Northwest Ductless Heat Pump Pilot Project

Market Progress Evaluation Report #1

PREPARED BY

Research Into Action, Inc.

REPORT #E10-215
MARCH 17, 2010

NORTHWEST
ENERGY
EFFICIENCY
ALLIANCE

www.nwalliance.org

529 SW Third Avenue, Suite 600
Portland, Oregon 97204
(tel) 503-827-8416 (fax) 503-827-8437

research/into/action inc

Final Report

Northwest Ductless Heat Pump Pilot Project First Market Progress Evaluation Report

Prepared for:

NORTHWEST ENERGY EFFICIENCY ALLIANCE

Prepared By:

research/into/action inc

Marjorie McRae, Ph.D.
Ned Harris
April Armstrong
Research Into Action, Inc.

March 17, 2010

ACKNOWLEDGEMENTS

The market progress evaluation team would like to thank Anu Teja, Northwest Energy Efficiency Alliance (NEEA) evaluation manager, for providing support and direction to this research, as well as Poppy Storm of Ecotope, Inc., the prime contractor for the pilot evaluation. We thank NEEA's Jeff Harris, Stephanie Fleming, and Alexis Allan for their interest in this research, contributions to crafting the research agenda, and willingness to be interviewed. We appreciate the implementation contractor staff of Fluid Market Strategies (special thanks to Selena Bell Heise and Erica Thompson) and Smashing Ideas (special thanks to Ben Yenter) for providing their time and the time of their staffs to answer our many questions, provide us with extensive program documents, and help us contact program participants. Finally, we are grateful to the many pilot participants, installers, manufacturer contacts, and utility program managers who participated in this research study through responding to in-depth telephone interviews and surveys.

TABLE OF CONTENTS

ES EXECUTIVE SUMMARY

The Northwest Energy Efficiency Alliance (NEEA) hired the team of Ecotope, Inc., working with Research Into Action, Inc., to evaluate the Northwest Ductless Heat Pump Pilot Project. This document provides an assessment of the pilot's market progress and processes. The pilot implementation document specifies four primary goals, listed below with our key findings. These findings represent the first wave of research; second-wave research will occur in 2010. This MPER presents interim findings, conclusions, and recommendations from the first wave.

➡ ***Goal 1:*** **To demonstrate the use of inverter-driven DHPs to displace electric resistance space heat in existing Northwest homes.**

Findings: Nearly all (99%) pilot participants (participants) interviewed for this report indicated installing the DHP to displace existing electric heating equipment, which remains available for use, and said that the DHP was now their primary heating source. In a related but separate effort, Ecotope is assessing the technical effectiveness of DHPs.

➡ ***Goal 2:*** **To support documentation of project implementation and determination of the costs and potential energy savings of ductless heat pumps in this application.**

Findings: NEEA facilitated Research Into Action's efforts to document project implementation processes among the pilot implementation contractor and the participating utilities, the findings from which we discuss in this report. Ecotope's technical assessment, underway, includes an evaluation of costs and potential energy savings.

➡ ***Goal 3:*** **Market research elements of the evaluation will examine other non-energy benefits and potential barriers to large-scale implementation of ductless heat pumps.**

Findings: Of the 20% of participants who reported that, prior to installing their DHP, they had planned to purchase some type of AC equipment, none continued to have such plans after DHP installation. Most participants reported receiving non-energy benefits from their DHPs, including increased comfort, ease of control, and air filtration.

Potential barriers to large-scale implementation of DHPs include concerns about their ability to provide adequate heat in colder temperatures (a research question for Ecotope's technical analysis). We did not identify significant market barriers to DHPs. Although some installers expressed misconceptions about DHPs in retrofit applications, these could be addressed through ongoing installer education.

➡ ***Goal 4:*** **To define the future of the ductless heat pump market and build an infrastructure to sustain and accelerate growth in the market.**

Findings: The pilot exceeded its installation goal of 2,500 units; as of December 31, 2009, 59 participating utilities installed 3,899 DHPs through the pilot. The pilot staff conducted 47 in-person and 29 web-based installer orientations, orienting 906 installers from 602 firms. Of these, 312 had completed at least one pilot installation. Pilot installations represented five brands (plus a single system representing a sixth brand); all five manufacturers reported increasing marketing for the pilot.

Participants reported high levels of satisfaction with DHPs and with pilot project implementation processes, including: ease of understanding incentive qualification requirements; ease of finding an installer; ease of locating program information; and the speed with which they received their incentive checks (between 80% and 90% of respondents reported being "very" or "extremely satisfied" with each of these processes). The incentive appeared to overcome participants' first-cost hurdle; 66% of participants reported that they "would not" or "might not" have purchased their DHP without the utility incentive. Another indicator of the influence of the rebate on purchase decision comes from participants who received a substantially lower-than-average incentive; only 11% of these participants said their decision "may have" or "would have" changed were the incentive not available.

The majority (about 90%) of both participant and installer respondents reported that DHP installations were quick, minimally invasive, and did not require installer follow-up. However, several interviewed utility staff, installers, and participants reported issues with the installation of DHP line sets.

The majority (78%) of installer respondents provided high ratings regarding the pilot orientation sessions. Installers requested additional information on general project requirements, utility-specific project requirements, and the "displace, not replace" theory. Manufacturer contacts and project staff reported that the pilot's reliance on the Internet to communicate program information represented a barrier, as some installers did not want to access the Internet.

DHP installations in Washington were concentrated in the areas along the I-5 corridor such as Seattle and Puget Sound. Installations in Oregon and the Portland metropolitan area also centered around I-5, primarily Clark County (Washington), McMinnville, Salem, and Eugene. Southern Idaho (Idaho Power territory) and Northern Montana (Flathead Electric territory) have also had a high number of installs relative to the population density of the areas.

CONCLUSIONS AND RECOMMENDATIONS

We conclude that NEEA has made and is continuing to make substantial progress in attaining its goals and objectives for the Northwest Ductless Heat Pump Pilot Project. By directly intervening with market actors, the pilot appears to be effective in strengthening DHP marketing, training, and distribution networks, and in increasing consumer awareness of DHPs. By offering an incentive on DHP installations, utilities overcame many participants' first-cost hurdle for DHP installation – persuading them to participate in the pilot project.

We organize our remaining conclusions and recommendations by key pilot goals. We draw our conclusions and recommendations from research primarily conducted midway through the pilot. The pilot project implementation team may have addressed some of our recommendations subsequent to our research. We have observed the team practices adaptive management.

Goals: Offset electric energy use and "displace, not replace" existing electric heating equipment

Conclusions:

The majority (65%) of installations during the pilot were systems comprised of one compressor with a single indoor unit serving the primary living area formerly served primarily by electric zonal heat. These installations support the program goal of displacing rather than replacing existing electric zonal heat. However, the pilot's acceptance of systems with multiple indoor units undermines its cost-effectiveness. Participants that previously used non-electric fuels for their primary heat source also undermine pilot cost-effectiveness. The region may choose to view the program as serving the house, and not the application, and thus decide that applicant behavior should not drive program eligibility. Yet the region would then need to reconcile such a design philosophy with the program's cost-effectiveness analysis. On a related note, the current application pre-approval processes received more negative reviews than positive ones in terms of their effectiveness and efficiency.

Recommendations:

- **In support of a DHP program, NEEA will need to address the issues of primary heating fuel of DHP applicants and the number of indoor units allowed**.
- **The pre-approval processes appear in need of revision, yet any such revision needs to await the resolution of the issues of fuel and indoor units.**

Goals: Develop the supply side and work with installation firms

Conclusions:

The majority (64%) of installer respondents provided high ratings regarding the project orientation sessions. The project websites appear to be working well for installers that access

them. However, the research identified opportunities to improve the orientation sessions and the pilot's methods for working with installers.

Recommendations:

- ➡ **Project staff should consider ways to improve the effectiveness of web-based project orientations.**
- ➡ **Project orientation sessions should spend additional time on project requirements, utility-specific project requirements, and the pilot's goal to displace, not replace**.
- ➡ **Project staff should ensure the program's use of the Internet does not constitute a barrier to installer participation**.
- ➡ **Consider encouraging utilities to maintain lists of preferred installers**.
- ➡ **Project staff should provide key findings from this study to DHP manufacturers and recommend that their trainings include additional instruction on installation of DHP line sets.**

Goal: Encouraging DHP Sales

Conclusions:

Participants identified the opportunity to see functioning DHP units as important to their decision-making. Manufacturer contacts suggested that installers, as well, would benefit from access to functioning DHP units during trainings, thereby increasing the likelihood that installers will market DHPs to participants.

Prior to DHP installation, most participant respondents experienced dissatisfaction with the compromised comfort and high cost of operation associated with their existing zonal electric heat source. During weather extremes, such participants are particularly dissatisfied.

Recommendations:

- ➡ **Project staff should consider ways to make available to participants and installers functioning DHPs and should publicize the resulting opportunities**.
- ➡ **Advertising emphasizing the cooling benefits of DHPs might occur in early May (pre-season) and early August (temperature highs); campaigns emphasizing the heating benefits might occur in early September and early January**.

1 INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA) is a non-profit corporation supported by electric utilities, public benefits administrators, state governments, public interest groups, and energy efficiency industry representatives that operate in the states of Idaho, Montana, Oregon, and Washington. These entities work together to make affordable, energy-efficient products and services available in the marketplace.[1]

NEEA hired the team of Ecotope, Inc., supported by Research Into Action, Inc., to evaluate the Northwest Ductless Heat Pump Pilot Project. This document, prepared by Research Into Action, constitutes a first-year market progress evaluation report (MPER) for the pilot project. The research described herein comprises just a portion of the evaluation activities undertaken in support of the pilot.

Historically, DHP manufacturers' perception was that the United States represent a limited market for sales of residential DHPs. Due to recent technology improvements, manufacturers have introduced variable-speed ductless heat pumps (DHPs) with advanced individual controls to the U.S. market. A number of major manufacturers offer this equipment, both in the U.S. and worldwide. In the U.S., the technology's use has been in limited applications with a small overall market niche.

Given manufacturers' reported efficiency values, this technology appears to be a promising energy efficiency measure to displace the use of electric heat in the Northwest.[2] NEEA is leading a regional project intended to implement, demonstrate, and evaluate energy savings and market acceptance of this new generation of DHPs. The focus of this pilot project is to understand the impact of this technology when applied as a retrofit in single-family residences.

For the retrofit, existing electric resistance heating equipment remains in place for the occupant to use as needed. The DHP serves the main living areas of the home and displaces the need for heat from the existing electric heat source. The contractor does not remove the existing heating equipment, which the participant might continue to use to supplement the heat provided by the DHP, particularly during periods of colder weather.

The pilot includes marketing and implementation activities to coordinate installations of DHPs with Northwest utility programs that provide residential incentives. The primary goals of the pilot project are to:

---

1 See the website at www.nwalliance.org.

2 A pilot-provided comparison of the cost of heat in the Northwest suggests that DHPs offer heat more efficiently and at a lower delivered-cost than any other available heating technology.

- Demonstrate the effectiveness of inverter-driven ductless heat pumps to displace electric heat in existing Northwest homes;
- Support evaluation efforts to document project implementation, and to determine the costs and potential energy savings of DHPs in this application;
- Examine other non-energy benefits and potential barriers to large-scale implementation of DHPs through the market research elements of the evaluation; and,
- Define the future of the DHP market, and build an infrastructure to sustain and accelerate its growth.

The Project Implementation Document specifies several objectives related to these goals, including the objectives to:

- Engage the ductless heat pump industry (manufacturers, distributors, and contractors) and create cooperative relationships and leverage resources to support the project;
- Accomplish up to 2,500 quality installations of inverter-driven ductless heat pumps in existing homes with electric resistance space heat in the Northwest;
- Understand customer satisfaction and develop recommendations for future program implementation strategies;
- Address potential first cost barriers associated with ductless heat pumps;
- Ensure HVAC contractors are trained in the technical nuances of installing ductless heat pumps correctly and install accordingly;
- Provide HVAC contractors with an understanding of the basis of the project, the applications, and what is in it for them (new market and increased profits);
- Ensure ductless heat pump products installed through the project are among the best available and are well supported by the distribution channel in the Northwest;
- Pave the way for future ductless heat pump programs by testing program designs and marketing messages.

The Bonneville Power Administration agreed to sponsor the installation of DHPs in 1,500 homes across the region by October 2009. Parallel efforts by other regional utilities, who agreed to sponsor the installation of an additional 1,000 units by December 2009, supplemented BPA's commitment. In total, the project sought to install 2,500 DHP units between October 2008 and December 2009. The pilot exceeded this goal in early November 2009.

Table 1.1 summarizes pilot implementation outcomes through 2009. By the pilot's conclusion on December 31, 2009, it had installed 3,899 DHP units.

Table 1.1: Pilot Outcomes Summary (October 2008 through December 2009)

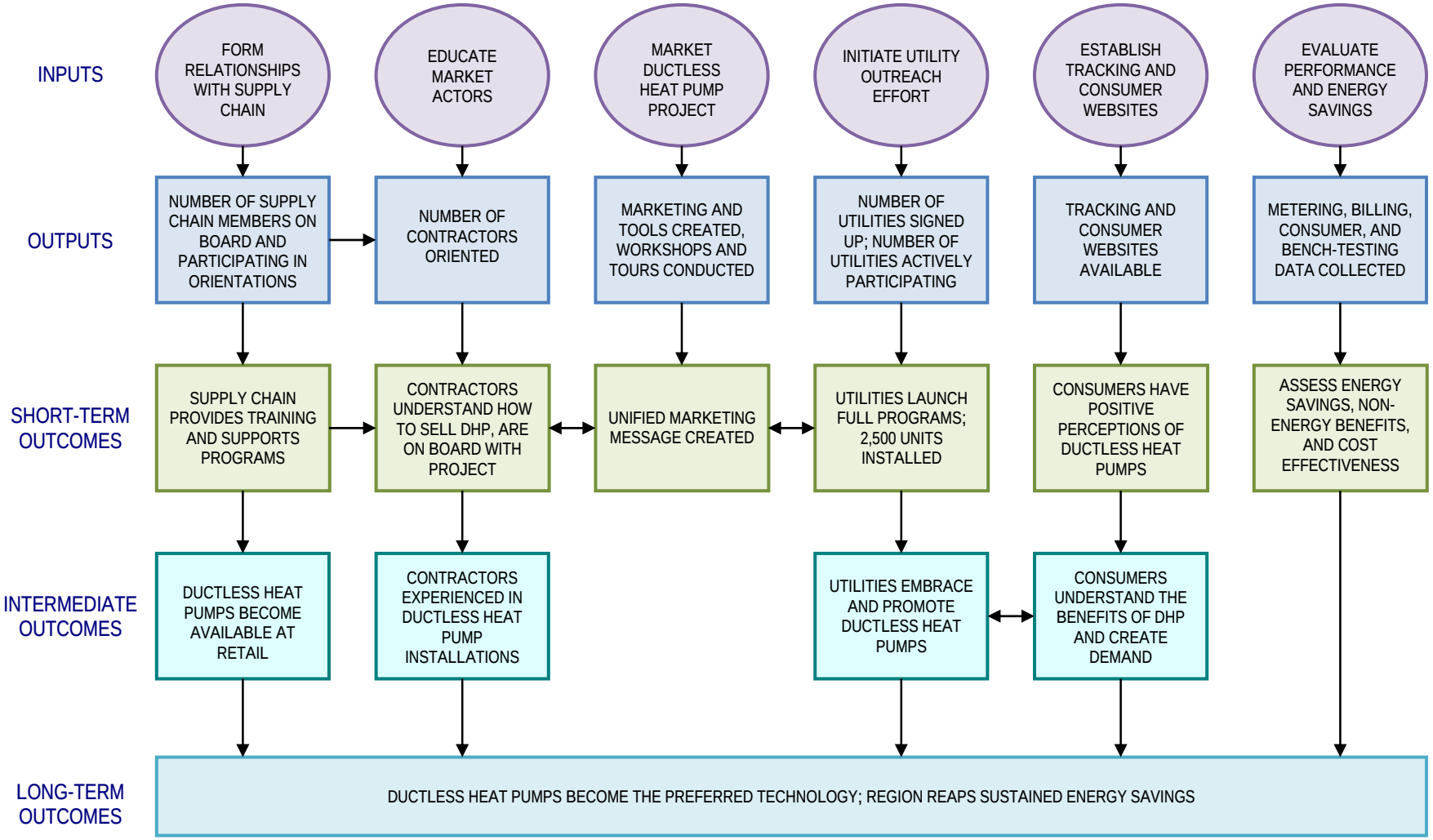
IMPLEMENTATION OUTCOMES	COUNT
PILOT STAFF ORIENTATION OUTCOMES	
In-Person Installer Orientation Sessions Offered	46
Web-Based Installer Orientation Sessions Offered	27
INSTALLER ORIENTATION OUTCOMES	
Number of Installation Firms that Attended Orientation Session	602
Number of Installation Firms that Installed DHPs through the Pilot	320
Number of Individual Installers Oriented through the Pilot	906
UTILITY OUTCOMES	
Number of Participating Utilities	78
Number of Utilities that Installed DHPs through the Pilot	59
TOTAL DHP INSTALLATIONS	
DHP Units Installed	**3,899**

DHP PILOT THEORY AND LOGIC

Historically, DHP manufacturers' perception that the U.S. represents a limited market for sales of residential DHPs resulted in a lack of manufacturer marketing activities for DHPs and limited availability of DHPs through distributors. Consumer barriers to uptake of DHPs included lack of familiarity with DHP technology, aesthetic concerns, and cost. Related to these factors, installers had minimal experience with DHP installation and limited access to training.

The program theory (see Figure 1.1) posits that by directly intervening with market actors, DHP marketing, training, and distribution networks would strengthen and consumer awareness of DHPs would increase. The theory further assumed that by offering an economic stimulus on DHP installations, utilities across the region would overcome participants' first-cost hurdle for DHP installation, persuading them to participate in the project.

Figure 1.1: Logic Model for Northwest Ductless Heat Pump Pilot Project



2 EVALUATION ACTIVITIES

OVERVIEW OF FULL DHP EVALUATION RESEARCH

The DHP pilot project evaluation, led by Ecotope, addresses five primary objectives, reflecting the pilot goals. This MPER addresses the latter two objectives.

