interviewees reported any problems sourcing HPWHs.

4.5.3 Marketing Strategies

The smaller retail shops do not actively market HPWHs and the larger retailer promotes HPWHs to end-users through the Internet and Sunday print advertisements. Three of the retailers considered end-users as their only target market, whereas one of the small retailers considered 80 percent of their target market to be HPWH installation contractors (they focused 20 percent of their efforts towards end-users).

Two of the smaller retailers and the larger retailer emphasize energy savings while promoting HPWHs, and the other small retailer highlights the available rebates. The larger retailer also emphasizes ROI in their marketing messages. One of the smaller retailers reportedly uses point-of-purchase materials and in-store displays to promote HPWHs to their customers. 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.

The large retailer was the only retailer to report receiving marketing support from NEEA. In collaboration with NEEA, the large retailer ran advertisements in Sunday newspapers in the Northwest. They worked to identify the best markets in each state and then targeted advertisements accordingly. They also reported that they incorporate NEEA's logo in their promotional material, and that NEEA developed website information regarding their promotional activities, highlighting participating retail locations. The utilities also promoted the large retailers efforts by sending direct mailers to end-users and marketing through Twitter and Facebook postings.

The interviewee from the large retailer recommends that NEEA should collaborate with retailers on marketing and co-branding strategies. One of the smaller retailers suggests that NEEA should market more directly to end-users.

4.5.4 HPWH Sales

All of the representatives from the smaller retail stores reported that NEEA's efforts have had no impact on their HPWH sales. However, the respondent from the larger retailer stated the NEEA's efforts have had a "wonderful" impact.

The expiration of federal tax credits did not affect the HPWH sales of the larger retailer. One of the small retailer interviewees believes the expiration of the tax credit as the main reason for low HPWH sales (and two did not report how the expiration had affected sales).

The large retailer and one of the small retailers expect HPWH prices to decrease in the future. One of the small retailers expects HPWH prices to increase (and one small retailer did not comment).

4.5.5 Interactions with Other Market Actors

None of the respondents were concerned with the way their HPWHs were being installed. The large retailer employs a staff of installers for HPWHs and other appliances. Their installers receive training and they report no issues with installations.

The large retailer sources HPWHs directly from the manufacturer. They reported no problems sourcing HPWHs as needed. One of the small retailers tried to source from the manufacturer of Tier 2 HPWHs but was unsuccessful. None of the smaller retailers had any problems sourcing other HPWHs from distributors.

4.5.6 Interactions with NEEA and Market Test

None of the interviewees representing small retailers had direct interactions with NEEA or Fluid.[18] The bigger retailer interacts with NEEA and Fluid on a regular basis through phone calls. The respondent also mentioned that their Green Leadership team is actively promoting HPWHs. NEEA reinforced this retailer's belief in the market potential and the value of the product for the end-user. Further, the interviewee from the large retailer planned to assist NEEA during 2013 (did not specify how) and stated they were extremely satisfied with NEEA (because they were well organized, open to new ideas and collaborative).

4.5.7 HPWH Barriers and Challenges

The large retailer representative stated that the main barrier to increasing HPWH market share is lack of awareness among the end users. Two of the smaller retailers mentioned that HPWH noise and the space required to install them are the main barriers (one did not answer).

One of the small retailer interviewees stated that households with older people would be most resistant to HPWHs (less apt to try something new and relatively expensive). The other retailer respondents did not believe any particular customer segment to be more resistant to HPWH adoption. Retailers agreed that HPWHs are feasible in emergency replacement situations, but that it would be difficult to increase the prevalence of these replacements due to a general lack of familiarity with HPWHs among end-users. Educating the general population – and time – may help overcome this particular barrier.

[18] It is possible that another retail employee besides the person contacted for this study had contact with NEEA or Fluid.

4.5.8 Future Expectations

We asked the retailers to consider the effects of the 2015 Department of Energy (DOE) water heater standards on HPWH sales. The large retailer representative believes that the effect of the standards on HPWH sales would depend on how manufacturers would react. One of the smaller retailer interviewees indicated the standards would have minimal effects on HPWH sales because most resistance water heaters were 50 gallons in volume. Another small retailer respondent stated that the standards would make HPWHs a more viable option (by driving up prices of standard electric water heaters).

The larger retailer interviewee predicted a slight increase in HPWH sales through 2013, and that "there is always room for growth" over the next three years. Two smaller retailers predicted no change in sales for the rest of 2013, and both expected HPWH sales to increase modestly over the next three years.

The large retailer and two of the smaller retailers stated the HPWH sales are heavily tied to rebates and incentives. One of the small retailer and the large retailer interviewees stated that their companies could keep up with the market demand for HPWHs if sales took off (others would not comment). One of the small store retailer and the big store retailer interviewees stated that HPWHs were a high priority market for their company, and the other two small retailers stated they were not.

4.5.9 Retailers *Not* Selling HPWHs

We discussed HPWHs with four retailers not currently selling HPWHs. All four of the small retailer stores that were interviewed have been selling water heaters for long periods of time (one for 14 years, the other three for over 30 years). One of these small retailer interviewees stated that they could not sell HPWHs due to stiff competition from big store retailers (there were two big retailers in very close proximity to their location). Three out of the four stores carried standard electric water heaters. One of these retailers mentioned that HPWHs were too expensive for them to sell. Two of these retailers did not comment on why they do not sell HPWHs.

4.6 HPWH Installer In-depth Interviews

Evergreen researchers interviewed seven Northwest HPWH installers. This section provides the findings from these in-depth interviews.

4.6.1 Business Scope and Practices

Among the seven HPWH installer representatives, five interviewees were key managers or owners and two were employees (one a sales manager and one a water heater technician). The respondents reported that their firms, on average, employ four installers capable of installing HPWHs.

Installers reported that they have been installing HPWHs since the beginning of 2012. All of the firms offer HPWHs that meet NEEA's Tier 2 Northern Climate Specification, although not

all have actually installed Tier 2 HPWHs (prior to the interview). Three of the respondents also offer Tier 1 HPWHs to their customers. Six of the seven respondents indicated that a very small percentage (less than 2 percent) of their business revenue comes from HPWH sales (one did not comment).

4.6.2 HPWH Supply

All seven interviewees source HPWHs from distributors. Reportedly, two of the respondents want to source directly from the manufacturer, but currently do not. All interviewees stated that they order HPWHs as needed as oppose to maintaining a stock. One of the interviewees mentioned that they had begun stocking HPWHs, but that there were a high number of units requiring a manufacturer's comprehensive service campaign. As a result, their company is discouraged from stocking HPWHs at this time (and possibly into the future). Two of the other interviewees also expressed willingness to stock HPWHs but refrained due to supply issues. Four respondents reported that they do not stock HPWHs due to the lack of demand for HPWHs.

All respondents stated that ordering HPWHs as needed did not affect the number of installations in emergency replacement scenarios. One of the interviewees commented that they have installed HPWHs in a few emergency replacement situations but those were because existing HPWHs had been involved in a manufacturers comprehensive service campaign. No other installers reported installing HPWHs in emergency replacement situations.