- Provide a technical evaluation of DHP technology as a retrofit opportunity in Northwest homes, including the development of an appropriate efficiency and computational procedure to extend and verify current deemed savings tables.
- Provide an evaluation of the pilot project in terms of its achieved energy savings when applied in situ to a large number of Pacific Northwest residences.
- Calculate the cost/benefit ratios associated with the DHP project, including total resource cost, utility cost, and pilot participants' cost benefit.
- Assess both market response from participants in the pilot project and general market conditions in response from suppliers, distributors, and installers as the program and marketing are developed.
- Develop a process evaluation of the program as delivered and review alternatives as required for a larger-scale implementation of the DHP program.

OVERVIEW OF MPER RESEARCH

The MPER activities span two waves of research (see Table 2.1). In Wave 1, we surveyed pilot participants (participants) and contractors that installed DHPs through the pilot, manufacturer contacts (including DHP manufacturers, manufacturer representatives, and distributors), and program stakeholders (including NEEA program staff, implementation contractor staff, and utility and energy agency stakeholders). In Wave 2, we will conduct interviews with the same individuals, for a total of two interviews per contact, with two exceptions – in Wave 2, we plan to interview a subset of the manufacturer contacts and a different set of installation contractors. We will conduct Wave 2 interviews with contractors who NEEA oriented to the DHP pilot project, but who did not install any DHPs through the pilot (nonparticipating installers). Both waves of research review the logic model and project tracking data; in Wave 1, we also reviewed a 2008 publication by the National Association of Home Builders (NAHB) outlining the barriers to adoption of the DHP technology.

Table 2.1: MPER Activities

ACTIVITIES		2010	2011
Interviews and Surveys	NEEA Staff	X	X
	Implementation Contractor Staff	X	X
	Manufacturers / Distributors	X	X
	Utility Project Managers	X	X
	Participating Installers	X	
	Nonparticipating Installers		X
	Participating Participants	X	X
Document Review	Logic Model	X	X
	Project Tracking Data	X	X
	NAHB Research Center, *Ductless Heat Pump Market Research and Analysis*, June 2008	X	

Reports covering the two survey and review periods will address specific objectives.

- **Wave 1:** Findings obtained during the pilot (October 2008 through December 2009) and specific to participants installing DHPs; these surveys occurred during the pilot, soon after installation of the DHPs
- **Wave 2:** Findings obtained during the year following the pilot (2010) and specific to pilot participants; the surveys will occur in 2010, roughly one year after respondents were first interviewed

Table 2.2 (next page) summarizes the sampling plan.

Pilot Participants Sampling Plan

The participant survey sample excludes all sites participating in Ecotope's field monitoring sample. It also excludes renters, as the survey questions address both ownership and project processes.

We interviewed participant respondents monthly between June and September 2009, with the intention of reaching residents shortly after they installed their DHPs. We called sampled participants up to five times to reduce the likelihood of convenience sampling bias and judge our efforts successful, as the proportion of participant respondents over age 60 is comparable to the proportion of the population of households with any member over age 65.

Although we initially sought to conduct stratified random sampling, we modified this approach in consultation with the NEEA evaluation manager. To obtain a good sample distribution of regional weather differences, we sought to obtain roughly equal numbers of participants in

Cooling Zone 1 (less than 300 cooling degree-days) as participants in Cooling Zones 2 and 3 (greater than 300 cooling degree-days).[3] We also sought to include participants from virtually every participating utility. These objectives necessitated oversampling – in comparison to their proportions in the population – of participants from Cooling Zones 2 and 3, and from utilities with fewer participants. The sampling criteria were too numerous to support stratified sampling. Rather, we began with a random sample from the overall list of participants installing DHPs during the period leading up to the round of surveying and focused our calling on those providing the desired distribution across cooling zones and utilities.

Table 2.2: Wave 1 MPER Sampling Plan

GROUP	WAVE 1 SAMPLE	WAVE 2 SAMPLE	TOTAL (Unique Contacts)	POPULATION	CONFIDENCE/ PRECISION
Participants	235	Up to 235	235 (two interviews)	3,899*	Approaches 95/5
Manufacturer Contacts**	20	Up to 20	20 (two interviews)	80	Exceeds 85/15
Participating Installation Contractors	30	0	30 (one interview)	219	Exceeds 90/15
Nonparticipating Installation Contractors	0	15	15 (one interview)	298	Approaches 80/15
NEEA Project Staff	3	3	3 (two interviews)	3	Census
Implementation Contractor Staff	3	3	3 (two interviews)	5	All key staff
Utility, Energy Agency Project Staff	20	20	20 (two interviews)	74	Approaches 90/15

* At the conclusion of the survey period, the population of pilot participants stood at 2,258.

** Population and contact information provided by NEEA pilot manager. Contacts represent all six DHP brands in list provided by NEEA: Comfort Star, Daiken, Fujitsu, LG, Mitsubishi, and Sanyo. The pilot installed no Comfort Star units.

Additional Detail

Appendices A through C provide additional detail. Appendices A and B provide complete findings for the DHP participant and installer surveys. Appendix C provides summary tables and findings associated with pilot implementation processes.

[3] Cooling Degree-Days (CDD) refers to the amount of air-conditioning needed, created by adding up all temperature differences of the form (daily temperature in °F - 65° F) for each day in a year in which the temperature exceeds 65° F. *Cooling Zone 1* = Less than 300 Cooling Degree-Days; *Cooling Zone 2* = 300 to 600 Cooling Degree-Days; and *Cooling Zone 3* = Greater than 600 Cooling Degree-Days.

3 MARKET CHARACTERIZATION

TARGET MARKET DESCRIPTION

The primary target market for the pilot project consists of single-family, site-built homes using electric resistance zonal heating systems as the primary source of heat. NEEA program staff estimate there are approximately 534,842 homes in the Northwest in the target market. The secondary target market for the pilot project includes single-family, site-built homes using central forced-air electric furnaces (593,341) and manufactured homes using central forced-air electric systems (385,310). Altogether, NEEA program staff estimate there are approximately 1.5 million single-family homes eligible for the pilot project.

Prior research reported that as of 2008, DHPs represented only one percent of the $15 billion U.S. commercial and residential market for HVAC equipment and found that only five percent of the American public was aware of the existence of DHPs.[4] The source does not provide residential saturations. However, installer respondents who had installed DHPs prior to the pilot had installed twice as many commercial units as residential units.

The pilot project sought to identify barriers to market acceptance of residential DHPs and to explore methods to overcome those barriers. Pilot staff reported that prior to the project, consumer barriers to uptake of DHPs included lack of familiarity with DHP technology, aesthetic concerns, and cost; additionally, distribution networks for residential DHPs were weak.

To address these issues, and roughly coincident with the efficiency improvements undertaken by the manufacturers, program stakeholders engaged utilities, manufacturers, distributors, and installers in a cooperative relationship to leverage their resources in support of the project. Because the pilot had no formal marketing budget, these relationships were vital for building awareness about the project. By offering an economic stimulus on DHP installations, utilities across the region sought to motivate their customers to participate.

PARTICIPATING MANUFACTURER AND INSTALLER CHARACTERISTICS

The pilot installed five brands of DHPs: Daiken, Fujitsu, LG, Mitsubishi, and Sanyo (plus a single Amcor system). Although the evaluation team was unable to locate definitive data on market share, contacts (both those related to the pilot effort and interviewed manufacturers)

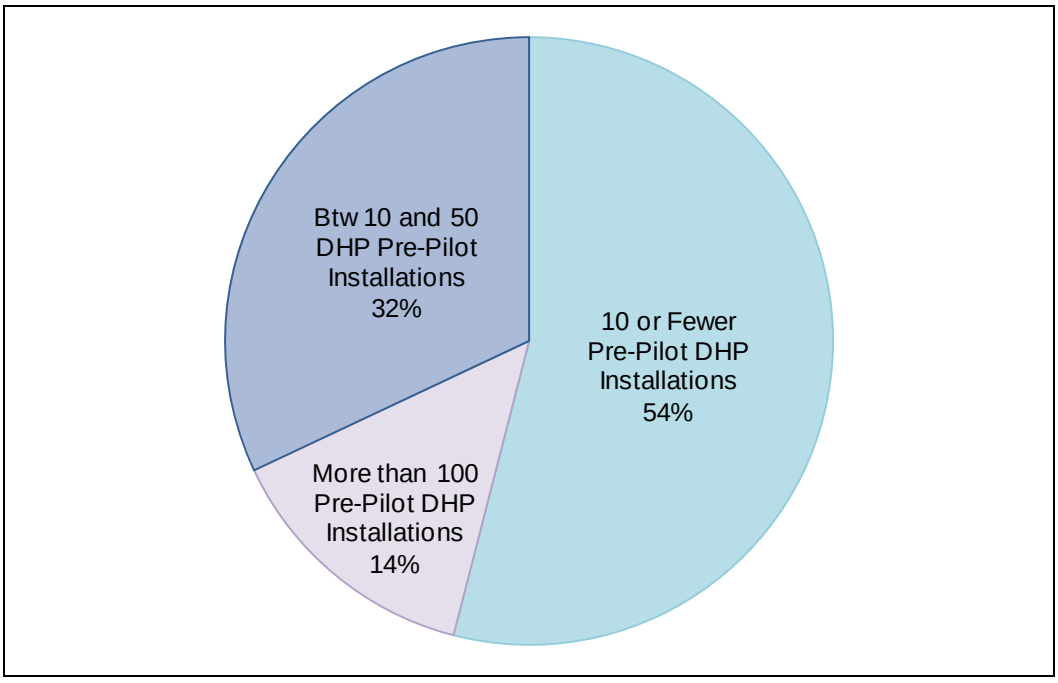
[4] NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 7. See: *http://www.nwductless.com/images/pdf/neea%20dhp%20analysis.pdf.*

suggest these five manufacturers dominate ductless heat pump sales in the U.S.[5] All five brands, plus contacts for a sixth brand (Comfort Star), were represented among our interviews with 20 participating manufacturers, manufacturer representatives, and distributors. Of the 20 contacts, 18 supply both commercial and residential HVAC equipment. The remaining two contacts (both manufacturer representatives) deal in residential equipment only. The majority of manufacturer contacts (14 of 18 answering the question) reported no previous contact with NEEA.

All 30 interviewed DHP installers reported that they provide heating and cooling equipment sales, installation, repair, and maintenance. The majority (26 of the 30) also sell water heaters. Installer respondents most commonly reported that they participated in the pilot in order to increase sales of residential DHPs and/or because they believed that DHP installation benefits homeowners.

The majority (24 of 30) of installer respondents reported having completed at least one DHP installation prior to the pilot. However, consistent with prior research indicating low market penetration of DHPs, over half of installers (15 of 28 responding) reported ten or fewer pre-pilot DHP installations; only four reported more than 100 pre-pilot installations (Figure 3.1).

Figure 3.1: DHP Installations Prior to the Pilot (N=30)



[5] A contact for Mitsubishi estimated it supplies 50% of the DHP market; a Sanyo contact estimated Sanyo supplies 10-15% of sales in the West; a Daiken contact estimated Daiken was the third largest provider.

Also consistent with prior research indicating particularly low penetration of residential DHPs, installer respondents reported that the majority of their pre-pilot DHP installations (349 of 508 units, or 67%) had occurred in commercial applications.[6]

Prior research indicates that a large majority of pre-pilot residential DHPs provided heating or cooling to a space that previously had no heating/cooling, as opposed to displacing existing zonal heat.[7] Somewhat in contrast with these earlier findings, responses from installer respondents indicate that approximately half (46%) of their pre-pilot residential DHP installations were put in to displace existing zonal heat and about half (54%) were installed to provide heating or cooling to a previously unconditioned space. Altogether, installer respondents reported that over 85% of their pre-pilot DHP installations occurred outside of the pilot's target market of residential electric heat displacement.

6 NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 14.

7 NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. pp. 22-24.

4 MARKET PROGRESS ASSESSMENT

This chapter provides a synthesis of our findings relating to the pilot's goals to demonstrate the use of inverter-driven DHPs to displace electric resistance space heat in existing Northwest homes and to build an infrastructure to sustain and accelerate growth in the market.

MARKET PROGRESS OVERVIEW

Table 4.1 provides a summary of pilot implementation outcomes. As of December 31, 2009, participants had installed 3,899 DHPs through the Northwest Ductless Heat Pump Pilot Project. Figure 4.1 (next page) illustrates the location of the DHPs installed through the pilot.

Table 4.1: Pilot Outcomes Summary (October 2008 through December 2009)

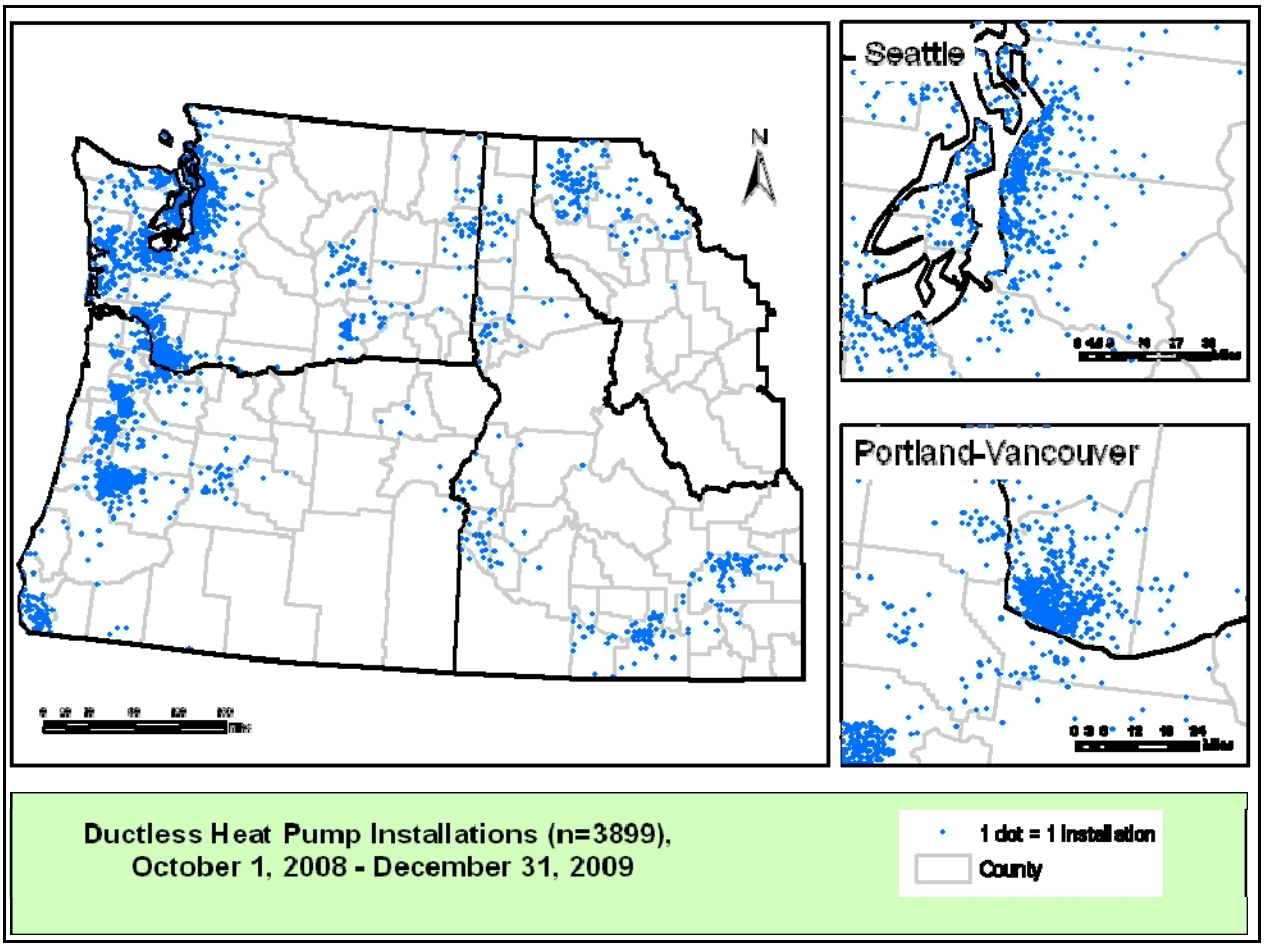
IMPLEMENTATION OUTCOMES	COUNT
PILOT STAFF ORIENTATION OUTCOMES	
In-Person Installer Orientation Sessions Offered	46
Web-Based Installer Orientation Sessions Offered	27
INSTALLER ORIENTATION OUTCOMES	
Number of Installation Firms that Attended Orientation Session	602
Number of Installation Firms that Installed DHPs through the Pilot	320
Number of Individual Installers Oriented through the Pilot	906
UTILITY OUTCOMES	
Number of Participating Utilities	78
Number of Utilities that Installed DHPs through the Pilot	59
TOTAL DHP INSTALLATIONS	
DHP Units Installed	**3,899**

Manufacturer Response to the Pilot

Significant pre-pilot market barriers to proliferation of residential DHPs included weak manufacturer and distributor supply chains, and the relative unavailability of residential DHP training for installers. According to pilot staff, manufacturers provided support to the pilot by training internal employees, DHP distributors, utilities, and manufacturer representatives and installers; they also provided tools and resources. The latter include manuals describing the proper application and servicing of DHP units, sales guides, and marketing support (including

development of promotional campaigns and cost sharing with utilities). DHP distributors worked with manufacturers, installers, utilities, and customers. They provided inventory, training, sales literature, and technical, warranty, and marketing support. DHP manufacturer representatives acted as liaisons between distributors and manufacturers. They trained installers and salespeople, and reported to manufacturers on market conditions and market progress.

Figure 4.1: Location of DHP Pilot Installations (N=3,899)



Program contacts reported that, over the course of the pilot, involvement and interest among DHP manufacturers increased. Notably, contacts reported that at the time the pilot launched, there were three involved manufacturers, and that by late 2009, there were five. However, some program implementation contacts reported a degree of disappointment with the level of engagement among DHP manufacturers. For instance, an interviewed pilot staff member indicated that some of the largest DHP manufacturers were not particularly responsive to the project and did not provide information quickly. Manufacturers reported that the project created a great deal of consumer interest in DHPs, was very consumer friendly, and did a great job of marketing. Contacts were pleased with the increased interest in their companies and products.