4.6.3 Installation Training and Market Test Communication

Employees from all seven firms attended Smart Water Heat training and staff from six of the interviewed firms attended a Tier 2 HPWH manufacturer's training (there were multiple trainings during the study period). Between two and three installers from each of these companies received training from the Tier 2 manufacturer.

Among those respondents that attended the Smart Water Heat training, two rated the training as extremely effective, one as very effective and two as somewhat effective. None of the interviewees had recommendations for improving the training sessions.

Two installers receive regular NEEA partner newsletters and report that the information keeps them up-to-date with the market and rebate information. Five installers reported that they do not receive NEEA partner newsletters (it remains unclear why not). None of the interviewees stated that they needed further information regarding HPWH installation best practices.

4.6.4 Marketing Strategies

All installer representatives reported that their firms are involved in more than one form of HPWH marketing. Two out of the seven installers mentioned using marketing tools provided by NEEA. Four respondents refer potential customers to websites, two use emails or social

media to promote HPWHs and two distribute literature during sales interactions. One of the firms advises customers about HPWHs (based on cost, need and feasibility) while doing general energy audits. Another firm displays HPWHs at trade shows and shows customers how they work during site visits (by showing them the Smart Water Heat website on their smart phone).

When asked about the most effective "sales-closer messages" or making a business case for HPWHs, two respondents emphasize cost and/or rebate factors and three interviewees highlight the energy efficiency aspects of HPWHs to customers. Six of the interviewees believe energy savings are one of the main reasons that customers install HPWHs. Two respondents mentioned that they are most successful only when customers call in and ask about HPWHs themselves.

We asked installers if there were any segments of the population that were most accepting of HPWHs. Two installers mentioned higher income households and two respondents indicated new construction homes are more likely to install HPWHs. One interviewee mentioned existing homes and yet another believed that homes in rural areas lacking natural gas may be most accepting.

Three respondents reported that the marketing support from NEEA was sufficient and three mentioned that additional material from NEEA would help. Specifically, they mentioned that a list of participating utilities and more information on energy savings would be beneficial.

4.6.5 Rebates and Financing

Four of the seven installers reported that every HPWH their company has installed received a rebate through the market test. One firm reported that approximately half of their installations were of rebated HPWHs and half were without rebates. The remaining two installers reported that they had not sold many HPWHs and were not sure how many received rebates.

Four respondents mentioned that local utility incentives are extremely important in driving HPWH sales and two interviewees stated that utility incentives were very important (one of the interviewees was not sure).

One respondent stated that utilities in their service area did not offer financing for HPWHs and six respondents were unsure. It is unclear whether installers would be aware of HPWH financing among their customers.

4.6.6 HPWH Installations

Five of the seven interviewees reported that they have installed Tier 2 HPWHs for their residential customers. One of these installers also has installed Tier 1 HPWHs. Two respondents were not sure if their company had installed any Tier 1 or Tier 2 HPWHs to date. None of the respondents reported installing any HPWHs in non-residential locations. Installers reported that all of their installation of both Tier 1 and Tier 2 HPWHs were

inspected as part of the market test. One of the interviewees indicated that they would like to get feedback from the inspectors regarding what they found during the inspection process.

One installer believes their firm will sell and install approximately 40 HPWHs over the course of 2013. Two other respondents forecasted selling and installing one or two more HPWHs, and four installers were unsure if they would sell any more in 2013.

Three installers believe HPWHs will be a long-term product for their firm. Others were either unsure or said it depends on rebates, demand, and HPWH cost. None of the installers had any formal HPWH installation goals. Four installers predicted that the price for HPWHs will decrease and three respondents thought that the price of HPWHs would continue to increase.

Four installers experienced no technical issues during installations, but three installers commented on space constraints. According to one of the installers, the main issues related to space requirements are that HPWHs are much taller compared to standard water heaters and that pipes need to go up and around the unit during installation. This installer also mentioned that HPWHs have to be secured to a wall (due to earthquake safety) and that the piping can get in the way. Another installer also commented about space issues, as well as concerns regarding venting. This installer has installed a Tier 2 HPWH in a sealed garage and created a venting system himself. This installer also mentioned the air exchange was a big issue even though the requirements stated that areas over a certain threshold did not need outside air.

When the installers quote a price to their customers, six are specific (provide a single dollar amount) and one provides an installation cost range. Ultimately, the costs to install the HPWH are dictated by situational factors present in the home, and include the location of the appliance and whether ducting is required.

4.6.7 HPWH Barriers and Challenges

Four installers believe the price of HPWHs is the main barrier for HPWH sales. The other three reported that low customer awareness and knowledge of the technology limit purchases. Four installers also indicated that many homes do not have suitable install locations, and that HPWH noise is a barrier to sales. These same four installers also mentioned that customers are not familiar with the Tier 2 brand, and that customers may see this as a barrier.

Three of the installers reported customer callbacks requiring assistance with their HPWHs. One of the three installers stated that there were a "myriad of things that were wrong" (electrical issues, heat pump failures, shortages, sparks from wires and lack of hot water). Another installer mentioned that after installing a HPWH, the customer switched back to an electric water heater because of the noise and drop in the house's temperature. The third installer had callbacks because of rewiring issues (that led to manufacturer comprehensive service campaigns) and noise complaints.

Five installers did not think that HPWHs will gain acceptance in emergency replacement situations. Only one installer said that there is potential for HPWHs in emergency replacement situations, and only if prices become more competitive. The last installer was unsure.

One of the installers reported that there is a Smart Water Heat Tier 2 rebate requirement to submit paperwork within one week of completing a qualifying installation. This installer mentioned that it is difficult to obtain and complete all the paperwork in such a short time frame.

5 Key Findings and Recommendations

Overall, NEEA's Heat Pump Water Heater Market Test has effectively tested promotional strategies, developed relationships with market actors throughout the supply chain, and provided customers with products that meet their expectations. In this section we present some of the key findings from this assessment, and recommendations for future Market Test (or HPWH Initiative) activities.

Key Findings:

1. **From January 2012 through April 2013, Northwest homeowners installed 881 heat pump water heaters through Market Test promotions. The vast majority were in urban locations within heating zone one.**
2. **Key drivers for HPWH purchases are saving energy, lower monthly operating cost, and rebate availability.**
3. **Barriers to HPWH adoption are typical of new energy efficiency products (first cost, low awareness).**
4. **Market actors have a wide range of views regarding future HPWH sales, HPWH price, and installation price.**
5. **The main marketing messages to end-users are energy savings and return on investment, as well as availability of rebates.** Among consumers, Internet research was most frequently cited source for information regarding HPWHs once the consumer was aware of the technology.
6. **The main marketing message from manufacturers to other market actors is that selling HPWHs is good for business.**
7. **Contractors installed nearly every Tier 2 HPWH. Customers installed more than half of Tier 1 HPWHs.**
8. **Contractors who install Tier 2 HPWHs – and thus have received Smart Water Heat and Tier 2 Manufacturer training – educate end-users regarding appropriate water heater settings at a high rate.**
9. **More than half of the HPWH installations were in garages (most of which were semi-conditioned). Most replaced water heaters were between 40 and 55 gallons.** Nearly one-quarter (23 percent) were greater than 55 gallons in volume.
10. **Emergency replacements only accounted for 13 percent of HPWH installations.** Nearly half of the replaced resistance water heaters were nearing the end of their useful life (among those that did a planned replacement). Most installers do not believe HPWHs will gain acceptance in emergency replacement situations.