One contact commented, “The ultimate strength is that the project came at a time when there needed to be some stimulus to the consumer in getting out of resistant heat and introducing more of the DHP technology - so it was the right time.”

Growth in the Residential DHP Market

Manufacturer contacts unanimously reported they expect the market for residential DHPs in the Northwest to grow over the next two-to-five years; and many contacts (8 of 20) identified the activities of the pilot project as a primary driver of this growth. These contacts specifically mentioned the following as growth drivers: the pilot’s financial incentives; the pilot’s facilitation of utility marketing activities; and the pilot’s training activities, to which these contacts attribute an increase in the number of installers marketing residential DHPs. According to one DHP manufacturer, “It’s the HVAC installers that are going to push the DHP market forward.” Utility staff agreed that installers were often the primary driver of DHP sales.

Manufacturers also frequently (6 of 20) included the large size of the residential market for DHPs in the Northwest as a driver of future growth. According to one DHP manufacturer, “If there is one thing the pilot has taught me, it’s that the target market is so much bigger than we had thought. If I were an installer, I would be looking at this as such a huge opportunity, a paradigm shift, and the biggest thing in my 20-plus years in the HVAC industry that I've seen change.” Manufacturer contacts unanimously (20 of 20) reported that there are a sufficient number of HVAC installers to serve the residential DHP market in the Northwest. Most of the manufacturer contacts cautioned that this number is sufficient, if an adequate number of these installers receive training in DHP installation.

Manufacturer contacts reported that their pre-pilot residential DHP marketing messages emphasized energy efficiency, zonal control, simple installation, energy savings, comfort, quiet, brand recognition, and environmental attributes. Representatives from the majority (5 of 6) of participating DHP manufacturers reported that they adjusted marketing activities in response to the pilot project. These changes included advertising the pilot project and the available rebates, increasing the number of installer DHP trainings, and emphasizing heating (as opposed to cooling) capabilities of DHPs to appeal to northern climates.

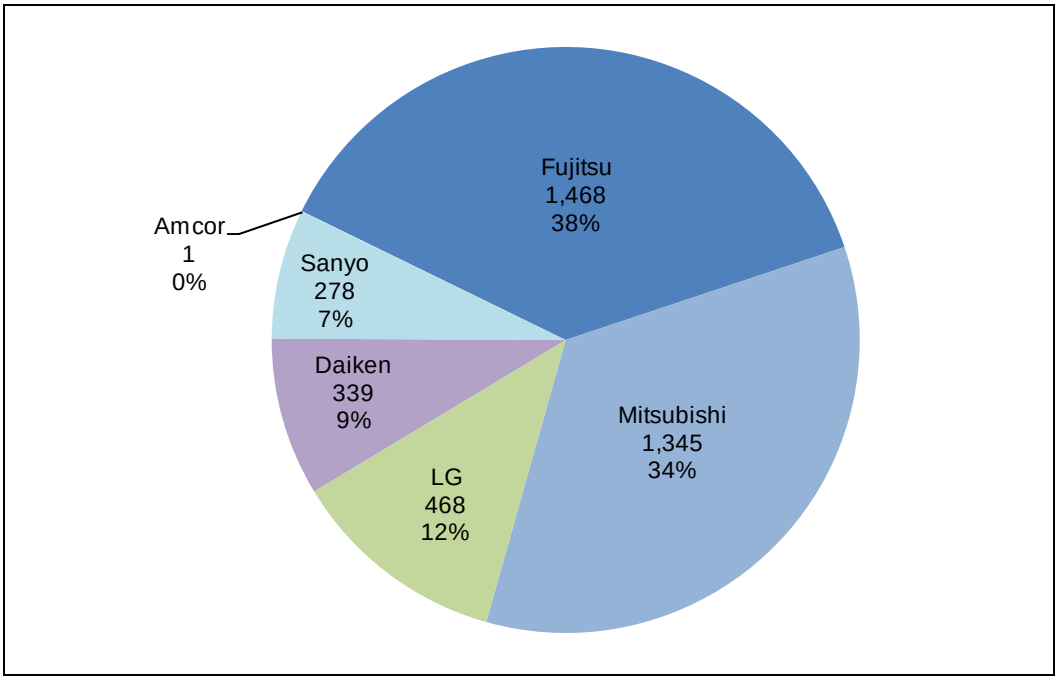
Comments from installer respondents indicate that the activities of the pilot project have strengthened DHP supply chains, resulting in increased availability of DHPs. Nearly all of the installer respondents (26 of 27) reported that obtaining DHPs is “easier” or “the same degree of difficulty” as obtaining other types of space-conditioning equipment.[8] According to one interviewed installer, “Now that there’s an incentive, it’s easier to obtain DHPs, because almost all distributors carry at least one brand of DHP and some carry multiple brands.” Only one interviewed installer reported that DHPs were more difficult to obtain than other types of space-

[8] Twenty-seven of thirty installer respondents provided valid responses.

conditioning equipment, which the installer attributed to "some rushes on DHPs that qualify for the federal tax credit at the beginning of the pilot project."

Figure 4.2 displays total number of DHP sales during the pilot period (through December 2009), by manufacturer. The majority (eight of the nine manufactures providing valid responses) reported that during the pilot period, sales of residential unitary ducted systems have either decreased or remained flat.[9] In addition, one of the eight reported, "If we hadn't been selling DHPs, our business would be in trouble right now." However, some manufacturer contacts expressed disappointment with DHP sales during the pilot. According to one manufacturer contact, "I've invested a lot of time in the pilot project, and in the grand scheme of things I don't think it was worth my time."

Figure 4.2: Pilot DHP Sales by Manufacturer through December 2009 (N=3,899)



Manufacturer contacts frequently cited the activities of the pilot project as a primary driver of growth in the residential DHP market and most would like continued incentives for DHPs. According to one manufacturer contact, "The pilot project greatly improves customer knowledge of DHPs as an alternative to ducted systems. I think the pilot project needs to continue for

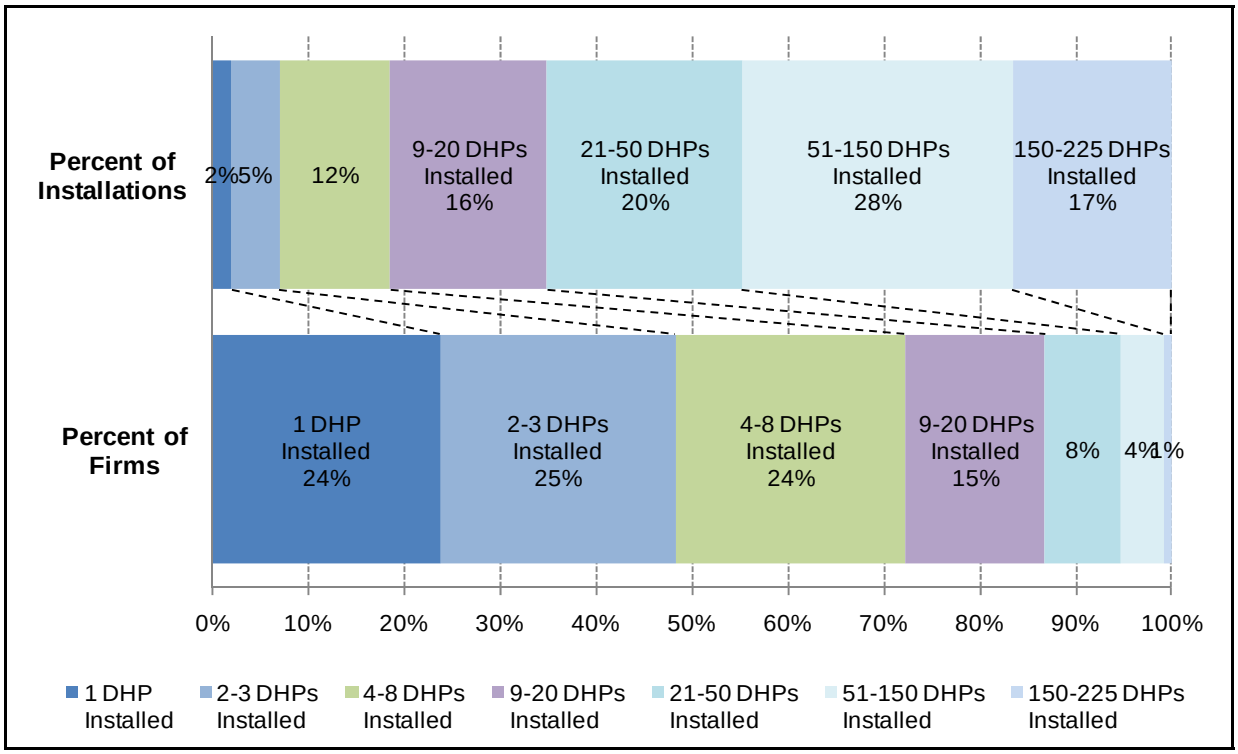
[9] Previous research hypothesized that unitary, ducted systems have been more affected by the current housing market and economy, while DHPs have been able to differentiate themselves in the marketplace. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 20.)

another couple of years. I would hate to see the pilot project be discontinued just as the market is beginning to learn about DHPs." Additionally, the majority (18 of 20) of interviewed utility managers expressed approval for continuance of DHP incentives.

Installer Response to the Pilot

As of December 31, 2009, 320 installers participated in the pilot, installing 3,899 DHPs (Figure 4.3). We interviewed 30 installers (9% of total), each installing between 1 and 59 DHPs, and collectively installing 441 DHPs (12% of total).

Figure 4.3: Participating Installers and Their Numbers of Installations (N=30)



The majority of installer respondents (23 of 29) reported that, because of the pilot, they now offer DHPs to customers more frequently than they did prior to the project.[10] According to one installer, "We didn't know much about DHPs before the pilot project. When the pilot came along, we started to receive requests for them and then we really started pushing them." In addition, the majority of installer respondents (26 of 30) reported that they would continue to offer DHPs after the incentive period ends.

[10] Twenty-nine of thirty installer respondents provided valid responses.

According to manufacturer contacts, factors contributing to a high level of installer participation in the pilot project include favorable DHP profit margins, the relative ease of DHP installation, and the ease with which installers can explain installation and application of DHPs to customers. According to one contact, "Installers feel comfortable because DHPs are a simple technology. They are unlikely to get any tricky questions concerning DHPs from customers." Manufacturer contacts reported that barriers to installer participation include low utility involvement within some service territories, installer confusion related to variations in utility rebate structures and program offerings, and fee-based installer eligibility requirements (reported within one utility service territory).

Nearly all (27 of 29) installer respondents reported that their DHP profit margins were "equivalent to" or "higher than" other equipment they install.[11] In general, the installer respondents reported that they achieved standard or above-average profit margins via the reduced amount of time necessary to install DHPs and/or via charging customers a higher-than-average markup on DHP equipment. One interviewed installer reported that, at pilot launch, DHP profit margins were equal to other space-conditioning equipment, but that the popularity of the pilot project resulted in increased market competition, prompting the installer to reduce the amount charged to customers in order to remain competitive.

According to prior research, the average pre-pilot installed cost of residential DHPs with one outdoor and one indoor unit ranged from $2,800 to $3,000.[12] The pilot installed 2,552 systems (65% of the total) with this configuration; costs ranged from $2,000 to $7,974 (with seven outliers removed due to suspect data). Both average and median costs were about $4,100.

Some utility contacts expressed frustration because installed costs were exceeding the estimates they had received from the program manager and provided to customers. According to one utility contact, "The cost of DHP installations should not exceed $5,000, because DHP units cost installers from $1,800 to $2,000 from the distributor and can be installed in just one day." The installed cost of DHPs seemed to contacts to vary by area. One utility contact reported DHP installation costs in the Seattle/I-5 area are elevated because the consumer market in that area supports these costs. Multiple utility contacts attributed the prices that exceeded their expectations to DHP installers. One utility contact suggested that DHP suppliers were driving up costs.

Pilot project staff expressed the opinion that, in some cases, the cost of DHP installations rose in proportion to utility incentive levels (see Table 4.2). This belief resulted in questioning of the appropriateness of possible future incentive efforts. To address these issues, pilot staff reported

---

11 Twenty-nine of thirty installer respondents provided valid responses.

12 Purchase price includes costs associated with shipping, damaged units, support, and marketing. These installation prices, however, can vary greatly depending on region of the country. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 17.)

that "upstream" buy-downs and other cooperative promotions might provide an alternative approach.

Table 4.2: DHP Incentives of Offered by Participating Utilities

NUMBER OF UTILITIES	INCENTIVES
2 Utilities	$2,250 to $2,375
45 Utilities	$1,500
15 Utilities	$1,000 to $1,350
2 Utilities	$400 to $700

Utility contacts reported that the installed cost of DHPs was an important consideration in determining pilot-period incentive amounts. Multiple utility contacts reported that their plans concerning DHP incentives depend upon demonstration of DHP cost effectiveness. Several utility contacts expressed frustration that the pilot-sponsored analysis of DHP cost-effectiveness will not be complete until 2012. In addition, one interviewed utility contact reported, "Our internal planning department considers DHPs to be adding load because of their cooling feature."

Interviewed pilot project staff cautioned utilities against making decisions based on the installed cost of DHPs during the pilot period, because DHP supply chains are still forming. Regarding prospective evolutions in the DHP supply chain, one pilot project staff reported that, in Europe, DHPs require no "middle-man" and typically are not installed by HVAC installers. Instead, DHPs are sold in stores similar to Home Depot and installed by "DHP specialists." This contact further reported that increased sales of DHPs in the U.S. might result in a similar evolution in the supply chain, thus reducing the installed cost of DHPs.

Additionally, pilot staff cautioned against using a "complete economics perspective" to assess the value of DHPs, because, according to one staff contact, "That view does not do justice to non-energy benefits associated with DHP installation, including increased comfort levels, air filtration, cooling, and the remote control."

CHARACTERISTICS OF PILOT PARTICIPANTS

We interviewed participating installers from three geographic areas in the Northwest.[13] Responses from interviewed installers suggest geographic areas that are not in close proximity to major population centers contain higher proportions of customers that are eligible to participate

[13] *Area 1 Respondents*: installer respondents located in the Seattle area, within 50 miles of I-5. *Area 2 Respondents:* installer respondents located along the Portland/Vancouver/Eugene I-5 corridor, within 50 miles of I-5. *Area 3 Respondents (Other):* comprised of installer respondents throughout the four Northwest states, greater than 200 miles from I-5.

in the pilot project. The majority of installer respondents from the Seattle I-5 and Portland I-5 areas estimated fewer than 33% of their customers would be eligible to install DHPs through the pilot. In contrast, all seven installer respondents not located in the Seattle I-5 or Portland I-5 areas estimated more than 34% of their customers would be eligible.

In addition to providing their assessments of the proportion of eligible pilot participants in the areas in which they work, we asked installer respondents to provide estimates of the proportion of their customers who had expressed interest in DHPs. In each of the three areas, the majority of installer respondents reported that less than 33% of their customers had expressed interest in DHPs. However, one interviewed installer, working in Clark County, Washington, reported that 80% of his customers had expressed an interest in DHPs. The installer attributed this high level of interest to a substantial utility marketing effort, active marketing by installers, and a high proportion of customers with zonal electric heat.

Additionally, we asked installer respondents from the three geographic areas to estimate the percentage of customers to whom they had recommended DHP installation that had chosen to have one installed. Of the three areas, installer respondents in the Seattle I-5 region reported the lowest percentage of customer uptake relative to installers' recommendations for DHP installation. There is a significant correlation between geographical location and the installer-reported likelihood that customers to whom DHPs were recommended chose to have one installed (p=.017, n=27).

The majority (18 of 28) of installer respondents reported most DHP customers contacted them specifically to request a DHP consultation.[14] Most frequently, the installers reported DHP customers had heard about the pilot project from their utilities and located the installer's name and contact information via utility links to lists of eligible installers. One interviewed installer reported a "huge customer response" to a newspaper article describing the project. Conversely, 10 of the 28 installers reported it was most often the case that customers became aware of DHPs and of the pilot project only after consulting with installers. The majority of participant respondents reported hearing about DHPs from fliers or bill inserts from their utilities. The utilities' marketing approaches varied; in particular, newspaper coverage occurred in only a few communities. These data suggest written information has been highly effective in reaching the demographic that predominates among participants to date: older participants.

Role of Incentives in Participants' Decision to Purchase

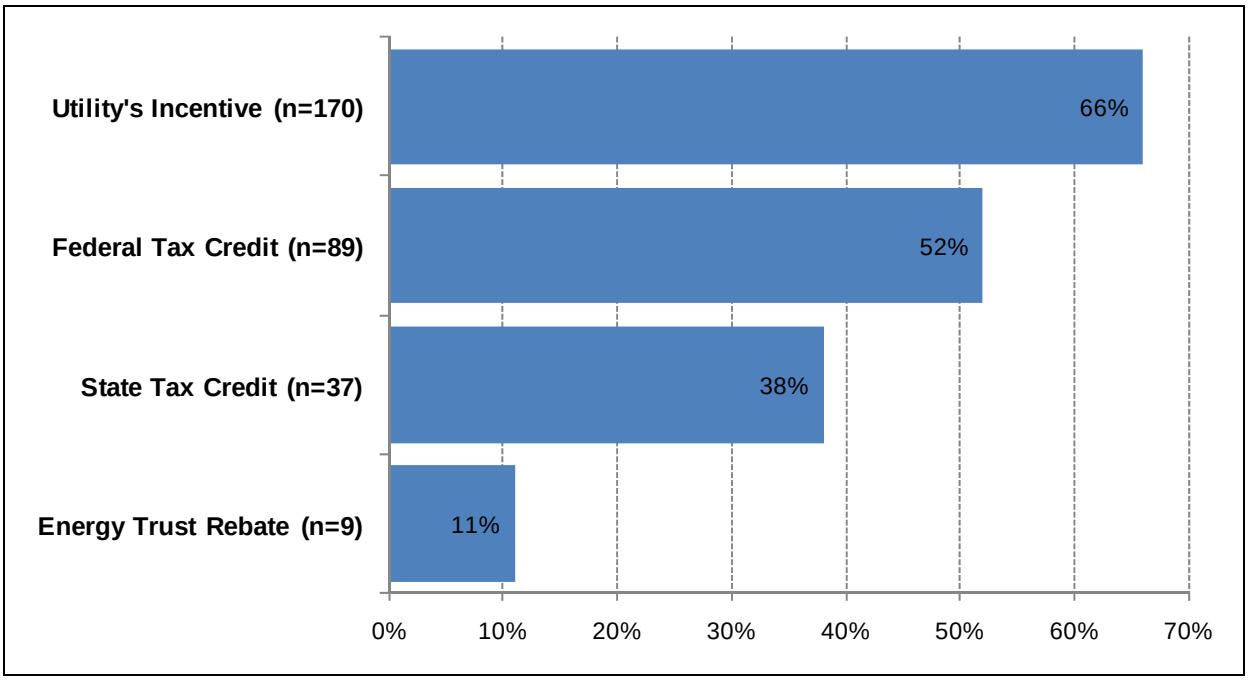
Of the participant respondents who recalled being offered a utility rebate, 66% indicated their decision to purchase the DHP "may have" or "would have" changed had the utility incentive not been available (Figure 4.4).[15] Another indicator of the influence of the rebate on purchase

[14] Twenty-eight of thirty installer respondents provided valid responses.