11. **Households that installed HPWHs report relatively high levels of satisfaction with the installation time, maintenance requirements, and overall. HPWHs have met the expectations of an overwhelming 95 percent of participants.** However, noise was rated 3.8 out of 5 for Tier 1 purchasers, and 4.0 out of 5 for Tier 2 purchasers (the lowest satisfaction ratings of any attribute). HPWH purchasers are very likely to (or already have) recommend HPWHs to their friends, colleagues, and family members.
12. **Northwest utility representatives believe HPWHs are ideally suited for new construction, particularly the Tier 2 models.**
13. **Northwest utilities report that the quality of technical information and promotional materials from the Market Test has been very high.**
14. **Most utilities believe NEEA responded well to Tier 2 supply issues, and were confident that the technical issues had been resolved.**
15. **The Tier 2 manufacturer is more heavily reliant on Northwest incentives than the Tier 1 manufacturers.** All manufacturers believe the rebates are beneficial**.**
16. **Manufacturers believe that HPWHs will always remain higher in cost than traditional electric resistance storage tanks,** largely because a HPWH *is* an electric resistance storage water heater, but with additional heat pump components and additional complexities.
17. **Tier 1 manufacturers reported that the Northern Climate Specification should focus on performance, not specific solutions.**
18. **Distributors that do not stock HPWHs believe they are currently too risky to stock (in terms of the barriers preventing installations).**
19. **All five of the distributors that sell Tier 2 HPWHs mentioned supply chain issues.**
20. **Less than half of the distributors actively market HPWHs in the Northwest.** Distributors consider marketing of rebates crucial to driving sales of HPWHs in the Northwest.
21. **Most distributors have not perceived much impact from the Market Test on HPWH demand in the Northwest.**
22. **At the time of the research, the Market Test had limited engagement small retail stores.**
23. **The large retailer that worked with NEEA reported that the partnership was very successful – Tier 1 sales seem to corroborate this finding.**
24. **Installers source HPWHs from distributors. Installers do not stock HPWHs,** but do not believe their stock affects what gets installed in emergency replacement situations.

Recommendations include:

1. **Continue the Smart Water Heat incentives.** Customers and market actors report that rebates are key to HPWH purchases. They reduce first cost and provide credibility to the product.

2. **Continue to leverage relationships with key large retailers.** Current promotions through one primary retailer proved very successful. Since they have a trained a controlled installation staff, as well, we believe they could be suited to sell Tier 2 HPWHs in addition to Tier 1 models.

3. **Investigate midstream buy-down approach with distributors and contractors – availability may be a constraint.** Spiffs to contractors or incentives to distributors for stocking and promoting HPWHs should be investigated. They may require assistance overcoming the risk associated with stocking HPWHs. While lack of stock may not *prevent* a distributor or contractor from supplying a customer with a HPWH, it may discourage the market actors from actively promoting HPWHs.

4. **Market HPWHs to homeowners with Ductless Heat Pumps (DHPs) and traditional heat pumps.** Awareness and acceptance of heat pump technology in general (in any type of appliance) appears to alleviate key barriers, even across end-uses. Encourage utilities to cross-promote HPWHs to customers who have purchased DHPs or other heat pump technologies.

5. **Target the new construction market.** Most of the technological barriers to HPWH adoption (that is, things other than price and awareness) are related to typical home characteristics. However, homebuilders could design homes with the HPWH in mind, alleviating many technological barriers (sound, space, ducting, and drainage). We acknowledge that the initiative design elements encouraged by this recommendation may be difficult to implement, but evidence from installers and utility representatives suggests that new homes could be particularly well suited to HPWH technology.

6. **Develop a broad based marketing campaign to increase public awareness of HPWHs.** Awareness is a primary barrier to increasing market adoption of HPWHs. Lack of awareness is particularly problematic in emergency replacement situations when a customer does not typically have sufficient time to research water heaters

7. **Communicate with manufacturers that NEEA's market goals do not include first cost parity with electric resistance water heaters.** Without incentives, HPWHs will continue to be more expensive than electric resistance water heaters. NEEA's goal is to reduce HPWH first cost to the sum of the MSRP of an electric resistance water heater and a room air conditioner. Currently there exists a misconception in the market that regarding this goal.

Appendix A: Survey Instruments/ Interview Guides

Included in this Appendix are:

1) HPWHs Households Phone Survey
2) HPWHs Utilities In-Depth Interview Guide
3) HPWHs Suppliers In-Depth Interview Guide
4) HPWHs Installers In-Depth Interview Guide

Heat Pump Water Heater Evaluation
Households Phone Survey Guide
FINAL – April 15, 2013

Background:

Data from telephone surveys with households who recently purchased a heat pump water heater are intended to inform the Heat Pump Water Heater Market Test Market Progress Evaluation Report (MPER) and Process Evaluation.

Key Research Topics:

The key research topics identified for discussion with heat pump water heater purchasers include the following:

- Usage and interaction with installed Heat Pump Water Heaters
- Satisfaction with installed Heat Pump Water Heaters, and installation/maintenance issues
- Replaced water heater characteristics (e.g., storage capacity, end of life v. early replacement)
- Importance of rebates and other financial incentives (e.g., federal/state tax credits)
- Household and home type information (e.g., new construction, manufactured homes, electric forced air furnaces), to explore detailed submarket issues

Additional research objectives were determined through in-depth discussions with NEEA and Fluid Market Strategies staff.

Target Audience:

The phone survey will include 150 households who have heat pump water heaters installed. We will aim to complete 75 interviews of Tier 1 and Tier 2 heat pump water heater purchasers, respectively.

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 got a financial incentive from either NEEA or a local utility. The information you give will help NEEA improve the program for homeowners in the future.

(Anything you tell us will be kept confidential.)(This is not a sales call.)

(Our contact at NEEA: Anu Teja, 503-688-5421)

(IF CUSTOMER NAME IN SAMPLE SAY:) May I speak to _____?

(ALL OTHER SAY:) Could I speak to the person most familiar with your home's decision to purchase a heat pump water heater?

(REPEAT INTROS TO NEW PERSON, IF NECESSARY)

The survey takes about 20 minutes. Is this a good time? (ARRANGE CALLBACK IF NECESSARY)

PROGRAMMING NOTE:
SAMPTYPE = T1 if Tier 1 HPWH purchased and installed
SAMPTYPE = T2 if Tier 2 HPWH purchased and installed
CONST = "New" if installed in new construction
CONST = "Existing" if installed in existing home

SCREEN:

A. [If **SAMPTYPE** = T1] Our records indicate that you purchased a heat pump water heater around <YEAR>. Is this correct? [FOCUS IS ON WHETHER THEY PURCHASED OR NOT, NOT THE YEAR – YEAR ONLY TO JOG MEMORY]

1. Yes [CONTINUE]
2. No [TERMINATE]
88. Refused [TERMINATE]
99. Don't know [SKIP TO EXPLAIN]

B. [If **SAMPTYPE** = T2] Our records indicate that you installed a heat pump water heater around <YEAR>. Is this correct? [FOCUS IS ON WHETHER THEY PURCHASED OR NOT, NOT THE YEAR – YEAR ONLY TO JOG MEMORY]

1. Yes [CONTINUE]
2. No [TERMINATE]
88. Refused [TERMINATE]
99. Don't know [SKIP TO EXPLAIN]

[IF A OR B = DK, CONTINUE. OTHERWISE SKIP TO C]

EXPLAIN: A heat pump water heater would have replaced your previously existing water heater. It is a different technology, but it serves the same purpose: providing hot water for your household. Do you recall having a heat pump water heater installed?

1. Yes – aided [CONTINUE]
2. No [TERMINATE]
88. Refused [TERMINATE]
99. Don't know [TERMINATE]

C. Was the heat pump water heater installed in your home?

1. Yes [SKIP TO **Q 1**]
2. No [SKIP TO E.]
88. Refused [SKIP TO E.]
99. Don't know [SKIP TO E.]

D. Was the heat pump water heater installed in your existing home or was it part of a new home construction?

1. Existing home [CONST = EXISTING; SKIP TO **Q 1**]
2. New home construction [CONST = NEW; SKIP TO **Q 1**]
88. Refused [TERMINATE]
99. Don't know [TERMINATE]

E. Where was the heat pump water heater installed? *(PROGRAMMER: WE NEED TO BE ABLE TO REPORT THIS BREAKDOWN)*

1. Family member's home [TERMINATE]
2. Friend's home [TERMINATE]
3. Rental property (respondent is landlord) [TERMINATE]
4. Not installed [TERMINATE]
5. Other [SPECIFY] _____
88. Refused [TERMINATE]
99. Don't know [TERMINATE]

Terminate: Those are all my questions. Thank you for your time. Good-bye.

Sources of Awareness

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
99. 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)
77. Other, please specify: _____
16. Nowhere else
88. Refused

99. Don't Know

Q 3. [If **SAMPTYPE** = T2] And how did you first hear about the <Tier 2 Manufacturer> 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
99. Don't Know

Q 4. [If **SAMPTYPE** = T2] Did you hear about <Tier 2 Manufacturer> 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
99. 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 5. 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. Rheem
77. Other [SPECIFY]_____
88. Refused
99. Don't Know

Q 6. [If **Q 5** = 99] 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. Rheem
77. Another brand? [SPECIFY]_____
88. Refused
99. Don't Know

Q 7. How many gallons was your previous water heater tank?

Gallons: _____

7777. Tankless / On demand / Instantaneous
8888. Refused
9999. Don't Know

Q 8. Under normal circumstances, was your old water heater able to provide sufficient hot water for your household?

1. Yes
2. No
88. Refused
99. Don't Know

Q 9. [If **CONST** = Existing] 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 10. [If **CONST** = Existing and **Q 9** = 2] 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 [SPECIFY] _____
88. Refused
99. 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 11. 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 [SPECIFY] _____
88. Refused
99. Don't Know

Q 12. [If **Q 11** = 5 or 6] What specific information did the contractor provide before the water heater was purchased?

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

Q 13. 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 payback period
2. The lower monthly operating cost
3. Saving energy
4. Concern of carbon footprint / greenhouse gases
5. The product's appearance
6. The availability of the rebate
7. Past participation in similar program
8. The recommendation by contractor / plumber
9. The water heater's programmability
10. A bad experience with previous water heater
11. The product warranty
12. A desire to be high tech
77. Other [SPECIFY]_____
88. Refused
99. Don't Know

[Repeat Q 14 and Q 15 for all answers to Q 13]

Q 14. How important was **<Q 13>** 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
99. Don't Know

Q 15. [If **Q 14** = 1 or 2] Why do you say that?

RECORD VERBATIM: _____
88. Refused
99. 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 16. … the ENERGY STAR® label?	1 2 3 4 5 77 88 99	Q 17.
Q 18. [If **Q 1** or **Q 2** = 5, or **SAMPTYPE** = T2] … the information on the Smart Water Heat website?	1 2 3 4 5 77 88 99	Q 19.
Q 20. … your familiarity with the water heater brand?	1 2 3 4 5 77 88 99	Q 21.

Q 22. 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
99. Don't Know

Q 23. 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
99. Don't Know

Q 24. [If **SAMPTYPE** = T2] Would you have purchased the same water heater if the Smart Water Heat rebate were half as much, that is, $500 instead of $1,000?

1. Yes
2. Maybe
3. No
88. Refused
99. Don't Know

Q 25. Was there anything you were concerned about when you were considering a heat pump water heater? [DO NOT READ; CHECK ALL THAT APPLY; IF MORE THAN 1 OTHER, LIST EACH SEPARATELY IN PREPARATION FOR Q26]

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
55. Other #1 (SPECIFY:) _____
66. Other #1 (SPECIFY:) _____
77. Other #1 (SPECIFY:) _____
88. Refused
99. Don't Know

Q 26. [ASK FOR EACH RESPONSE TO **Q 25** IF **Q 25** ≠ 1, 88 or 99] How did you overcome the **<Q 25>** concern?

_____

Q 27. Did you use a loan to pay for your new water heater?

1. Yes
2. No
88. Refused
99. Don't Know

Q 28. [IF **Q 27** = 1] 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. Or somewhere else? (SPECIFY:) _____
88. Refused
99. Don't Know

Q 29. [If **Q 27** = 1] 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
99. Don't Know

Q 30. [If **Q 29** = 1 or 2] Why do you say that?

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

Q 31. [If **Q 27** = 1,] What was the interest rate of the loan you received for the new water heater?

RATE: _____%
88. Refused
99. Don't Know

Q 32. 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
99. Don't Know

Q 33. [If **Q 32** = 1 or 2] 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
99. Don't Know

Q 34. [If **Q 33** = 1 or 2] Why do you say that?

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

Q 35. 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
99. Don't Know

Q 36. [If **Q 35** = 1 or 2] 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
99. Don't Know

Q 37. [If **Q 36**= 1 or 2] Why do you say that?

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

Installation, Inspections, Experience and Satisfaction

Now I would like to ask a few questions about the installation itself.

Q 38. [If **CONST** = EXISTING] 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

99. Don't Know

Q 39. [If **CONST** = NEW] 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
99. Don't Know

Q 40. [If **Q 38** = 2 or **Q 39** = 2 or 3] 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 41. [If **Q 38** = 2 or **Q 39** = 2] How did you find 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
77. Other [SPECIFY]_____
88. Refused
99. Don't Know

Q 42. [If **Q 38** = 2 or **Q 39** = 2] 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
99. Don't Know

Q 43. [If **Q 42** = 1 or 2] Why do you say that?
RECORD VERBATIM: _____
88. Refused

99. Don't Know

Q 44. 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
99. Don't Know

Q 45. 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
99. Don't Know

Q 46. [If **Q 45** = 1 or 2] Why do you say that?