[15] Although all interviewed participants received a utility incentive for their DHP, only 198 recalled their installer mentioned the utility incentive to them.

decisions comes from participants who received a substantially lower-than-average incentive; only 11% of these participants said their decision "may have" or "would have" changed were the incentive not available.[16] Given that DHPs had a very low share of the residential heating market prior to the pilot, participants may be overestimating their willingness to purchase a DHP without the incentive. On the other hand, the pilot intervention is not limited to the incentives; it also has mobilized installers, who were not actively selling into this market prior to the pilot.

Figure 4.4: Percent of Participants Who Would Not Have Installed DHP Without an Incentive, by Incentive Type, N= 170 (respondents may have received more than one incentive)



Note: Percents exclude "Don't Know" responses.

Question 14: When your contractor provided you with a pricing quote, what kind of incentives did they discuss with you or include in the bid? If [each indicated incentive] was not available, would you decision to buy a DHP have changed. And Question: 16. If the incentive(s) you received was(were) not available, how would your decision to install the DHP have changed?

In addition to the utility incentives facilitated by the pilot project, pilot participants were frequently offered a variety of additional rebates and incentives, including state and federal tax credits and/or manufacturer rebates. Regarding these incentives, 87% of participant respondents who reported applying for state tax credits and 58% of those who applied for a federal tax credit said their decision to purchase a DHP "may have" or "would have" changed had these financial incentives not been available. Of those participant respondents who reported their decision to install a DHP

[16] The program administrator offers a $400 DHP incentive.

may have or would have changed had the incentive not been available, 37% reported they would have postponed the purchase and 54% reported they would not have installed the DHP at all.

Although DHPs represented only a small percentage of overall HVAC equipment sales prior to the pilot, prior research indicates the DHP industry was, nonetheless, experiencing steady growth from 2003 to 2008.[17] This prior research hypothesized a significant portion of pre-pilot DHP customers were educated, energy conscious, willing to comprehend how DHP systems functioned, financially able to invest upfront, and willing to embrace new technology.[18]

Participants' Prior Heating Sources

Participant respondents identified *all* of the heat sources they had used prior to the installation of their DHPs. Most frequently, participants included wall heaters (43%), baseboard heaters (40%), wood heat (29%), and electric radiant heat (22%) in their responses. Twenty-two participant respondents indicated they used space heaters as a source of heat before installing the DHP, with an average of 2.6 space heaters per participant.

Reported percentages for participants' *primary* heat sources were generally lower than the percentages reported for *all* sources of heat in their residences. As Figure 4.5 shows, participants most frequently reported that, prior to DHP installation, their *primary* source of heat had been wall heaters (30%), followed by baseboard heaters (29%), electric radiant heaters (16%), and wood heat (10%). It is noteworthy that 10% of participant respondents reported wood heat had been their primary heating source prior to DHP installation, because participants using wood as their primary heating source are not eligible to participate in the pilot project. Furthermore, the technical evaluation team disqualified from the metering sample, pilot participants who reported pre-DHP wood use above certain levels, because such wood usage made it difficult to identify an electric heat signature on participants' electricity bills.[19] Of the participant respondents who reported they used any wood heating prior to DHP installation, 67% reported an amount of wood in excess of the thresholds specified for the metering sample.[20]

---

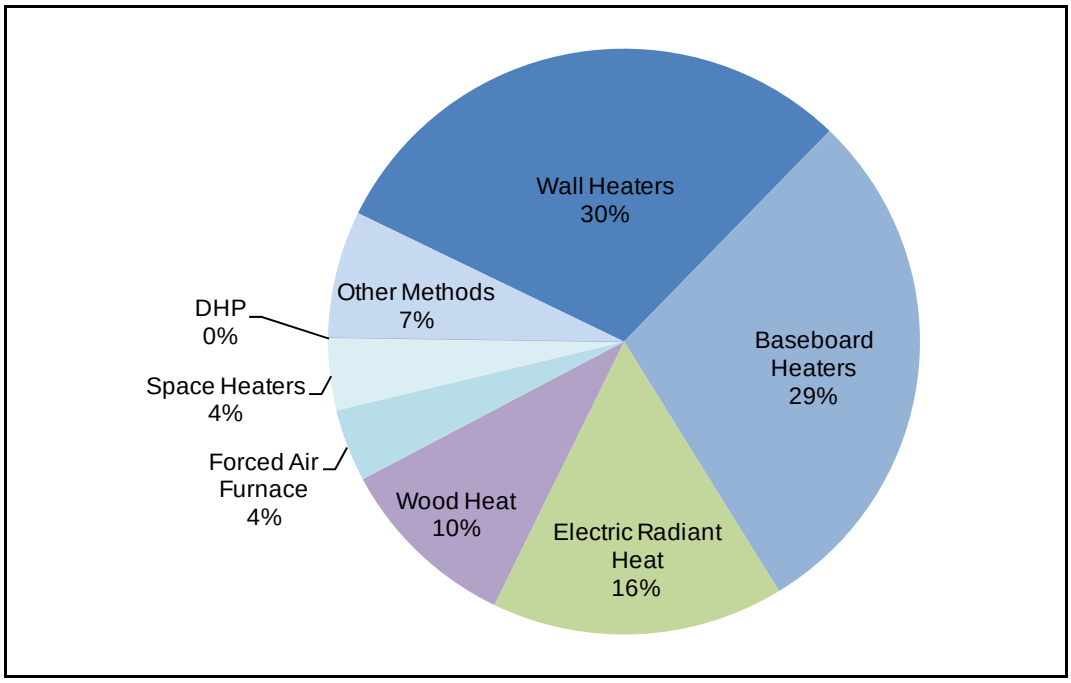
17 NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. pp. 20.

18 In addition to customers representing these demographic characteristics, prior research determined many pilot participants were first introduced to the systems when they were picked to participate in a rebate program offered by their electric company. Others first heard about DHPs from friends in the residential heating and cooling business. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. pp. 24.)

19 The technical evaluation team reported they excluded from the metering sample participants that reported use of: 0.5 cords or more in Climate Zone 1; 1 cord or more in Climate Zone 2; and 1.5 to 2 cords or more in Climate Zone 3. Corresponding exclusion thresholds for pellets is 1 ton and for propane is 170 gallons.

20 Of the 67 interviewed participants who reported using wood heat (either primarily or supplementally) prior to DHP installation, 46 provided valid responses concerning the amount of wood they had used.

Figure 4.5: Participants' Primary Heating Methods Before DHP Installation (N=235)



Question 30: Before DHP, which of the following types of heating equipment did you use?

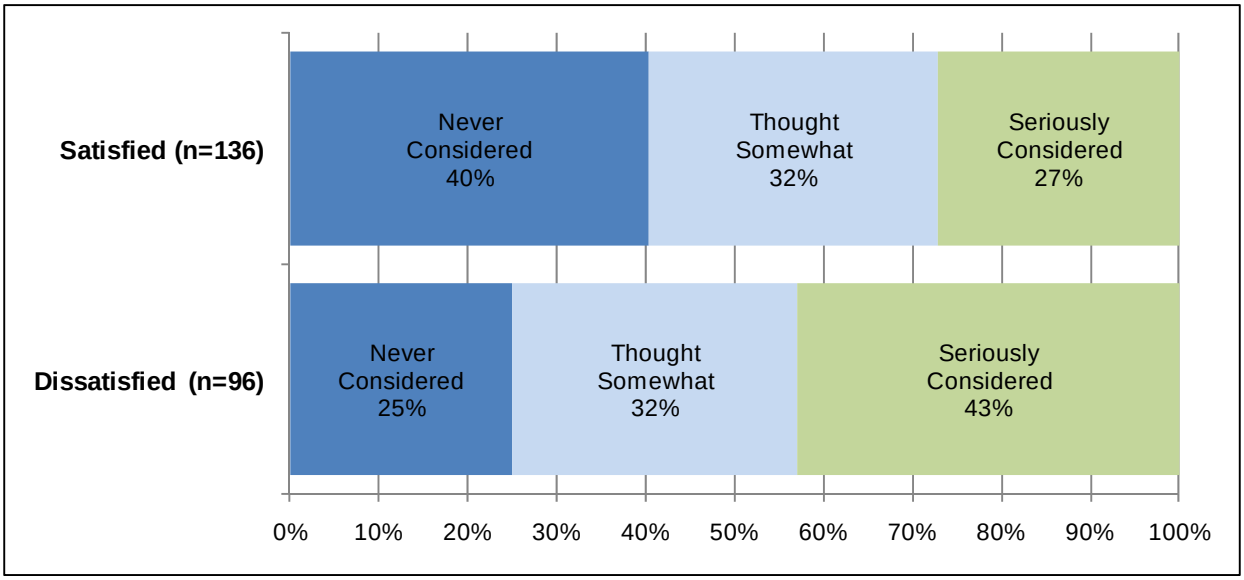
Forty-one percent of participant respondents described themselves as "not at all" or "not very" satisfied with their heat source(s) *prior* to DHP installation, while 59% of participant respondents described themselves as "somewhat," "very," or "extremely" satisfied. Among the participant respondents who reported being "somewhat," "very," or "extremely" satisfied with their previous heat, more than 40% reported they had 'never considered' replacing their old heating equipment prior to learning about the pilot project (Figure 4.6).

Interviewed participants who reported using electric radiant heat prior to DHP installation reported the highest satisfaction with their previous heat, with 10% reporting having been "extremely satisfied." Forced-air furnaces were a close second, with 9% of participant respondents indicating they were "extremely satisfied." One percent of the participant respondents who reported having used wall heaters and none of those reporting use of space heaters described themselves as being extremely satisfied with those heat sources.

About one-third of participant respondents reported they had "seriously considered" replacing their previous heating equipment prior to their participation in the pilot project, about one-third reported they had "somewhat" considered replacement, and the remaining third reported they had "never" considered replacement. The two-thirds of participant respondents who reported they had been "somewhat" or "seriously" considering replacement of their previous heating equipment indicated they had considered ducted heat pumps (37%) and ducted furnaces (24%) over other options (5%). Interviewed participants who reported they had not been considering

replacement of their existing heat prior to DHP installation, frequently cited the cooling function of the DHP as a motivator for purchase.

Figure 4.6: Participant Satisfaction with Prior Heat and Inclination to Replace Equipment



Questions: 18. Before learning about the DHP and the incentives, how seriously had you considered installing some new heating equipment? and 6. How would you rate your overall satisfaction with the heat you had before the DHP in your home?

BARRIERS TO DHP MARKET PENETRATION

Comments from manufacturer contacts suggest that customers representing these demographic characteristics continue to install DHPs, both as pilot participants (to displace zonal heat) and outside of the context of the pilot project (to provide heating and/or cooling to a previously unconditioned space, or because they are not aware of the pilot). In addition, comments from manufacturer contacts suggest that the pilot has succeeded in attracting a substantial number of lower-to-middle income customers by addressing lack of awareness (via pilot-facilitated marketing activities) and cost hurdles (via pilot-facilitated financial incentives).[21]

Interviewed utility staff in colder climates agreed that the cooler temperatures can be a barrier to sales. According to one utility contact, “Geothermal heat pumps make more sense than DHPs in our service territory, because we are at a higher elevation and our weather is very cold.”

[21] Consistent with prior research, comments from installer respondents suggest that the utilization of DHPs to gain points in green building programs may also be a factor driving DHP sales. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. pp. 24*).*

Manufacturer contacts were more than twice as likely to agree as to disagree that climate is an important consideration in installing a DHP, with colder climates negatively affecting DHP sales. Conversely, some manufacturer contacts dispute the supposed climatic limitations of DHPs. For instance, one manufacturer contact reported that one of their DHPs "works just as well in the Mojave Desert as it does in Alaska at well below zero." Manufacturer contacts further reported that as inverter technology becomes more sophisticated, the amount of heat a ductless system can produce will increase, enhancing the applicability of DHPs.[22]

Similarly, manufacturer contacts most frequently (19 of 20 responding) reported the most common residential participant's concerns associated with DHPs are the appearance (14 of 19) and/or participants' lack of familiarity with DHPs (7 of 19). Multiple manufacturer contacts reported having addressed DHP aesthetics by improving the appearance and reducing the size of the interior DHP units.[23] However, according to one manufacturer contact, "The problem is not necessarily the aesthetics of the interior unit per se. It's more the fact that people don't want to have something hanging on their wall." To address the issues of aesthetics in a broader sense, multiple manufacturer contacts reported development of ducted-style units for their ductless product line that are recessed into ceilings, essentially out of sight of the consumer.

Using a list of specific potential concerns about DHPs that were identified in previous market research,[24] we asked interviewed participants to rank how concerned they were about each previously identified topic. While the prior market research sampled a population generally unfamiliar with DHPs, our research surveyed participants that had installed DHPs. Not surprisingly, our sample of homeowners did not express high degrees of concern (Figure 4.7). Nonetheless, the greatest proportions of participant respondents expressed concern prior to their DHP purchases with the purchase cost (44% reported being "very" or "extremely" concerned) and the cost of running the equipment (32% reported being "very" or "extremely" concerned).

The most frequent concerns participants mentioned in addition to those we explicitly asked about were: appearance of the unit, sound level, placement of the unit, and how effective the unit would be at heating efficiently. Many participants mentioned they were reassured by utility and installer contacts, and that the incentive amount made the DHP appealing enough to mitigate any concerns.

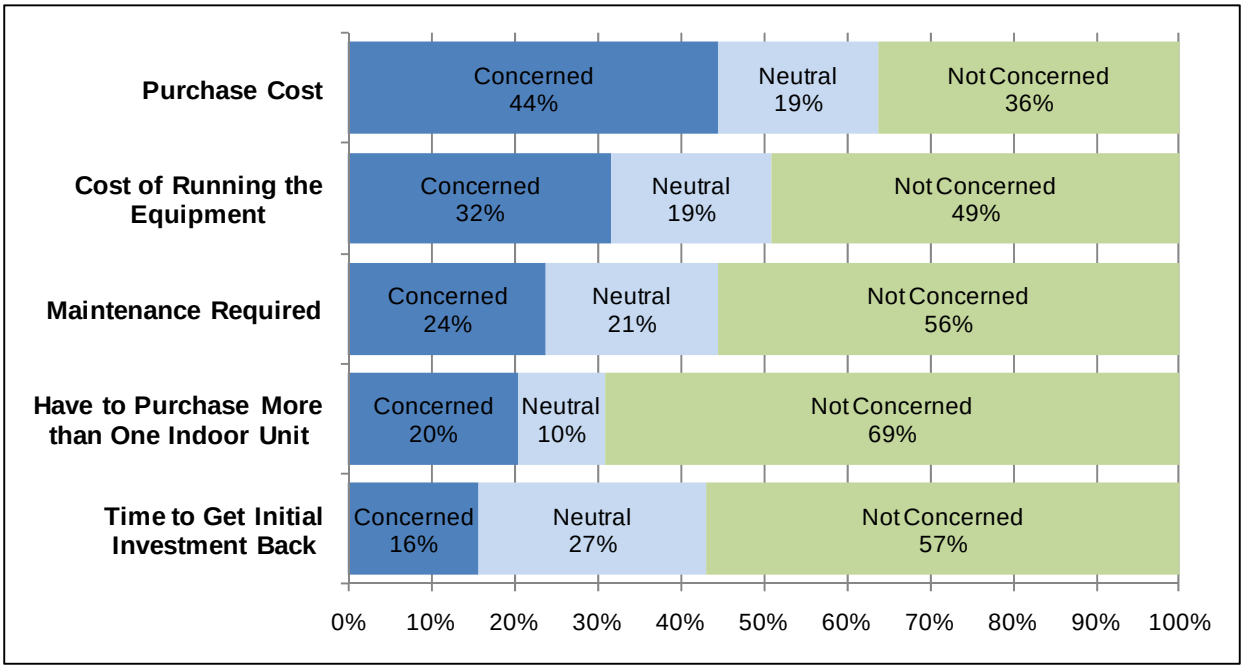
---

22 For instance, in early 2008, Mitsubishi introduced its new hyper-heating inverter (H2i™) technology. This new technology allows the system to run at full capacity in extremely cold temperatures, unlike traditional heat pumps which require supplemental heat. A Mitsubishi representative said this new technology has the capability of functioning at 100% heating capacity at 5° F and will operate effectively down to -13° F. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 21.)

23 Prior research indicates that, in an attempt to approve the aesthetics, manufacturers began making the indoor units much smaller. DHPs in 2008 were approximately half the size of what they were in 2003. (NAHB Research Center. 2008. *Ductless Heat Pump Market Research and Analysis.* Report #08-190. Portland, Ore.: Northwest Energy Efficiency Alliance. p. 32.)

24 *Evaluation of Consumer Market for Ductless Heat Pumps in the Northwest*, prepared by Russell Research for NEEA, Supplied by NEEA, 2/13/09.

Figure 4.7: Participant Respondents' Concerns before DHP Installation (N=235)



Question: 20. I would like to know whether you had any of the following concerns about the DHP prior to the installation. Please rate each possible concern using a five-point scale, where 1 means 'not at all concerned' and 5 means 'extremely concerned'.