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

Q 47. 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 48. Is your new water heater installed in a part of your house that is heated?

1. Yes – heated
2. No – unheated

77. Other [SPECIFY] _____
88. Refused
99. Don't Know

Q 49. 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
99. Don't Know

Q 50. 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
99. 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 51. [If **SAMPTYPE** = T1] 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
99. Don't Know

Q 52. [If **Q 51** = 1] 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
99. Don't Know

Q 53. [If **Q 54** = 1 or 2] Why do you say that?
RECORD VERBATIM: _____
88. Refused
99. Don't Know

Q 54. [If **SAMPTYPE** = T2] 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
99. Don't Know

Q 55. [If **Q 54** = 1 or 2] Why do you say that?

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

Q 56. 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 [SPECIFY]_____
88. Refused
99. Don't Know

Next, I'd like to ask about your experiences with your heat pump water heater.

Q 57. [If **Q 38** = 2 or **Q 39** = 2 or 3] Did the installer/contractor educate you regarding which water heater settings to use?

1. Yes
2. No
88. Refused
99. Don't Know

Q 58. What setting – or operation mode – is your heat pump water heater set for?

1. [if SAMPTYPE = T2, SHOW:] Econ (heat pump only)
2. [if SAMPTYPE = T2, SHOW:] Auto (heat pump and resistance element)
3. [if SAMPTYPE = T2, SHOW:] Heater (resistance element only)
4. [if SAMPTYPE = T1, SHOW:] Heat Pump (only)
5. [if SAMPTYPE = T1, SHOW:] Hybrid (heat pump and resistance element)
6. [if SAMPTYPE = T1, SHOW:] Standard
7. [if SAMPTYPE = T1, SHOW:] Vacation
8. [if SAMPTYPE = T1, SHOW:] High Demand
9. [if SAMPTYPE = T1, SHOW:] Efficiency Mode
10. [if SAMPTYPE = T1, SHOW:] Electric Mode

77. [all SAMPTYPE SHOW:] Other [SPECIFY]_____
88. Refused
99. Don't Know

Q 59. Prior to now, were you aware that the heat pump water heater's air filter must be cleaned?

1. Yes
2. No
88. Refused
99. Don't Know

Q 60. [IF Q59 = 1 and Q38 = 2 or Q39 = 2 or 3] Did the installer inform you that the air filter must be cleaned?

1. Yes
2. No
88. Refused
99. Don't Know

Q 61. 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
99. Don't Know

Q 62. [If **Q 61** = 1] 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 63. [If **Q 62** = 2 or 99] 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 [SPECIFY]_____
88. Refused
99. 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?
Q 64. … the sound level of the heat pump water heater?	1 2 3 4 5 88 99	Q 65.
Q 66. … the change in your electricity bill?	1 2 3 4 5 88 99	Q 67.
Q 68. … your hot water supply?	1 2 3 4 5 88 99	Q 69.
Q 70. … the maintenance requirements of the heat pump water heater?	1 2 3 4 5 88 99	Q 71.
Q 72. … the heat pump water heater overall?	1 2 3 4 5 88 99	Q 73.

Q 74. Overall, has the heat pump water heater met your expectations?

1. Yes
2. No
88. Refused
99. Don't Know

Q 75. [If **Q 74** =2] Where did it fall short of meeting your expectations?

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

Q 76. 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 77. [If **Q 76** = 1 or 2] 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 [SPECIFY]_____
88. Refused
99. 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 78. 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 79. Do you own or rent your home?

1. Own
2. Rent

77. Other [SPECIFY]_____
88. Refused
99. Don't Know

Q 80. What year was your home built?

YEAR: _____
88. Refused
99. Don't Know

Q 81. [If **Q 80** = 99] 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 82. What is your home's primary heat source? Is it… [NOTE: WE'RE LOOKING FOR A **FUEL** TYPE HERE, NOT A TYPE OF HEATER] [READ LIST; ACCEPT ONE]

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

77. Or something else? [SPECIFY] _____
88. Refused
99. Don't Know

Q 83. [If **Q 82** = 1] 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 84. [If **Q 82** = 2] 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 [SPECIFY]_____
88. Refused
99. Don't Know

Q 85. How many people live in your household, including yourself?

NUMBER OF PEOPLE: _____
88. Refused
99. Don't Know

Q 86. [If **Q 85** = 1] Which of the following groups includes your age? [BEGIN WITH CATEGORY C]

[If **Q 85** > 1] How many people in your household are in each of the following age groups? Be sure to include yourself. [STOP READING WHEN TOTAL = **Q 85**]

[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
99. Don't Know

Q 87. 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
99. Don't Know

Q 88. 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 $40,000 and $60,000
3. Between $60,000 and $80,000
4. Between $80,000 and $120,000
5. Between $120,000 and $250,000
6. Over $250,000
88. Refused
99. Don't Know

Q 89. Do you consider yourself Hispanic or Latino?

1. Yes
2. No
88. Refused
99. Don't Know

Q 90. 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 something else? [SPECIFY] _____
88. Refused
99. Don't Know

Q 91. For your political affiliation, are you a Democrat, a Republican, an Independent or something else?

1. Democrat
2. Republican
3. Independent
4. Green Party
5. Libertarian
6. Tea Party
77. Other [SPECIFY] _____
88. Refused
99. Don't Know

Q 92. 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 93. [Interviewer: Record Gender]

1. Male
2. Female
99. Don't Know

Thank you VERY MUCH for your time!

Heat Pump Water Heater Evaluation Interview Guide: Utilities
FINAL April 15, 2013

Background:

Data from interviews with Northwest utilities are intended to inform our Heat Pump Water Heater Market Test Market Progress Evaluation Report (MPER) and Process Evaluation.

Key Research Topics:

The key research topics identified for discussion with NEEA's partner utilities include the following:

- Utility program participation relative to goals
- Barriers to market transformation (technical, installation, customer demand issues)
- Perceptions of prevalence of non-incented units
- Installation quality and customer feedback
- Interactions with other market actors (i.e., installers, distributors, retailers, manufacturers, implementation staff)
- Future plans and participation goals
- Desired assistance from NEEA

Additional research objectives were determined through in-depth discussions with NEEA and Fluid Market Strategies staff.

Target Audience:

We will conduct 6 to 8 interviews with Northwest utilities that offer incentives for HPWHs to their residential customers.

Recruitment

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm based in Portland, Oregon. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) who engaged us to conduct heat pump water heater research.

NEEA has asked us to speak with its partner utilities to learn more about the HPWH market, so NEEA can potentially adjust and improve its Market Test and subsequently develop a successful Initiative for customers, utilities, suppliers and installers. Anything you tell us will be kept confidential.

Is now a good time to talk about the Market Test, or can we schedule a time to talk for about one hour?

(If they have any concerns, ask them to contact Anu Teja (NEEA) at 503-688-5421 for more information about the evaluation.)

Introduction

First I would like to get some big picture feedback.

1. In your own words, what motivated your utility to provide incentives for heat pump water heaters?
2. What are the main goals for your utility with respect to the heat pump water heater market? Are you confident you will meet these goals?
3. Do you have any major reservations about heat pump water heaters? Like what?
4. For what types of residential customers or applications are heat pump water heaters most feasible, and where should NEEA be focusing its promotion attention?
5. How do you believe the emergency replacement market be tapped into most effectively?
6. What is your general perception of consumer demand for heat pump water heaters in your territory? And the Northwest in general? Do you believe this will change? How so?
7. Do you believe, or have evidence of, a market for heat pump water heaters in the Northwest in absence utility or NEEA-sponsored incentives? (Probe for size, in annual sales or percent market share)

Program Characteristics

Now let's discuss your own utility's heat pump water heater rebate program.

8. What types of customer homes are you targeting? Why? (Probe for new construction vs. existing, single family vs. multifamily, urban vs. rural)
9. Are your heat pump water heater rebates tied to NEEA's Northern Climate Specification? Do you provide different incentives for Tier 1 vs. Tier 2 products? (Get details on rebate levels, reasoning)
10. What rebate amount(s) are you offering in 2013? (Probe to distinguish Tier 1 from Tier 2, different housing types or ducting scenarios, etc.)
11. In the next two years, do you think your rebate amount(s) will increase, decrease, or remain the same? Why do you say that? (Get details on specific changes)
12. What are you expectations for heat pump water heater cost effectiveness in the next two years?
13. Do you offer customer financing for heat pump water heater?
    a. If NO: Why not?
    b. If NO: Would you be interested in either providing financing or promoting customers to use financing, if it were available from other sources?
    c. If YES: Get details

d. If YES: What percent of your heat pump water heater customers use this financing if they are eligible?

e. If YES: How is this going for your utility?

f. If YES: Is financing driving participating up?

14. Have you offered or recommended financing for other energy efficiency products? How was that experience? Lessons learned? (Probe for market-based vs. utility-based)

15. Are you actively promoting heat pump water heaters?

    a. If NO: Why not?

16. Which methods do you use to promote your heat pump water heater incentives? Do you use…

    A. Direct mailings?

    B. Newspaper ads?

    C. TV ads?

    D. Radio ads?

    E. Social media?

    F. Internet?

    G. Retail promotions?

    H. Homeowner magazines (e.g., Sunset)?

    I. Anything else?

17. Do you have one or more heat pump water heater display units?

    a. If so, how did you get it? Where is it located? Is it functional, or just a display? Is it permanently installed?

18. What marketing media and/or messages have been most effective in persuading customers to buy heat pump water heaters?

19. Are you working with retailers, distributors, or directly with manufacturers in any ways? How so? How is this going?

20. Are you promoting the Tier 2 heat pump water heater? Why/why not?

21. Are your promotion efforts or budget going to increase or decrease in 2013, compared to 2012? Why, and how so? (Probe for amount or percent increase)

22. What percent of your residential portfolio budget is for heat pump water heater rebates?

23. What services, if any, does your utility provide to heat pump water heater installers? (E.g., free or subsidized training, marketing assistance/referrals, other? Get details.)

a. If YES: Have any of these services changed in the last year? How so/Why not?

24. Have you had any significant or persistent problems with heat pump water heater installations in your area? (Probe on issues related to HVAC versus plumbers, plumbers potential unfamiliarity with utility rebates and install requirements)
    a. If YES: How are you working to resolve these issues?
    b. If YES: Is NEEA assisting? How so? (If NO, should NEEA assist?)
25. Do you have any concerns about high or variable installation costs for heat pump water heaters?
    a. If YES: Have you considered any strategies to help to mitigate this going forward? Please explain.
26. Which aspects of your program (e.g., rebates, marketing, technical training, contractor referrals, financing) have had the most impacts on driving customer participation?
27. Would you say that you achieved your heat pump water heater installation goals in 2012? Why or why not? (Probe on program challenges, successes)
28. What are the biggest challenges for heat pump water heaters in your service territory? (Probe on local codes, consumer awareness, deficient installer infrastructure, low retail presence, etc.)
29. Are your goals for 2013 different? If so, why?
30. Is your utility doing any heat pump water heater inspections, in addition to the inspections conducted by Fluid (on behalf of NEEA)?
    a. What kind of feedback are you getting from customers and installers on heat pump water heater installations in your territory?
31. Do you need any additional assistance from NEEA or Fluid to improve the inspections process in your area?

Market Test

Now I'd like to ask you some questions regarding NEEA's regional Market Test for heat pump water heaters.

32. How do you and/or other utility staff stay informed about NEEA's market test?
    a. Are you or other staff usually able to attend NEEA's webinars covering program updates?
    b. Do you have suggestions for improving communications between the utilities, NEEA, Fluid and/or BPA? (Probe to see if more personal meetings desired)
33. Do you work with BPA in your program delivery?

a. If YES: How is it going working with BPA, and also working with NEEA? Is there good coordination regarding eligible equipment, installer training and regional marketing?

34. Who do you provide installations and incentives data to? (Fluid? NEEA? BPA?)
    a. What is this process and how well is it working for you?
35. Have you visited the SmartWaterHeat.org website in the past 3 months?

    IF YES:

    a. How many times?
    b. For what purposes?
    c. Did you find the information you were looking for?
        i. If NO, ask: What other resources did you use to find the information you needed?
    d. Do you have any recommendations for improving the website?

    IF NO:

    e. Why not?
36. How satisfied have you been with the technical resources that are available through NEEA and Fluid? Why? How could these be improved?
37. And how satisfied have you been with promotional assistance and informational tools from the Market Test? Why? How could these be improved?
38. Are you familiar with any of NEEA's retail efforts, for instance, with <retailer redacted>?
    a. If YES: How effective is the point of purchase consumer education in your opinion? Could this be improved in any way?
39. What features of NEEA's Market Test do you like best or have worked well for your utility and region?
40. Lastly, how could NEEA better support your endeavors in the heat pump water heater market? (PROBE to see if any specific marketing to customers or installers needed, other activities).

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!

Heat Pump Water Heater Evaluation Interview Guide: Suppliers
FINAL April 15, 2013

Background:

Data from interviews with heat pump water heater suppliers (manufacturers, distributors, and retailers) are intended to inform our Heat Pump Water Heater Market Test Market Progress Evaluation Report (MPER) and Process Evaluation.

Key Research Topics:

The key research topics identified for discussion with heat pump water heater suppliers include the following:

- National/regional historical and anticipated HPWH sales
- Marketing techniques and challenges
- Distributor and retailer stocking practices
- Interactions with other market actors – manufacturers, distributors, retailers, installers, NEEA and Fluid implementation staff
- Key manufacturer/supply decision factors - construction/retrofits trends, rebates/tax credits, building codes trends, consumer acceptance
- Impacts of upcoming building code changes
- Current technology challenges, and anticipated improvements
- Barriers to future market growth

Additional research objectives were determined through in-depth discussions with NEEA and Fluid Market Strategies staff.

Target Audience:

We will conduct 20 total interviews distributed across suppliers.

Recruitment

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm based in Portland, Oregon. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) who engaged us to conduct heat pump water heater research. Please know that this is not a sales call.