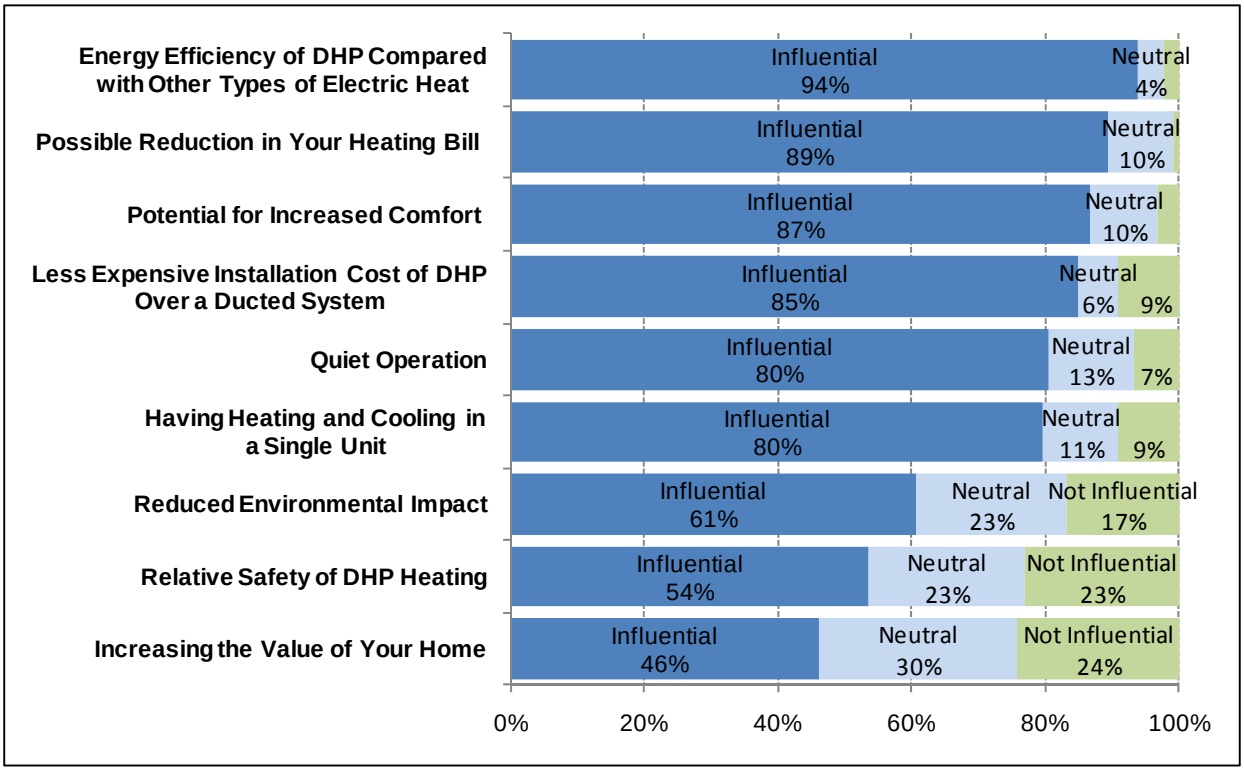
We note the contrast between the beliefs of manufacturer contacts and installers that the market is very concerned about equipment appearance, and the lesser concern for appearance reported by most pilot participants. We hypothesize that prior to the sale, prospective buyers are concerned with the appearance of the indoor unit, but that after living with the unit for a few months, this concern diminishes significantly.

MOTIVATIONS TO INSTALL DHPS

Using a list of specific potential motivations to purchase DHPs that were identified in previous DHP market research,[25] we asked participant respondents to rank each item to reflect their own motivations. (The reader should note that the prior research had sampled a general population, while our research surveyed participants that had installed DHPs). Over 90% of the surveyed participants able to respond to these questions reported the motivations of "possible reduction in heating bill" and "energy efficiency compared to other types of electric heat" as very or extremely influential (Figure 4.8). These were followed by the motivations of "less expensive installation cost over a ducted system" (87%) and "having heating and cooling in a single unit" (81%).

[25] *Evaluation of Consumer Market for Ductless Heat Pumps in the Northwest*, prepared by Russell Research for NEEA, Supplied by NEEA, 2/13/09.

Figure 4.8: Participant Respondents' Motivating Factors to Purchase DHP (N=235)



Question: 8. I'd like to know what influenced your decision to purchase a DHP. I am going to read a list of characteristics. For each one please tell me how influential it was on a scale of 1 to 5, where 1 means "not influential at all" and 5 means a "critical influence"—meaning you would not have purchased a DHP without it.

In addition to the possible benefits we specifically asked about, participants frequently reported that they wanted to reduce their reliance on wood, which is difficult to haul and gather, and that they were interested in the air/allergen filtration features that the DHP provides.

Participant respondents who had been able to see a working DHP unit before their purchase cited this experience as vital in convincing them that the technology could meet their needs. The chance to see working DHP units on display at installers' offices or elsewhere gave participants the confidence to make the purchase. However, one interviewed participant reported being unable to locate a working unit. According to this respondent, "I wanted to see the unit in action before I got one. I called around to see if anyone had one running, but never found one." One interviewed installer suggested that if the pilot were to qualify residential new construction projects, building contractors would be more likely to display DHPs in their showrooms, thereby increasing participant access to working DHPs.[26]

[26] This interviewed installer also reported that building contractors' showrooms have traditionally generated the majority of their referrals for HVAC installations.

Participants' DHP Heating and Cooling Behaviors

Although 73% of participant respondents reported since installation, they had used their DHP for heating and 86% reported they had used their DHP for cooling, no participants had experienced both a full heating and cooling season prior to the time of our survey.[27] Perhaps due to the short period of DHP ownership (typically, a few months), most participant respondents were not able to gauge reductions in their electricity bills.

Nearly all (99%) participant respondents indicated the DHP was now their primary heating source. However, because the majority of participant respondents had not yet experienced a full heating season, some may have been speculating. Consistent with the project mission to *displace, not replace* existing heating equipment, some participant respondents reported they were planning to use or were still using their prior heating equipment. Of the 22 (10% of total) participant respondents who reported using space heaters prior to DHP installation, 90% indicated they would now be using them less frequently or not at all. Only one interviewed participant reported an increased use of space heaters following DHP installation.

Heating Temperature Settings

Overall, there was no change reported in the temperature at which participants kept their homes before and after installing the DHP; for both periods, participants reported maintaining their homes at an average 69°.

Prior to installing the DHP, 69% of participants reported they "always" turned down their thermostat when leaving the house or at night. Fewer participants (42%) reported continuing this behavior post-DHP installation. Some participants did not comment on their thermostat set-back behaviors because they reported using the DHP only when they needed it for heating or cooling, rather than setting the unit at a particular temperature.

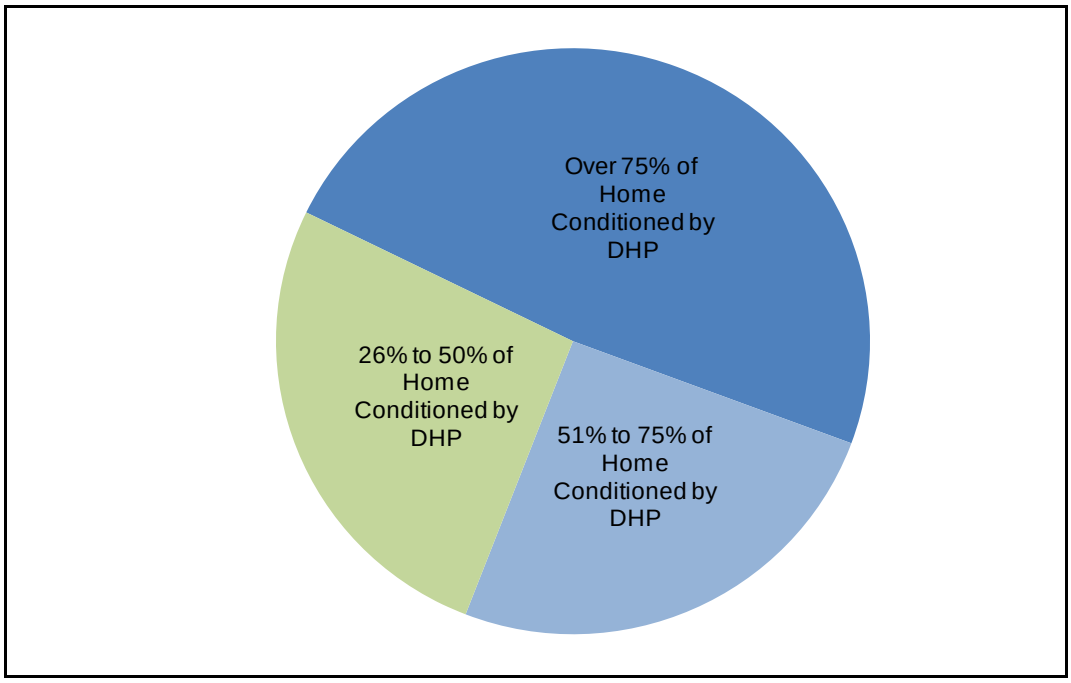
Area of Home Conditioned by DHP

As shown in Figure 4.9, about half (46%) of participant respondents reported the DHP conditioned 75% or more of their living space, about one-quarter (24%) reported the DHP conditioned between 51% to 75%, and about one-quarter (25%) reported the DHP conditioned between 26% and 50%. The vast majority of participant respondents reported they had their indoor DHP unit installed in what they referred to as a "living room," "family room," or "main living area." Of participant respondents who reported having installed a second indoor DHP unit, most reported they installed the second unit in a bedroom. Prior to the DHP installation, most participant respondents (88%) allowed some rooms – typically bedrooms and bathrooms – to be

[27] We conducted surveys of pilot participants from May through October 2009.

significantly cooler than other rooms. After installing the DHP, this proportion fell by about 10%, with 77% of participant respondents reporting they let some rooms be cooler.

Figure 4.9: Area of Home Conditioned by DHP (N=154)



Question 38: Now, approximately what percent of your living space do you regularly heat with the DHP?

Use of Cooling Equipment

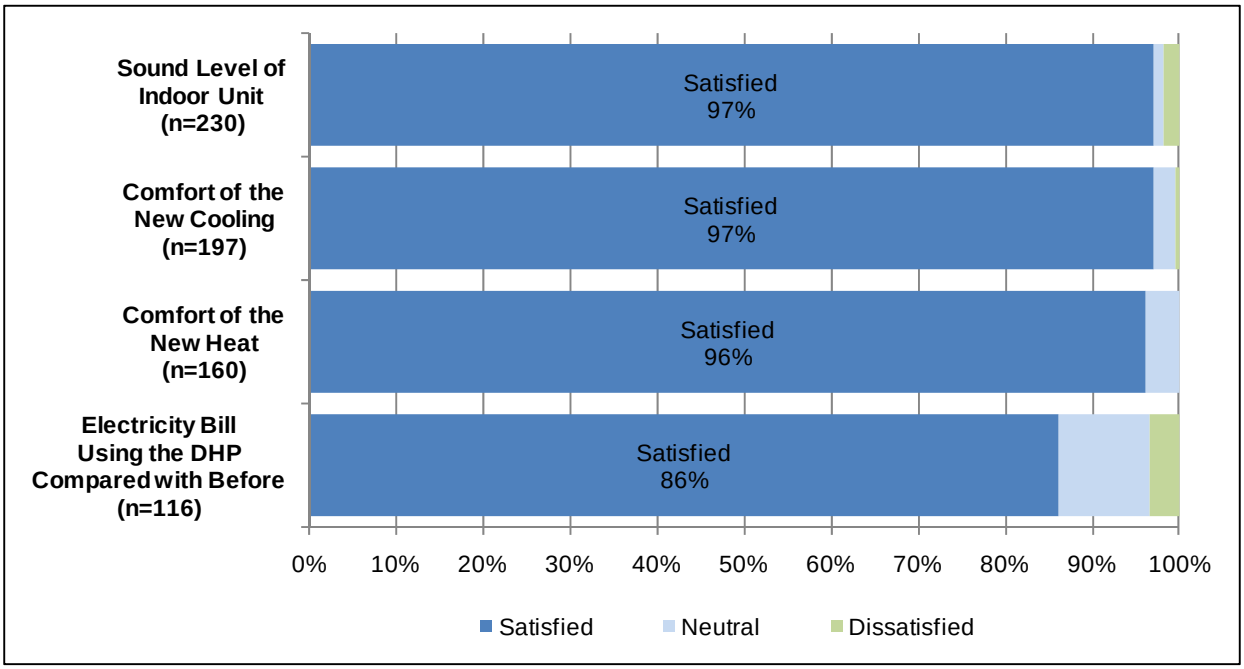
Thirty-seven percent of participant respondents reported air conditioners (AC) had been installed in their homes prior to DHP installation. In general, these participants indicated they used their existing AC "less" or "not at all" following DHP installation. Twenty percent of participant respondents reported they had planned to purchase some type of AC equipment before their purchased the DHP; most of these participant respondents reported they had been considering buying a "window" AC unit. Aside from a small number of participant respondents who reported they were considering purchase of an additional DHP to cool other areas of their homes, no participant respondents reported they were considering purchasing other AC equipment. On average, participants reported using the DHP to keep their homes between 70° and 75° during the cooling season.

Participant Satisfaction

We asked participant respondents a series of closed-ended questions regarding their satisfaction with their DHPs. Participant respondents generally reported being pleased with their DHPs and reported the units were performing well. Ninety-six percent of participant respondents reported

they were satisfied with the comfort of their new heat, 97% reported satisfaction with the comfort of their new cooling, and 97% reported satisfaction with the sound levels of their DHP (Figure 4.10).

Figure 4.10: Participants' Satisfaction with DHP



Question 65: Please rate your satisfaction with the following aspects using a 5-point scale, where 1= "very dissatisfied," and 5= "very satisfied." How satisfied are you with…The sound level of the indoor unit? …The comfort of the new cooling? …The comfort of the new heat? …The electricity bill using the DHP compared with before?

Perhaps due to the short period of DHP ownership (typically, a few months), most participant respondents were not able to gauge reductions in their electricity bills. Of the 116 participant respondents who provided valid responses concerning their satisfaction with electricity bill reductions, 86% reported being satisfied. Participant respondents provided many positive comments regarding their DHPs, including these representative comments:

- *"This was one of the best choices we have ever made."*
- *"We are using about a third as much electricity!"*
- *"It works just the way I hoped it would."*
- *"The utility was great. They responded quickly to the paperwork. They sent out a man promptly…The whole process took 2-3 weeks."*
- *"The speed with which we received the incentive was impressive."*

5 PILOT IMPLEMENTATION PROCESSES

This chapter provides a summary of pilot project implementation processes. The chapter includes information on training and support activities, utility response to the pilot project, customer outreach and recruitment, and project incentives.

TRAINING AND SUPPORT

Project Orientation

To build an installer infrastructure to serve the DHP market, project stakeholders conducted outreach to HVAC installers regarding the pilot. Installer respondents most frequently reported hearing about the pilot through their utilities (17 of 28) and/or DHP distributors (7 of 28).[28]

Installation firms that sought to install DHPs through the project were required to send a staff member to a project orientation session, acquire manufacturer training for the equipment they install, and screen homeowners for project eligibility. Orientations covered the purpose and key elements of the project, and discussed the short-term and longer-term opportunities for installers. The orientations also outlined project implementation procedures and expectations regarding eligible products, installer performance, quality assurance, and incentive payments.[29]

More than half (14 of 22) of installer respondents provided high ratings regarding the usefulness of the project orientation meeting on how to accurately complete program paperwork.[30] Representative responses from installer respondents who did not provide high ratings included:

- *"The paperwork isn't consistent between utilities – and if the form is not right, it takes a long time to get the rebate payment – so you're talking about thousands of dollars that you're waiting to collect."*
- *"Some of the paperwork was a little confusing – on what qualified and what didn't."*
- *"It wasn't very clear how systems with multiple heads would qualify."*
- *"Their communication could have improved. They change their forms every two weeks. I think they're now sending out e-mails that say there are new forms, but that's a little late."*

---

28 Twenty-eight of the thirty installer respondents provided valid responses.

29 Ductless Heat Pump Project. 2008. *The Northwest Ductless Heat Pump Pilot Project – Project Implementation Document.* Draft, November 17. Portland, Ore.: Northwest Energy Efficiency Alliance. *http://www.nwductless.com/images/pdf/project%20implementation%20document%2012_16_08.pdf.*

30 Twenty-two of the 30 installer respondents provided valid responses.

The majority of installer respondents (18 of 23) provided high ratings regarding the usefulness of the project orientation meeting on household eligibility requirements.[31] The installers who did not provide high ratings typically requested that the orientations provide additional information on both general and utility-specific project requirements.

The majority of installer respondents (16 of 23) provided high ratings regarding the usefulness of the project orientation meeting on the displace, not replace theory.[32] The installers who did not provide high ratings typically reported either that pilot staff did not adequately cover the displace, not replace theory or reported that they disagreed with the theory.

Additionally, one interviewed installer reported that although the webinar version of the project orientation was convenient, the webinar question-and-answer period was awkward because "only one person could speak at a time" and "Internet connection problems resulted in unanswered questions and issues that were left unaddressed."

Twelve of the 30 installer respondents reported that they contacted project staff to obtain additional project information beyond that provided in the project orientation. The installer respondents most commonly sought information related to project requirements, paperwork, and/or issues related to the pilot project's rebate process. Nearly all of the installer respondents provided high ratings regarding the degree of helpfulness of pilot staff.

Manufacturer Training

The majority of both manufacturer contacts and installer respondents reported that existing pilot training protocols are adequate. Despite these satisfactory ratings, several contacts recommended promoting or requiring additional training.[33] Regarding the need to increase training on pilot protocols, one interviewed installer reported, "There are a lot of installers participating in the pilot that have no idea what they're talking about." Additionally, many installer respondents suggested increasing DHP technical training on installation procedures, including optimal DHP placement and "how to cut vents into houses."[34] Respondents from among each of the groups surveyed reported issues with installation of DHP line sets.[35]

---

31 Twenty-three of the 30 installer respondents provided valid responses.

32 Twenty-three of the 30 installer respondents provided valid responses.

33 For instance, one interviewed distributor contact reported that they require installers to obtain North American Technician Excellence (NATE) certification.