NEEA has asked us to speak with heat pump water heater **<Supplier Type>**s to learn more about the HPWH market, so NEEA can potentially adjust and improve its project to be successful for both customers and suppliers. Anything you tell us will be kept confidential.

Is now a good time to talk about the project, or can we schedule a time to talk for about one hour?

(If they have any concerns, ask them to contact Anu Teja (NEEA) at 503-688-5421 for more information about the evaluation.)

Business Scope and Practices

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

1. 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)
2. How long have you been selling/making water heaters, in general? And how long have you been selling/making heat pump water heaters?
3. When did your company start selling heat pump water heaters?
4. (RETAILERS & DISTRIBUTORS) Considering all types of water heaters, which brands do you stock?
5. (RETAILERS & DISTRIBUTORS) And which brands and models of heat pump water heaters do you stock?
6. (RETAILERS & DISTRIBUTORS) Which of these brands meet NEEA's Northern Climate Specification, either Tier 1 or Tier 2?
7. (RETAILERS & DISTRIBUTORS) About what percent of your business revenues come from heat pump water heater sales and installations vs. other water heaters? And overall?
8. (MANUFACTURERS) About what percent of your business revenues comes from heat pump water heater sales vs. all other water heaters? And overall?
9. In the Northwest, what percentage of water heaters in general are gas water heaters vs. electric?
10. (MANUFACTURERS) Based on current production capabilities, about how many residential heat pump water heaters *could* your company produce in a year, if there was significant demand?

Supply (SKIP for Manufacturers)

Now I would like to ask you a few questions about your supply of heat pump water heaters.

11. From what company or companies do you source your heat pump water heaters?
12. Does your company maintain a stock of heat pump water heaters, or do you always order them upon receiving an order?

    IF THEY MAINTAIN STOCK:

    a. What motivated you to start stocking 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 do you keep in stock?

IF THEY DO NOT MAINTAIN STOCK:

a. Why don't you stock heat pump water heaters?

b. What, if any, impact does this have on the number of heat pump water heaters that get installed, in particular in emergency replacement situations? How so?

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

14. 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.

15. How does your company currently market heat pump water heaters for the residential market? (IF NECESSARY: For instance, do you 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 to households?

16. Who do you consider your target market, or markets, for heat pump water heaters?

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

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

19. 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.)

20. 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?

21. 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?
22. What types of marketing support, if any, have you received from NEEA's project? (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)
23. Do you have any recommendations for NEEA or the Northwest utilities regarding how best to market heat pump water heaters to homeowners?

Sales

24. What are your most popular heat pump water heater models in the Northwest?
    a. Why are these sales highest?
25. 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)
26. How has the expiration of federal tax credits influenced your heat pump water heater business?
27. Do you think the price for heat pump water heaters will increase or decrease in the next two years? (PROBE for percent increase/decrease) And how about five years? Ten years?

Interactions with Other Market Actors

(Asked of ALL Supplier types)

Now let's talk about the contractors that install heat pump water heaters.

28. 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.

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

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

31. (FOR DISTRIBUTORS AND MANUFACTURERS) Do you also rely on contractors to promote your HPWHs?

    b. If YES: How do you work with contractors, to ensure that they use appropriate messaging to households?

32. What is your perception of installation prices charged by installers?

    a. Do you know what these are, on average?

    b. What concerns, if any do you have about installation prices? (Probe for too high or variable price; to see if NEEA/utility rebates are being "captured" by installers; too few installers; other issues)

    c. 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? Ten years?

33. (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)

34. (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)

35. (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?

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

37. (RETAILERS WHO GO THROUGH 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)

38. (RETAILERS WHO GO THROUGH 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 Fluid

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

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

41. Did you have any challenges working with these organizations in 2012? (PROBE on rebates eligibility, NEEA/Fluid delivery, training or marketing issues)

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

43. Do you plan to assist the project in any way in 2013? (Probe on technology training, marketing, funding, etc.)

44. Overall, how satisfied would you say you are working with NEEA and Fluid? Would you say you are:
    A. Extremely satisfied
    B. Very satisfied
    C. Somewhat satisfied
    D. Not very satisfied
    E. Not at all satisfied
    a. Why do you say that?

Barriers and Challenges

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

45. 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)
46. Are there any particular consumer segments that are <u>most</u> resistant to heat pump water heaters?
47. Have you had any consumers call you after an installation and need assistance with their water heater? (If YES get details)
48. 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?
49. (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.)
50. Have any of your heat pump water heaters been returned due to technical failures?
    a. If YES: Get details (percentage and typical models, reasons)
51. 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.

52. 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)
53. What do you believe will be the impact of upcoming building code changes? (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?
54. What are your expectations regarding your company's overall heat pump water heater sales volume or market share in the Northwest in 2013?
    a. How about in the next 3 years?
    b. How much does this depend on the availability of utility incentives, which are typically about $1,000 for Tier 2 models, and less for Tier 1 models?
    c. Do you think that your company will be able to keep up with market-demand for heat pump water heaters?
55. Are residential heat pump water heaters a high priority market for your company?
56. Are there any new or fast growing market segments for heat pump water heaters, such as new residential construction, major remodels, 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!

Heat Pump Water Heater Evaluation Interview Guide: Installers
FINAL April 18, 2013

Background:

Data from interviews with heat pump water heater installers – including both plumbers and HVAC technicians – are intended to inform our Heat Pump Water Heater Market Test Market Progress Evaluation Report (MPER) and Process Evaluation.

Key Research Topics:

The key research topics identified for discussion with heat pump water heater installers include the following:

- Awareness of HPWH types
- Actual and forecast installations of HPWHs
- Technical installation challenges
- Equipment installation costs
- Interactions with other market actors
- Installation opportunities and constraints in submarkets
- Marketing techniques and challenges
- Recommendations for NEEA/utility marketing to homes
- Overall experience with the market test

Additional research objectives were determined through in-depth discussions with NEEA and Fluid Market Strategies staff.

Target Audience:

We will conduct 10 interviews with heat pump water heater installers that have been oriented to NEEA's market test. The Fluid installer database contains 213 "HVAC/Plumber Installer" records, 81 "Plumber Installer" records, and 1 "General Contractor" record. We will aim to interview 6 HVAC/Plumber Installers and 3-4 Plumber Installers, and we will attempt to contact the one General Contractor.

Recruitment

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm based in Portland, Oregon. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) who engaged us to conduct heat pump water heater research. Please know that this is not a sales call.

NEEA has asked us to speak with heat pump water heater installers to learn more about the HPWH market, so NEEA can potentially adjust and improve its project to be successful for customers, suppliers and installers. Anything you tell us will be kept confidential.

Is now a good time to talk about the project, or can we schedule a time to talk for about an hour?

(If they have any concerns, ask them to contact Anu Teja (NEEA) at 503-688-5421 for more information about the evaluation.)

Before we begin, can you confirm that you personally have attended a contractor orientation and training session conducted by Fluid Market Strategies?

If they did not attend personally, ask to speak with staff that have attended an orientation and are familiar with NEEA's project.

Business Scope and Practices

First, I'd like to get some general information about your company.

1. 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)
2. How many full time equivalent installers do you have on staff?
3. How many staff at your company received manufacturers training on heat pump water heaters?
4. How many staff attended a contractor orientation session for NEEA's HPWH Smart Water Heat program?
5. When did your company start installing heat pump water heaters?
6. Which heat pump water heater brands does your firm offer to customers?
7. Which of these brands meet NEEA's Northern Climate Specification, either Tier 1 or Tier 2?
8. About what percent of your business revenues come from heat pump water heater installations vs. other water heaters? And overall?

Supply

Now I would like to ask you a few questions about your supply of heat pump water heaters.

9. From what company or companies do you source your heat pump water heaters? Direct from the manufacturers, or from distributors? Which ones?
10. Does your company maintain a stock of heat pump water heaters, or do you always order them when they are needed?

    IF THEY MAINTAIN STOCK:

    a. What motivated you to start stocking 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 to you keep in stock?
    d. Do you carry heat pump water heaters in your service vehicles, for emergency replacement situations? If YES: Which types?

    IF THEY DO NOT MAINTAIN STOCK:

c. Why don't you stock heat pump water heaters?

d. What impact does this have on the number of heat pump water heaters that get installed, in particular in emergency replacement situations? Why does this have an impact?

11. Do you foresee any changes to your heat pump water heater stocking practices in the near- or mid-term (2 to 5 years)? (If YES get details)
12. Do you have any problems getting the heat pump water heaters you need from the distributors you work with? (If YES get details)

Training and Communication

Now let's discuss the heat pump water heater training that is offered through the program.

13. How many of your installers have undergone technical training offered through the program?
14. How would you rate the effectiveness of the orientation training offered by the program? Would you say it was:
    A. Extremely effective
    B. Very effective
    C. Somewhat effective
    D. Not very effective
    E. Not at all effective
    a. Why do you say that?
15. Do you have any recommendations to improve the training?
16. Do you receive the regular NEEA partner newsletter?
    a. (If YES) Do you find it useful? How so?
    b. (If NO) Would you like to?
17. Overall, how satisfied are you with the technical information provided to installers through the program? Would you say you are:
    A. Extremely satisfied
    B. Very satisfied
    C. Somewhat satisfied
    D. Not very satisfied
    E. Not at all satisfied
    a. Why do you say that?

18. Do you need any additional information about how to complete heat pump water heater installations according to best practices?
19. What changes, if any, would you recommend to improve program communications with heat pump water heater contractors?

Marketing

Now let's discuss your marketing activities.

20. How do you market heat pump water heaters? For instance, do you distribute product literature before or during sales situations, have info on a website, or use social media or newspaper/radio/TV advertising?
    a. (If NO marketing) Why do you choose not to market heat pump water heaters?
21. (IF THEY STOCK HPWHs) Do you display heat pump water heaters at your business location?
    a. (If NOT displaying) Why do you choose not to display heat pump water heaters at your business?
22. What are your most effective "sales closer" messages? How do you make the "business case" for this product type?
23. Thinking of your installations to-date, what have been the main reasons residential customers install heat pump water heaters? (PROBE on energy savings, more control over settings, desire for improved technology, etc.)
24. What types of households are most likely to install a heat pump water heater? (PROBE for differences between new construction, manufactured homes, and existing homes; rural vs. urban; particular cities/geographies)
25. For your installations, about what percentage of households had already selected a heat pump water heater, versus situations where your company actually recommended and sold them a heat pump water heater?
26. What do you think your sales "hit rate" is, in situations where you have tried to sell Tier 1 or Tier 2 heat pump water heaters to households instead of standard water heaters?
27. Do you use any of the tools or resources provided to you by NEEA, such as information sheets or marketing materials?
    a. (If YES) Do you have any recommendations for improvement?
    b. (If NO) Why not?
28. Is there any specific marketing or technical assistance you would like to get from NEEA or the utilities that participate in the program?
29. Do you have any recommendations for NEEA or the utilities regarding how best to market heat pump water heaters to homeowners?

Rebates and Financing

Now let's talk about the rebates and financing available in the Northwest.

30. Some of the electric utilities in the Northwest offer incentives for qualifying residential heat pump water heaters. About what percent of your residential heat pump water heaters sales get rebates from utilities?
    a. (IF PERCENT < 100) Why do some residential customers not get incentives? (PROBE to see if local utility doesn't provide, if customer awareness lacking, or ineligible models).
31. Do any of the utilities in your service area offer financing for heat pump water heater projects?
    a. If YES: Do you mention this to prospective buyers?
        i. If NO: Why not?
32. What percent of your customers use financing to pay for their installations?
    a. (IF PERCENT > 0) Is this financing through your company, a local bank, or other sources?
33. In your opinion, how important are local utility incentives to heat pump water heater sales in your service area? Would you say they are:
    A. Extremely important
    B. Very important
    C. Somewhat important
    D. Not very important
    E. Not at all important
    a. Why do you say that?

Installations

Now I would like to talk about the heat pump water heaters you've installed…

34. About how many Tier 1 and Tier 2 heat pump water heaters have you installed in residential locations? (Probe by Tier, by tank volume)
35. Have you installed any heat pump water heaters in nonresidential locations? About how many, or what percent of your total installations of heat pump water heaters?
36. How many of your residential installations have been inspected by the program?
    a. (IF > 0) Have you had any problems related to these inspections? (If YES: Get details)

37. Do you recommend any changes to the inspections process?
38. How many residential Tier 1 and Tier 2 heat pump water heaters do you think your company will install in 2013? (PROBE for differences by tier/brand)
    a. And in the next three years?
    b. Do you see more or less potential in any of the building types we spoke about? Which ones?
    c. Does this depend on the availability of rebates? How so? (PROBE for percent increase/decrease)
39. Do you think heat pump water heaters will be a long-term product for your company?
    a. If YES: Do you have any formal or informal installations goals?
    b. If NO: Why not?
40. What technical challenges have you experienced during your installations, if any? (PROBE on space constraints, plumbing issues, ducting, etc.)
41. When you give installation cost quotes, do you typically give a fairly specific estimate, or do you quote a price range?
    a. (IF RANGES) Why do you quote a price range?
42. What are your average residential installation costs, and what does this include?
    a. Material costs?
    b. Time-related costs?
    c. Other costs?
43. What may drive the cost up for one installation compared to another?
44. Do you think the price for heat pump water heaters will increase or decrease in the next two years? (PROBE for percent increase/decrease) And how about five years? Ten years?

Barriers and Challenges

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

45. What are the most common customer barriers to installing heat pump water heaters? (Probe on new technology concerns, lack of familiar brands, local codes, capital costs, install time/costs.)
46. Are there any particular customer segments that are <u>most</u> resistant to heat pump water heaters?
47. Have you had any customers call you back after an installation and need further assistance with their water heater? (If YES get details)

48. 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?
49. Have you faced any challenges related to local, regional, or state code requirements related to heat pump water heater installations? Like what? How did you overcome this/these challenges?
50. Are there any situations when you do NOT recommend a heat pump water heater to a customer? If YES: When might this be?

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 B: 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