34 Properly installing vents in the homes involved covering line sets. Participant respondents reported improperly installed or covered line sets as a concern.

35 Although remarks concerning DHP installation were generally positive, several interviewed utility staff reported issues with installation of DHP line sets. According to one interviewed utility contact, "Even with some of the good heat pump installers, they forget about the line set – if it's exposed, it looks ugly." Consistent with this, two interviewed installers reported difficulty with installation of DHP line sets into interior

continued…

Additionally, an interviewed manufacturer contact reported that HVAC installers are more comfortable marketing technologies with which they are personally familiar. Therefore, the contact suggested that DHP installation trainings provide installers the opportunity to see and experience a working DHP unit.

Pilot staff reported that, particularly in the case of larger HVAC firms, HVAC salespersons are typically not responsible for installations of equipment and HVAC installers are typically not involved in sales. However, staff reported that because they had not been aware of this distinction, the pilot required training of HVAC installers only and thus did not reach a portion of those individuals responsible for marketing DHPs (frequently HVAC salespersons). To address this issue, pilot staff reported that future training efforts should include both HVAC installers and HVAC salespersons.[36]

Consistent with the remarks of installer respondents, several utility respondents reported that, while installer orientation sessions are effective at presenting background information on the project itself, installers need additional information regarding specific utility program requirements. Utility contacts reported that they successfully conveyed utility-specific program information to installers by maintaining frequent contact with them and by being available to answer their questions. Additionally, one utility contact attributed the high level of installer knowledge of utility program requirements to the utility's maintenance of a preferred list of installers on its website.[37]

Pilot Websites

The pilot design included launching a website (*www.nwductless.com*) to provide utility-sponsors, industry partners, and installers access to project information and marketing materials, participant screening tools, product and application information, and other promotion-oriented pieces; and information to highlight variations in utility programs. Following the launch of *www.nwductless.com*, project staff subsequently launched a consumer-facing website

walls and a small number of interviewed participants reported that their DHP line set installation is unattractive.

36 Relatedly, installer respondents noted that manufacturer trainings consist of approximately one-half technical information and one-half product marketing information. Multiple installers reported that they did not consider the product marketing portion of the trainings useful (presumably because they are not involved in marketing). To address this issue, one installer suggested that manufacturers separate the technical portion of trainings from the marketing portion, so that DHP installers can attend the technical portion and DHP salespersons can attend the marketing portion.

37 One utility contact attributed the high level of installer knowledge of utility program requirements to the utility's maintenance of a preferred list of installers on its website. According to the contact, "Preferred installers undergo additional utility training and must demonstrate their ability to adhere to program requirements."

(*goingductless.com*), to provide participants with project information, general DHP information, customer testimonials, and an interface to locate eligible installers.

Manufacturer contacts reported that the pilot's reliance on the Internet to communicate program information represented a barrier to increased installer participation in the pilot project.[38] According to one interviewed manufacturer contact, "In general, installers do not use the web very much and do not visit the pilot's website." Consistent with this, project staff reported difficulty with driving installers to the project website, and reported that installers often requested faxed documents and/or telephone assistance.

Despite this reported barrier, the majority of installer respondents (24 of 30) reported that they viewed web pages from one or both of the project's websites. Furthermore, the majority of the installers provided high marks concerning the degree of relevance of the information contained on the sites.[39]

Installer respondents most frequently reported having viewed the *Installer Participation Forms* page on the *www.nwductless.com* website (20 of 24) and the *Find an Installation Installer in Your Area* page on the consumer-facing website (8 of 24).[40] Additionally, eight of the installers reported that they had visited the consumer-facing website to ensure that participants could access their firm's contact information.

Installer respondents' positive responses concerning the project website indicate that installers are not collectively averse to the web. We hypothesize that the pilot may be successful in attracting a larger number of installers to participate in the project by providing both web-based and paper-versions of project information.[41]

PARTICIPANT SATISFACTION WITH PILOT PROCESSES

Participant respondents expressed satisfaction with pilot processes, as illustrated in Figure 5.1. Customers were also satisfied with the service they received from their installers, as illustrated in Figure 5.2.

---

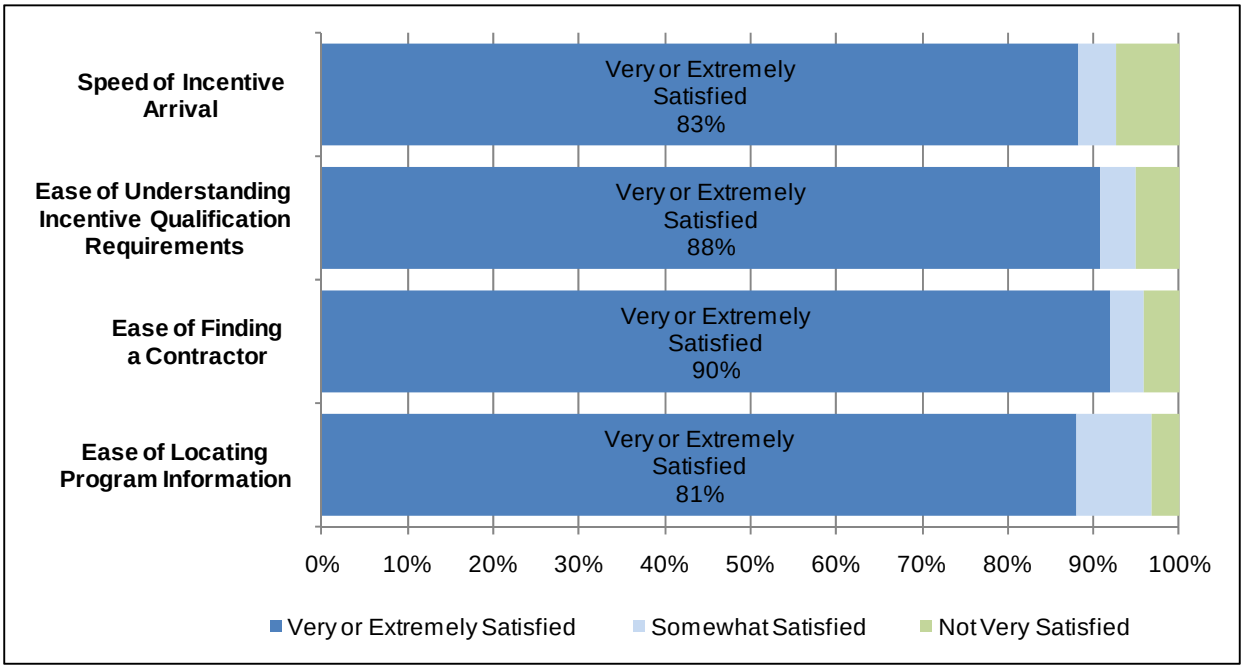
38 One DHP distributor reported being unclear about which utilities were participating in the pilot, and was therefore unable to provide clarifying information to participating installers.

39 Twelve of the thirty installer respondents provided valid responses concerning the degree of relevance of the information contained on the site.

40 Twenty-four of the thirty installer respondents provided valid responses.

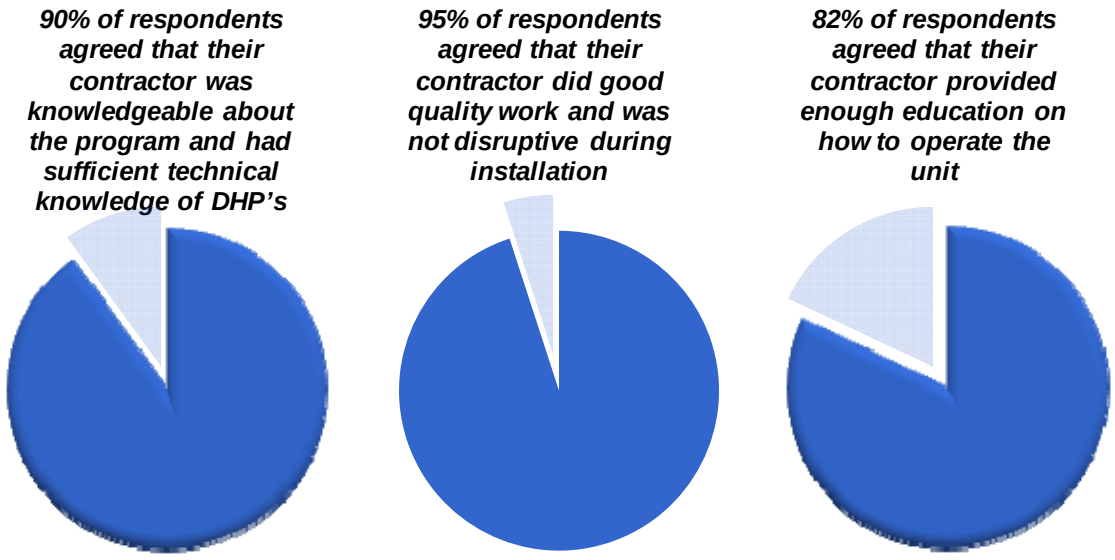
41 Lending credibility to the efficacy of this approach, one DHP distributor reported having created a booklet that provides detailed descriptions of the various utility program offerings. This booklet was reportedly very well received by installers.

Figure 5.1: Customer Satisfaction with Program Processes (N=235)



Question: 59. Please tell me how much you agree with the following statements using a 5 point scale with 1 being "completely disagree" and 5 being "completely agree". How much do you agree that…..

Figure 5.2: Customer Satisfaction with Contractors (N=201 to 221)
(Valid responses numbered between 201 and 221 respondents)



Question: 61. The next questions are about your experiences with installers and contractors. Please tell me how much you agree with the following statements using the same 5 point scale. How much do you agree that (1) …the contractor was knowledgeable about the program? (2) … the contractor had sufficient technical knowledge of DHP? (3) … the contractor did good quality work? (4) … the contractor provided enough education on how to operate the DHP? (5) … the contractor was not disruptive during installation?

UTILITY RESPONSE TO PILOT

In general, interviewed utility contacts provided positive feedback regarding the pilot project and commented that it had been a success. However, given that project literature specified that utilities were free to participate in the pilot project at "whatever level they choose," it is unsurprising that the type and level of involvement among utilities varied greatly. Almost unanimously, interviewed utilities reported a high level of participant satisfaction.

Responses from interviewed utility contacts indicate that utility program structures followed the pilot project design to varying degrees. Project forms, pre-approval, and qualifications frequently differed among interviewed utilities.[42] It is noteworthy that contacts representing the two utilities reporting the largest number of DHP installations reported implementing the project as designed, without major modification. Regarding challenges associated with project implementation, utility contacts most frequently reported "maintaining quality DHP installations" and "processing paperwork." Additionally, utility contacts representing utilities reporting high numbers of DHP installations frequently reported being somewhat overwhelmed with the large customer response. In general, utility contacts reported that project implementation staff's efforts to support their programs (including staffs' provision of administrative, customer, and marketing support) were helpful.

Three-quarters (15 of 20) of interviewed utility contacts reported that their utilities required pre-approval for DHP installations. Although some utilities reported conducting their own pre-approval process, most relied on the program implementer. Contacts from among each of the groups we interviewed – from utility program managers to participants – reported delays due to pre-approval paperwork processing. Program implementation contacts reported that they successfully increased the speed of paperwork processing by hiring additional staff. Utility contacts expressed frustration that pre-approval processes conducted by the implementation contractor do not effectively screen out all customers who should not be eligible to receive incentives. Similarly, implementation contractor contacts questioned the overall value of their conducting pre-approvals on behalf of utilities. (See Appendix C for additional details about the pre-approval processes and other implementation issues.) According to one program implementation contractor contact:

- *"More often than not, our pre-approval processing isn't very effective, because we rarely, if ever, reject forms during the pre-approval process. When we do, it's because the homeowner placed a check in the grey zone of the form, or because utility staff tells us to reject it based on their own screening processes."*

[42] Responses from utility contacts indicate that the programs varied in regards to permitting homes with supplemental gas lines and forced air furnaces.

6 CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the findings and presents the conclusions and recommendations we draw from our evaluation of the Northwest Ductless Heat Pump Pilot Project.

SUMMARY OF FINDINGS

Our findings relating to the pilot's goals and objectives follow.

➡ ***Goal 1:*** **To demonstrate the use of inverter-driven DHPs to displace electric resistance space heat in existing Northwest homes.**

Findings: Nearly all (99%) participant respondents reported installing the DHP to displace existing electric heating equipment, which remains available for use, and indicated that the DHP was now their primary heating source. In a related but separate effort, Ecotope is assessing the technical effectiveness of DHPs.

➡ ***Goal 2:*** **To support evaluation efforts to document project implementation and determine the costs and potential energy savings of ductless heat pumps in this application.**

Findings: NEEA facilitated Research Into Action's efforts to document for this report project implementation processes among the pilot implementation contractor and the participating utilities. Ecotope's technical assessment, underway, includes an evaluation of costs and potential energy savings.

➡ ***Goal 3:*** **Market research elements of the evaluation will examine other non-energy benefits and potential barriers to large-scale implementation of ductless heat pumps.**

Findings: Of the 20% of participants who reported that, prior to installing their DHP, they had planned to purchase some type of AC equipment, none continued to have such plans after DHP installation. Most participants reported receiving non-energy benefits from their DHPs, including increased comfort, ease of control, and air filtration. Most participants reported receiving non-energy benefits from their DHPs, including increased comfort, ease of control, and air filtration.

Potential barriers to large-scale implementation of DHPs include concerns about their ability to provide adequate heat in colder temperatures (a research question for Ecotope's technical analysis) and the cost and appearance of DHPs. Some installers expressed misconceptions about DHPs in retrofit applications; these could be addressed through ongoing installer education.

➡ ***Goal 4:*** **To define the future of the ductless heat pump market and build an infrastructure to sustain and accelerate growth in the market.**

NEEA identified eight objectives in support of this goal. Table 6.1 lists the objectives and our related findings.

Table 6.1: Goal 4 Objectives and Related Findings

OBJECTIVES FOR GOAL 4	FINDINGS
1. Engage the ductless heat pump industry (manufacturers, distributors, contractors); create cooperative relationships; leverage resources to support the project.	As of December 31, 2009: • Number of installer orientations: 46 in-person and 27 web-based • Number of oriented installers: 906 • Number of oriented installation firms: 602 • Number of firms completing at least one pilot installation: 320 • Number of manufacturers/brands installed in pilot: 5 • Number of manufacturers increasing marketing in response to the pilot: 5 • Proportion of interviewed installers planning to promote DHPs after pilot: 87%
2. Accomplish up to 2,500 quality installations of inverter-driven ductless heat pumps in existing Northwest homes with electric resistance heat.	As of December 31, 2009: • DHP pilot installations: 3,899 (see **Error! Reference source not found.**) • Number utilities registered to participate: 80 • Number of utilities having at least one installed DHP: 59
3. Understand customer satisfaction and develop recommendations for future program implementation strategies.	Participants reported high levels of satisfaction with DHPS and with pilot project implementation processes, including: ease of understanding incentive qualification requirements; ease of finding an installer; ease of locating program information; and the speed with which they received their incentive checks.
4. Address potential first-cost barriers associated with ductless heat pumps.	The incentive appeared to overcome participants' first-cost hurdle. • Participants recalling the utility rebate who "would not" or "might not" *have* purchased their DHP without the incentive: 66% • Participants receiving lowest incentive ($400) who "would have" or "might have" *not* purchased their DHP without the incentive: 11%
5. Ensure HVAC contractors are trained in the technical nuances of installing ductless heat pumps correctly and install them accordingly.	The majority of both participant and installer respondents reported that DHP installations were quick, minimally invasive, and did not require installer follow-up. The majority of manufacturers estimated that 90% to 100% of residential DHPs installed in the Northwest are installed properly and function optimally. However, several interviewed utility staff, installers, and participants reported issues with the installation of DHP line sets.

Continued

OBJECTIVES FOR GOAL 4	FINDINGS
6. Provide HVAC contractors with an understanding of the basis of the project, the applications, and what is in it for them (new market and increased profits).	The majority of installer respondents provided high ratings regarding the project orientation sessions. However, installers requested additional information on general project requirements, utility-specific project requirements, and the *displace, not replace* theory. Some installers suggested the webinar question-and-answer period was awkward because "only one person could speak at a time" and "Internet connection problems resulted in unanswered questions and issues that were left unaddressed." The majority of installers reported having viewed pages from the project's websites, which they assessed as useful. However, manufacturer contacts reported that the pilot's reliance on the Internet to communicate program information represented a barrier to increased installer participation in the pilot project and project staff reported some installers did not want to access the Internet.
7. Ensure ductless heat pump products installed through the project are among the best available and are well supported by the distribution channel in the Northwest.	Comments from installer respondents indicate that the activities of the pilot project have strengthened DHP supply chains, resulting in increased availability of DHPs. Nearly all of the installer respondents reported that obtaining DHPs is "easier" or "the same degree of difficulty" as obtaining other types of space-conditioning equipment. According to one DHP manufacturer, "If there is one thing the pilot has taught me, it's that the target market is so much bigger than we had thought.
8. Pave the way for future ductless heat pump programs by testing program designs and marketing messages.	About 70% of applicants had at least one member of their home who was over the age of 65, suggesting the pilot's marketing efforts were successful in reaching an older demographic, but less successful in reaching younger participants. The second wave of this evaluation will further explore marketing messages and reaching a younger demographic.

CONCLUSIONS AND RECOMMENDATIONS

Based on our findings, we conclude that NEEA has made and is continuing to make substantial progress in attaining its goals and objectives for the Northwest Ductless Heat Pump Pilot Project. By directly intervening with market actors, the pilot appears to be effective in strengthening DHP marketing, training, and distribution networks, and in increasing participant awareness of DHPs. By offering an economic stimulus on DHP installations, utilities overcame many participants' first-cost hurdle for DHP installation – persuading them to participate in the pilot project.

We organize our remaining conclusions and recommendations by key pilot goals. We draw our conclusions and recommendations from research primarily conducted mid-way through the pilot. The pilot project implementation team may have addressed some of our recommendations subsequent to our research. We have observed the team practices adaptive management.

Goals: Offset electric energy use and "displace, not replace" existing electric heating equipment

Conclusions:

The majority of installations during the pilot were systems comprised of one compressor with a single indoor unit serving the primary living area formerly served primarily by electric zonal heat. These installations support the program goal of displacing rather than replacing existing electric zonal heat. However, the pilot's acceptance of systems with multiple indoor units undermines its cost-effectiveness. Participants that previously use non-electric fuels for their primary heat source also undermine pilot cost-effectiveness. The region may choose to view the program as serving the house, and not the application, and thus decide that applicant behavior should not drive program eligibility. Yet the region would then need to reconcile such a design philosophy with the program's cost-effectiveness analysis. On a related note, the current application pre-approval processes received more negative reviews than positive ones in terms of their effectiveness and efficiency.

Recommendations:

- **In support of a DHP program, NEEA will need to address the issues of primary heating fuel of DHP applicants and the number of indoor units allowed**. It is premature for this Wave I MPER to recommend any program design modifications; NEEA will want to consider the findings from the second year of the pilot evaluation, which will include the results from a billing analysis of pilot participants and from on-site metering.

- **The pre-approval processes appear in need of revision**, yet any such revision needs to await the resolution of the issues of fuel and indoor units. At a minimum, we recommend NEEA reword the DHP application question to ask about "primary" heating source, instead of its current phrasing that assumes that owners of electric resistant heat use that heat source as the primary heating source.

Goals: Develop the supply side and work with installation firms

Conclusions:

The majority of installer respondents provided high ratings regarding the project orientation sessions. The project websites appear to be working well for installers that access them. However, the research identified opportunities to improve the orientation sessions and the pilot's methods for working with installers.

Recommendations:

- **Project staff should consider ways to improve the effectiveness of web-based project orientations** – such as instructing participants to use the *chat* feature rather than to pose their questions orally, by including a short break during which participants could phone-in their questions, with answers provided when the training resumes, and by maintaining an on-going Q&A dialogue via email.

- **Project orientation sessions should spend additional time on project requirements, utility-specific project requirements, and the pilot's goal to displace, not replace**.

- **Project staff should ensure the program's use of the Internet does not constitute a barrier to installer participation**. Consider a biannual mailing of a letter to infrequently participating and nonparticipating installers briefly describing the technology and the program, and including a reply card with which they can request paper versions of program materials.

- **Consider encouraging utilities to maintain lists of preferred installers**. Utilities reporting such lists also reported better communication and fewer problems with their participating installers.

- **Project staff should provide key findings from this study to DHP manufacturers and recommend that their trainings include additional instruction on installation of DHP line sets.**

Goal: Encouraging DHP Sales

Conclusions:

Participants identified the opportunity to see functioning DHP units as important to their decision-making. Manufacturer contacts suggested that installers, as well, would benefit from access to functioning DHP units during trainings, thereby increasing the likelihood that installers will market DHPs to participants.

Prior to DHP installation, most participant respondents experienced dissatisfaction with the compromised comfort and high cost of operation associated with their existing zonal electric heat source. During weather extremes, such participants are particularly dissatisfied.

Recommendations:

- **Project staff should consider ways to make available to participants and installers functioning DHPs and should publicize the resulting opportunities**. Possible opportunities for displaying functioning DHPs include regional energy centers, utility offices, project trainings, and showrooms of HVAC contractors and homebuilders.

➡ **Advertising emphasizing the cooling benefits of DHPs might occur in early May (pre-season) and early August (temperature highs); campaigns emphasizing the heating benefits might occur in early September and early January**.

APPENDICES

APPENDIX A: PILOT PARTICIPANTS – DETAILED SURVEY METHODOLOGY AND FINDINGS

APPENDIX B: DHP INSTALLERS – DETAILED SURVEY METHODOLOGY AND FINDINGS

APPENDIX C: PILOT IMPLEMENTATION PROCESSES – SELECTED SUMMARY TABLES AND FINDINGS

APPENDIX D: SURVEY INSTRUMENTS – PILOT PARTICIPANTS AND INSTALLERS

APPENDIX E: INTERVIEW GUIDES – DHP MANUFACTURER CONTACTS, UTILITY PROJECT MANAGERS, AND PILOT PROJECT STAFF

APPENDICES

A PILOT PARTICIPANTS – SURVEY METHODOLOGY AND FINDINGS

Surveys conducted with pilot participants explored:

- Characteristics of pilot project sample and participants
- Heating and cooling behaviors
- Project awareness and motivation for participation
- Participant DHP and pilot-related concerns and satisfaction

SAMPLE DISPOSITION

We interviewed participant participants via phone from May to October 2009. Each interview took approximately 20 minutes to complete.

Although we initially sought to conduct a stratified random sampling, we modified this approach in consultation with the NEEA evaluation manager. We wanted the sample to: include roughly equal proportions of participants in Cooling Zone 1 as in the combined Cooling Zones 2 and 3;[43] facilitate comparison of experiences by climate zone; reflect the age distribution of the participant population (the proportion age 65 or older, as indicated by the application form); include participants from virtually every participating utility; exclude participants that had meters installed to track DHP performance through another facet of the pilot project; and have staggered DHP installation dates, so that we surveyed participants participating throughout the pilot period.

These criteria were too numerous to support stratified sampling. Rather, we began with a random sample from the overall list of participants installing DHPs during the period leading up to the round of surveying, and focused our calling on participants providing the desired distribution across cooling zones, ages, and utilities. To avoid convenience sampling bias, we placed up to five calls to the participants we were targeting. We placed calls at various times of the day, as well as on weekends, to ensure participants who work a standard workweek would still be included in the sample.

[43] Cooling Degree Days (CDD) refers to the amount of air-conditioning needed, created by adding up all temperature differences of the form (daily temperature in °F - 65° F) for each day in a year in which the temperature exceeds 65° F. *Cooling Zone 1* = Less than 300 Cooling Degree Days; *Cooling Zone 2* = 300 to 600 Cooling Degree Days; and *Cooling Zone 3* = Greater than 600 Cooling Degree Days.

We redrew the sample between each round of calling to add in new installations and exclude newly metered sites. This necessity caused the population size and sample to expand every round and therefore all data reported here reflect the population size at the time of the last sample draw.

Table A.1 displays sample and population details.

Table A.1: Participant Sample Population

SAMPLING TARGET	POPULATION*	SAMPLE SIZE	CONFIDENCE / PRECISION
Pilot participants	2,258	235	Approaches 95/5

* This number refers to the population at the conclusion of the survey period. Total estimated project population is 2,500.

POPULATION AND SAMPLE CHARACTERISTICS

We interviewed participants throughout the Northwest in 45 utility territories and across all three cooling zones (Table A.2). Segmenting by cooling zone assured representation for the full range of climates in the Northwest.

Table A.2: Cooling Zone by Percent of Interviewed Participants

COOLING ZONE	POPULATION DISTRIBUTION	SAMPLE DISTRIBUTION (N=235)
Cooling Zone 1	31%	40%
Cooling Zone 2	65%	53%
Cooling Zone 3	4%	7%
TOTAL	**100.00%**	**100.00%**

Sixty percent of respondents had used the DHP for both heating and cooling at the time of the survey; nearly three-quarters of the sample (73%) reported using their DHP for heating, while 85% had used it for cooling. The high proportion of people who reported using the DHP for cooling is a result of the timing of the rounds of data collection and the weather. Wave 2 research, to be conducted in 2010, will gather information about usage during all four seasons.

The survey respondents were evenly divided between male and female. Fifty-seven percent of those answering the survey were over the age of 60, which is roughly consistent with the overall installation demographics, which show that 70% of the population had at least one member of their home who was over the age of 65 (according to the pilot project application form). Table A.3 provides the ages of survey respondents.

Table A.3: Age of Participant Survey Respondents

AGE RANGE	PERCENT OF SAMPLE (N=235)
29 Years Old and Younger	2%
30 to 39 Years Old	6%
40 to 49 Years Old	7%
50 to 59 Years Old	26%
60 to 69 Years Old	36%
70 Years Old and Older	22%
Refused	1%
TOTAL	**100.00%**

Participants surveyed identified television as their primary source of news (Table A.4).

Table A.4: Primary News Source of Participants

NEWS SOURCE	PERCENT OF SAMPLE (N=235)
Television	48%
Newspaper	27%
Websites	15%
Public Radio	5%
Commercial Radio	3%
Blogs	1%
Friends	<1%
Don't Follow News	<1%
Don't Know / Refused	<1%
TOTAL	**102.00%**

Participant respondents were primarily long-term homeowners: 62% of participant respondents had been in their home for more than ten years. Only 8% of participant respondents had been living in their home for less than two years. Interestingly, 2% of the sample reported having lived in their home for less than a year, which would have made them ineligible for the pilot project.[44]

[44] As noted in Chapter 2, renters were excluded from the sample, as they would not have been able to answer questions about both owning a DHP and the project processes.

The majority of respondents (76%) had at least some college education, with 22% reporting having graduate or professional degrees (Table A.5).

Table A.5: Education Level of Participant Respondents

EDUCATION	PERCENT OF SAMPLE (N=235)
High School	21%
Some College / Trade School	29%
Four Years of College	19%
Some Post Graduate	7%
Graduate Degree	22%
Refused	2%
TOTAL	**100.00%**

The incomes of participant respondents varied widely, with the majority falling in the $30,000 to $50,000 range (Table A.6).

Table A.6: Income Level of Participants

INCOME RANGE	PERCENT OF SAMPLE (N=235)
Less than $10,000	<1%
$10,000 to $29,999	9%
$30,000 to $49,999	22%
$50,000 to $69,999	19%
$70,000 to $89,999	15%
$90,000 to $109,999	10%
$110,000 and Greater	6%
Refused	18%
TOTAL	**100%**

Respondents also varied in the number of DHP heads, or indoor units, they installed. Because the objective of the pilot is to *displace, not replace* existing zonal electric heat, each participating utility offers only a single incentive amount, established in reference to the market price for just one indoor and one outdoor DHP unit. However, the pilot allows multi-zone DHP systems (that is, systems with multiple indoor units). Table A.7 shows the number of indoor units installed within their home by the sample respondents.

Table A.7: Number of Units Installed

NUMBER OF INDOOR DHP UNITS INSTALLED	PERCENT OF SAMPLE (N=235)
One Indoor Unit	65%
Two Indoor Units	23%
Three Indoor Units	8%
Four or More Indoor Units	4%
TOTAL	**100.00%**

Although there were multiple reasons for choosing to install more than one indoor DHP unit, the most common was a desire for coverage in all areas of the home. Houses with more than one story or a floor plan that prevented air circulating between all rooms were commonly cited examples of why respondents indicated that they needed more than one indoor unit. The final decision on how many units were installed often depending on the recommendation of contractors.

Of participant respondents, 62% indicated that the brand of the DHP unit was at least "somewhat important" in their choice of which DHP to install. In comments, participants often noted that they did not know anything about various DHP brands before they started the pilot project process. Many reported that they had done online research on manufacturers' and independent websites to learn about the DHP technology and read reviews from other DHP users.

Sixty-six percent of participant respondents reported that prior to their purchase of a DHP, they had been considering replacing their heating equipment. More than half (134 of 235) reported that in addition to the DHP installation, they had made various other improvements to their homes in the year prior to our survey. Most frequently, participant respondents reported having completed bathroom renovations and/or energy efficiency upgrades (Table A.8).

Table A.8: Home Improvements Made in the Prior Year

TYPE OF HOME IMPROVEMENT	NUMBER OF IMPROVEMENTS	PERCENT OF SAMPLE (N=235)
Updated a Bathroom	21	9%
Energy-Efficient Updates	20	9%
Updated a Kitchen	18	8%
Refurbished Outside of Home	16	7%
Redecorated a Room	11	5%
Added Space (room addition, conversion to living space)	7	3%
Finished a Basement (living space)	1	1%
TOTAL	**94**	**42%**

The majority (87%) of participant respondents reported that the DHP installation constituted an equipment upgrade and was not part of a larger project, such as a remodel (less than 1%) or room addition (less than 1%). Five percent indicated that installing the DHP was part of a larger home improvement project. Consistent with pilot eligibility requirements, nearly all (99%) of participant respondents reported that they had installed the DHP to displace existing heat, as opposed to providing heating or cooling to a previously unconditioned space (1%).

In addition to home improvements, many participant respondents (164 of 235, or 70%) reported that, in the year prior to the survey, they had taken some steps to reduce their energy use (Table A.9). Although all of the participant respondents had installed a DHP in the past year, only 38% included this action in their list of things they had done specifically to reduce their energy use.

Table A.9: Participant Actions to Reduce Energy Use

TYPE OF ACTION	NUMBER TAKING ACTION	PERCENT OF SAMPLE (N=235)
Added Insulation	24	10%
Installed/Replaced Windows or Doors	41	18%
Installed Programmable Thermostats	7	3%
Replaced Appliances with Efficient Models	12	5%
Installed CFL's or Efficient Lights	32	14%
Caulked Windows or Doors / Added Weather-Stripping	4	2%
Installed Ceiling Fans	1	<1%
Installed Solar Panels	1	<1%
Installed Low-flow Shower Heads, Aerators	2	1%
Installed New Water Heater	7	3%
Installed the DHP	88	38%
Changed Behavior	68	29%
Other	36	15%
TOTAL	**323**	**100%**

Behavior changes to reduce energy use included turning off lights, turning down the thermostat, and changing their mindset to being more "green." Thirteen of the participant respondents had participated in a home audit in the past year; 14 had received an incentive for at least one other energy-efficient product; and 6 reported they had received incentives for other energy-efficient appliances in the past year.

HEATING AND COOLING BEHAVIORS

One hundred seventy (73%) participants reported that they have used their DHP for heating since the installation, while 202 (86%) had used it for cooling. Since many people had not had the units for a long period of time, their heating and cooling behavior may have been influenced by the season.

We asked participants to identify *all* of the heat sources they used prior to the installation of their DHPs; Table A.10 provides the results.

Table A.10: Previous Heating Used

HEATING USED PRIOR TO DHP INSTALLATION	PERCENT OF SAMPLE (N= 235)*
Wall Heaters	43%
Baseboard Heat	40%
Wood Heat	29%
Electric Radiant Heat	22%
Space Heaters	9%
Forced Air Furnaces	5%
Other	16%

* Multiple responses allowed

Thirty-four percent of respondents had never considered replacing their heating equipment before they learned about the DHP project and incentives, while 32% had "somewhat considered" doing so. Thirty-four percent of respondents had been seriously considering replaced their old heating equipment. Participants who mentioned that they had not been considering replacing their existing heat frequently cited the cooling function of the DHP as a motivator for purchase.

Table A.11 shows the type of equipment that respondents had considered purchasing before they entered the DHP pilot. Those respondents who had been at least somewhat considering replaced their old equipment indicated that they had been considering ducted heat pumps (37%) and ducted furnaces (24%) over other options. Among *Other* responses, participants mentioned: Amish fireplace insert, propane, and wood stoves/inserts.

Table A.11: Heating Equipment Considered before DHP Purchase

TYPE OF EQUIPMENT CONSIDERED FOR PURCHASE	PERCENT WHO CONSIDERED (N=155) *
Ducted Heat Pump	37%
Ducted Furnace	24%
Gas Conversion	5%
Hydronic System	1%
Don't Know	14%
Other	33%

* Multiple responses allowed.

The majority (46%) of respondents indicated that they were at least "somewhat satisfied" with their previous heat. Since the project mission is to *displace* electric load, not completely replace existing heating equipment, some respondents were planning to use or were still using their prior heating equipment. Table A.12 shows participant satisfaction level by equipment type.

Table A.12: Satisfaction with Previous Heating Equipment

PREVIOUS HEATING EQUIPMENT	PERCENT AT LEAST SOMEWHAT SATISFIED*
Forced Air Heat	64%
Electric Radiant Heat	61%
Wood Heat	59%
Wall Heaters	57%
Baseboard Heat	53%
DHP	50%
Space Heaters	28%
Other	53%

* Multiple responses allowed

As shown in Table A.13, participants reported *primarily* using wall heaters (30%), baseboard heat (29%), and electric radiant heat (16%). Participants using wood as their primary heat source were not eligible to participate in the pilot project. However, despite this eligibility requirement, 10% of participant respondents reported that wood heat had been their primary heating source prior to DHP installation.

Table A.13: Primary Heat Source Prior to DHP and Levels of Dissatisfaction / Satisfaction

PRIMARY HEATING SOURCE PRIOR TO DHP	PERCENT OF SAMPLE (N=226)	PERCENT OF GROUP DISSATISFIED	PERCENT OF GROUP AT LEAST SOMEWHAT SATISFIED
Wall Heaters	30%	40%	60%
Baseboard Heat	29%	52%	48%
Electric Radiant Heat	16%	33%	67%
Wood Heat	10%	34%	66%
Forced Air Furnaces	5%	23%	77%
Space Heaters	4%	75%	25%
Other	6%	40%	60%

Table A.13 not only displays the types of heating equipment participants had before they decided to install a DHP, but also shows the percent of those who were dissatisfied, as well as the converse proportion of those at least somewhat satisfied with that source. In detail not shown, participants with electric radiant heat reported the highest satisfaction with their previous heat, with 10% being extremely satisfied. Forced air furnaces were a close second, with 9% of participant respondents indicating they were extremely satisfied. No participant respondents who were using space heaters were extremely satisfied and only 1% of those using wall heaters were extremely satisfied.

It is noteworthy that 10% of participant respondents reported that wood heat had been their primary heating source prior to DHP installation, because participants using wood as their primary heating source are not eligible to participate in the pilot project. Furthermore, the technical evaluation team disqualified from the metering sample pilot participants who reported pre-DHP wood use above certain levels, because such wood usage made it difficult to identify an electric heat signature on participants' electricity bills.[45] Of the participant respondents who reported they used wood heat (either primarily or supplementally) prior to DHP installation, 67% reported an amount of wood in excess of the thresholds specified for the metering sample.[46]

To address the issue of wood heat among potential pilot participants, one interviewed utility contact suggested revising the homeowner participation form to include an additional qualifying question, asking project applicants the number of cords of wood, tons of wood pellets, and/or gallons of propane they use each year, and disqualifying applicants who report usage above

[45] The technical evaluation team reported they excluded from the metering sample participants that reported use of: 0.5 cords or more in Climate Zone 1; 1 cord or more in Climate Zone 2; and 1.5 to 2 cords or more in Climate Zone 3. Corresponding exclusion thresholds for pellets is 1 ton and for propane is 170 gallons.

[46] Of the 67 interviewed participants who reported using wood heat (either primarily or supplementally) prior to DHP installation, 46 provided valid responses concerning the amount of wood they had used.

certain levels. According to this respondent, "Customers could still lie, but it is a more direct question than, 'Is electric heat your primary source of heat?'" Utilities that pre-screened applicants reported they addressed this issue by checking participants' bills for an electric heat signature.

In addition to asking participants about their satisfaction with each individual heat source, we also asked participants to rate their satisfaction with *all* of the heating equipment they used prior to DHP installation. More than half of participant respondents reported that they were dissatisfied with their previous heat source(s); on a five-point scale, 54% described themselves as "not at all" satisfied or "somewhat dissatisfied," while 46% of participant respondents described themselves as "somewhat," "very", or "extremely" satisfied with their previous heat source(s).

The vast majority (99%) of participant respondents indicated that the DHP was now their primary heating source, although some of these participants may have been speculating, because, as noted previously, the majority had not yet experienced a full heating season.

Twenty-two participant respondents indicated that they used space heaters as a source of heat before installing the DHP. The average number of space heaters owned by these participant respondents was 2.6 (Table A.14). Of participant respondents with space heaters, 90% indicated they were no longer using the space heaters now that they had the DHP or anticipated they would be using them less than before. Only one participant reported using the space heaters more than before.

Table A.14: Number of Space Heaters Used by Participants Reporting Having Space Heat

NUMBER OF SPACE HEATERS IN HOME	PARTICIPANTS REPORTING (N=22)
One	8
Two	8
Three	3
Four	1
Five	1
Six	1
TOTAL	**22**

Sixty-six participants indicated that they used wood for heat, either primary or supplementally, before purchasing the DHP. Of the participants using wood, 14 were using four or more chords in a single season (Table A.15). Most participant respondents could not comment on their anticipated wood use with the DHP, as they were waiting to see how the DHP performed through a heating season before making their decisions.

Table A.15: Number of Cords of Wood Used in a Single Season

CHORDS PER SEASON	PARTICIPANTS REPORTING (N=66)
Less than One Chord	25
One to Three Chords	19
Four or More Chords	14
Don't Know	8
TOTAL	**66**

Heating Temperature Settings

Most pilot participants (two-thirds) reported that prior to installing the DHP, they kept their homes about 69° F and 69° was also the average for the whole sample.[47] Participants reported heating their homes with the DHP to about the same temperature.

Only 77 participants were able to estimate if they were now heating the area served by the DHP differently than before. Of these, 44 (57%) said they were heating it the same amount, 31 (40%) indicated they were heating it more, and 2 (3%) reported heating their living space less. The most common reason given for heating the area more was that the new heat was cheaper to operate (61%).

Prior to installing the DHP, 69% of participant respondents reported always turning down their thermostat when leaving the house or at night; at the other end of the spectrum, 23% said they never turned down their thermostat. After installing the DHP, thermostat set-back behavior decreased, the proportion saying they always turned down the thermostat when leaving the house or at night falling to 42%, and the proportion never turning it down increasing to 35%. Some participants did not comment on their thermostat set-back behaviors because they reported using the DHP only when they needed it for heating or cooling, rather than leaving it on a set temperature.

Area of Home Conditioned by DHP

Prior to the DHP, most participants (88%) allowed some rooms – typically bedrooms and bathrooms – to be significantly cooler than other rooms. After installing the DHP, this proportion fell by about 10%, with 77% of participant respondents reporting they let some rooms be

[47] Note that these findings are imprecise summaries of the open-ended raw data, as some interviewed participants indicated temperature ranges.

cooler.[48] Both prior to and after the DHP installation, bedrooms, bathrooms, basements, and office space were areas participants indicated that they allowed to be cooler than the rest of the home. Participant respondents indicated that the DHP conditioned about 75% of their living space on average (Table A.16).[49]

Table A.16: Percent of Home Heated by DHP

PERCENT OF HOME CONDITIONED BY DHP	PERCENT OF SAMPLE (N=154)*
0% to 25%	5%
26% to 50%	26%
51% to 75%	24%
76% to 100%	47%
TOTAL	**1.02%**

* Total not equal to 100% due to rounding.

The vast majority of participants had their DHP indoor head installed in what they referred to as a living room, family room, or main living area. Bedrooms were a common location of secondary units.

Use of Cooling Equipment

During the cooling season, participants reported using the DHP to keep their homes about 70° to 75°, on average.

Thirty-seven percent of participant respondents reported having any type of air conditioning in their home before they installed the DHP (Table A.17).

[48] Sample sizes were 204 (temperature), 227 (room closure before DHP), and 163 (room closure after DHP). The remaining portion of the full sample of 235 interviewed participants replied "Don't Know" to these questions.

[49] Note that the estimated average is imprecise, as it was calculated from original data reported in ranges.

Table A.17: Preexisting Air Conditioning Equipment

TYPE OF EQUIPMENT	NUMBER REPORTING (N=235)
Window Unit(s)	72
Wall Air Conditioning	8
Room AC/Standing Unit	5
Central Air Conditioning	3
None	147
TOTAL	**235**

Twenty percent of participants had planned to buy some type of air conditioning equipment before they had decided to purchase their DHP. Of the 49 participants who indicated they had considered purchasing cooling equipment, 30 participant respondents had considered a window or freestanding unit, while 10 were considering installing a central air system. Other participant respondents were not sure. One interviewed participant remarked:

- *"This is the first time I have had cooling. I would not have gotten this just for cooling, but I also wouldn't have purchased any other AC equipment. My bill may actually be higher since I am running something in the summer now".*

All of the participants reported that they were no longer considering purchasing air conditioning equipment. A small number of participant respondents mentioned considering adding an additional DHP for the cooling benefits in another area of their home. Those participant respondents who had AC units before the DHP reported using their other AC units much less or not at all.

PROGRAM AWARENESS AND PARTICIPANT MOTIVATION

Just under half of participants interviewed had heard about DHPs from a flier or bill insert from their utility (43%). Additional sources of awareness varied (Table A.18).

Participant respondents also mentioned travel as a source of exposure to DHP technology. Many respondents reported they had conducted online research on manufacturers' and independent websites to learn about the DHP technology and read reviews from other DHP users. Of participant respondents, 62% indicated that the brand of the DHP unit was at least "somewhat important" in their choice of which DHP to install. In comments, participants often noted that they did not know anything about any DHP brands before they started the pilot project process and often followed the advice of their contractors as to which DHP brand was the best.

Table A.18: Participant Respondent Awareness of DHPs

HOW FIRST HEARD ABOUT DHP	PARTICIPANTS REPORTING SOURCE	PERCENT OF SAMPLE (N=235)
Utility Bill Insert or Flier	101	43%
Friend / Neighbor	37	16%
DHP Installer	29	12%
Newspaper	22	9%
Television	6	3%
Home Show	8	3%
Radio	7	3%
Internet	2	1%
Door Hanger	1	<1%
Don't Know / Refused	4	2%
Other	17	7%
TOTAL	**234**	**100%**

In addition to building awareness about DHPs, contractors informed participants about which incentives might be available to them. Besides those from utilities and government, other incentives participants recalled included a $150 rebate from Mitsubishi and gas cards. Table A.19 shows the number of participants who recalled their contractors mentioning each incentive.

Table A.19: Incentives Mentioned by Contractors

INCENTIVE	CUSTOMERS RECALLING MENTION (N=235)*
Utilities Incentive**	198
Federal Tax Credit, Stimulus Credit, Economic Stimulus Tax Credit	112
Oregon Department of Energy's Residential Energy Tax Credit	47
Energy Trust Rebate	10
Montana Tax Credit	1
Other Incentive	32
Some Incentive but Not Sure Which	6

* Multiple Responses allowed.

** Although all participants received an incentive from the utility, some reported that the contractor did not mention it. Some utilities awarded the incentive to the contractors so participants in those territories may have been less aware.

Of participant respondents, 58% indicated that their decision to purchase the DHP may have or would have changed if the utility incentive was not available. Conversely, 89% of participant respondents who had heard about the Energy Trust rebate (which is considerably smaller than the standard $1,500 rebate) said their decision would not have changed if that rebate was not available. Participants were asked, for each incentive they received, whether they would have changed their decision to purchase the DHP in the absence of the incentive (Table A.20).

Table A.20: Influence of Incentives on Participants' Purchase Decision

INCENTIVES*	PERCENT WHOSE DECISION WOULD NOT HAVE CHANGED	PERCENT WHOSE DECISION MIGHT HAVE CHANGED	PERCENT WHOSE DECISION WOULD HAVE CHANGED	TOTAL
Utilities Incentive (N=192)	30%	12%	58%	**100%**
Energy Trust Rebate (N=9)	89%	11%	0%	**100%**
Oregon Department Of Energy's Residential Energy Tax Credit (N=43)	53%	14%	33%	**100%**
Federal Tax Credit, Stimulus Credit, Economic Stimulus Tax Credit (N=102)	42%	13%	45%	**100%**
Montana Tax Credit (N=1)	0%	0%	100%	**100%**
Other Incentive (N=5)	52%	17%	31%	**100%**
Some Incentives But Not Sure Which	50%	25%	25%	**100%**

* Numbers exclude "Don't Know" responses.

Of those participant respondents whose decision may have or would have changed if the incentive was not available 37% would have postponed the purchase of the DHP and 54% reported they would not have installed the DHP at all. Participant respondents who said they would not have installed the DHP at all cited financial constraints as the most common reason.

Participants were asked their motivations for purchasing a DHP (Table A.21). In addition to categories shown, participants reported that they wanted to reduce their reliance on wood, which is difficult to haul and gather, and that they were interested in the air/allergen filtration features that the DHP provides. Customers who had been able to see a working DHP unit before they purchased theirs mentioned this experience as vital in convincing them that the technology could work for them. The chance to see working DHP units on display at contractors' offices or elsewhere gave participants the confidence to make the purchase. Participants also identified the incentive as a major motivation for purchasing the units at the time they did.

Table A.21: Participant Motivations for Purchasing a DHP

MOTIVATION	PERCENT NOT AT ALL/ NOT VERY INFLUENTIAL	PERCENT SOMEWHAT INFLUENTIAL	PERCENT VERY INFLUENTIAL	PERCENT EXTREMELY INFLUENTIAL	PERCENT DON'T KNOW / REFUSED	TOTAL PERCENT (N=235)
Possible Reduction In Heating Bill	0%	8%	17%	67%	10%	100%
Energy Efficiency Compared to Other Types of Electric Heat	3%	3%	22%	64%	10%	100%
Less Expensive Installation Cost Over a Ducted System	7%	4%	12%	63%	13%	100%
Having Heating and Cooling in a Single Unit	8%	10%	16%	61%	6%	100%
Quiet Operation	6%	10%	22%	48%	15%	100%
Reducing Environmental Impact	15%	20%	25%	31%	10%	100%
Relative Safety of DHP Heating	18%	18%	14%	28%	23%	100%
Potential for Increased Comfort	2%	19%	22%	20%	10%	100%
Increasing the Value of the Home	22%	27%	22%	19%	11%	100%

Just under half (44%) of pilot participants surveyed had visited at least one website to look for information about the DHP or the incentives available before making their purchase. Participants mentioned seeking information about the units themselves and looking for reviews of certain units before selecting which one to purchase. Table A.22 shows the most common websites participants visited before making their purchase. Those most often mentioned in the *Other* category were manufacturer websites, ENERGY STAR®, and general research on DHP's through search engines. Participants reported that they used the Internet to find lists of qualifying DHP models and information about how the DHP technology works.

The majority (90%) of participants who looked at websites found all the information they were looking for. Those who did not find what they were looking for were often seeking a list of qualifying units or a way to see if the model number of the unit they were interested in qualified for the incentive. Participant respondents were also seeking project information, such as if they should expect the incentive to come to them or be deducted from the sales price by the contractor.

Table A.22: Websites Visited by Participants Before Purchase of a DHP

WEBSITE	PERCENT VISITING (N=102)
Utility	34%
Manufacturer	23%
Contractor	15%
NEEA	6%
Energy Trust of Oregon	3%
Other / Don't Remember	19%
TOTAL	**1%**

Participant respondents indicated that it was easy to understand the qualification requirements and that their incentives from the utility arrived quickly.

PARTICIPANT CONCERNS AND SATISFACTION

Participants had a variety of concerns about DHPs before purchasing them. We asked participants about a specific list of concerns identified in previous market research as the primary concerns of people considering purchasing a DHP. Participants ranked how concerned they were about the established topics on a one-to-five scale, with one being not at all concerned and five being extremely concerned (Table A.23). The most frequent concerns participants mentioned in addition to those we had explicitly asked about were: appearance of the unit, sound level, placement of the unit, and how effective the unit would be at heating efficiently. Many participants mentioned being reassured by utility and contractor contacts and that the incentive amount made the DHP appealing enough to mitigate any concerns.

Table A.23: Participant Concerns About DHP Before Purchase

CONCERN	PERCENT NOT AT ALL CONCERNED	PERCENT SOMEWHAT / NOT VERY CONCERNED	PERCENT VERY CONCERNED	PERCENT EXTREMELY CONCERNED	PERCENT DON'T KNOW / REFUSED	TOTAL PERCENT (N=235)
Purchase Cost	19%	34%	20%	21%	6%	100%
Time It Would Take to Get Initial Investment Back	34%	42%	7%	5%	12%	100%
Cost of Running the Equipment	29%	35%	14%	14%	8%	100%

Continued

CONCERN	PERCENT NOT AT ALL CONCERNED	PERCENT SOMEWHAT / NOT VERY CONCERNED	PERCENT VERY CONCERNED	PERCENT EXTREMELY CONCERNED	PERCENT DON'T KNOW / REFUSED	TOTAL PERCENT (N=235)
Having to Purchase More than One Unit to Heat or Cool Enough of Home	46%	19%	10%	10%	15%	100%
Amount of Maintenance the Equipment Would Require	27%	44%	14%	6%	9%	100%

At the time of the surveys, relatively few participants had experienced both a heating and cooling season. Despite the short time spent with the DHP (typically, a few months), participants were pleased with the technology and felt it was performing well (Table A.24). Many participants were not able to report how satisfied they were with their bills, as they had not received enough since the installation to have sufficient information to judge. Participant contacts also reported that the entire process moved along quickly.

Table A.24: Satisfaction with Project Processes

PROCESS	PERCENT DISAGREE	PERCENT SOMEWHAT AGREE / AGREE	PERCENT STRONGLY AGREE	PERCENT DON'T KNOW	TOTAL PERCENT (N=235)
Locating Program Information was Easy	5	33	56	6	**100%**
It was Easy to Understand Incentive Eligibility Requirements	9	23	66	2	**100%**
The Incentive Arrived Quickly	7	18	69	6	**100%**

Participant Satisfaction with Contractors

Participants selected a contractor from a list of approved installers who had completed the program orientation. Participant respondents often selected the contractor who provided the lowest bid and seemed the most knowledgeable about the systems. Participants reported that finding a contractor was easy and most participants felt that their contractors were knowledgeable and did quality work (Table A.25; five-point scale where "1" represents "strongly disagree" and "5" represents "strongly agree"). Participant respondents reported minor issues with installations, such as exposed line sets or delays. One interviewed participant remarked, "None of the contractors were knowledgeable about the program; nobody was terribly

on top of it." Other participant respondents had more positive experiences: 'The contractor was very professional and wanted to work with me if I had any problems."

Table A.25: Satisfaction with Contractors and Installers

SATISFACTION CRITERIA *	5	4	3	2	1
The installer was not disruptive during the installation (n=201)	83%	12%	2%	1%	1%
Installer did good quality work (n=220)	81%	12%	4%	2%	0%
Finding a contractor was easy (n=220)	79%	14%	4%	2%	2%
The installer was knowledgeable about the pilot (n=212)	74%	16%	7%	2%	1%
The installer had sufficient technical knowledge of DHPs (n=213)	69%	20%	7%	2%	1%
The installer provided enough education on how to operate DHP (n=221)	54%	28%	10%	7%	2%

* Participant respondents were asked to rate the activities of installers on a five-point scale, where "1" represented "strongly disagree" and "5" represented "strongly agree".

The most common complaint from participant respondents regarding their contractors was that the amount of education provided by contractors during the installation process was insufficient. Participants requested that contractors take more time to explain how the units worked and how to operate them because the manuals were often not helpful or incomplete. Participant respondents also reported that instructions on how to clean the filters on the units were insufficient. By the time of the interviews, nearly all issues mentioned by participant respondents had been addressed to the interviewed participant's satisfaction.

At the time of the pilot survey, many participants had not had their DHP through both a heating and cooling season. Despite the short time period spent with the equipment, participants were pleased with the technology and felt it was performing well.

Overall Satisfaction

The survey design called for surveying participants shortly after the installations of their DHP, specifically to provide rapid feedback to the program implementers in case participants were experiencing problems. Table A.26 shows the satisfaction levels expressed.

Table A.26: Satisfaction with Using the DHP

ISSUE	PERCENT DISAGREE	PERCENT SOMEWHAT AGREE / AGREE	PERCENT STRONGLY AGREE	PERCENT DON'T KNOW	TOTAL PERCENT (N=235)
Sound Level	1%	14%	81%	4%	**100%**
Comfort of the New Heat	0%	15%	54%	31%	**100%**
Comfort of the New Cooling	0%	12%	73%	15%	**100%**
Electricity Bill Compared to Before	2%	19%	30%	49%	**100%**

In addition to the close-ended questions, we probed further for possible problems by asking participants if there was *anything* they did not like about their DHP. In this context, 40% of participants reported that they had at least one thing they did not like about the DHP. The most common characteristics participants mentioned not liking about the DHP were the size (9 mentions) and appearance (13 mentions). Most participant respondents added that these issues were not particularly troubling. Seven participant respondents suggested either that DHPs should be available in multiple colors or that installers should provide information about the full range of available color options. Participants also mentioned being confused over how to operate the unit (5 mentions) and finding the manuals provided with the equipment unhelpful (8 mentions). Participant respondents mentioned the appearance of visible line sets, a known issue related to improper installations, three times as a drawback of the DHP.

Participants had many positive comments to offer about the technology as well:

- *"This was one of the best choices we have ever made."*
- *"We are using about a third as much electricity!"*
- *"It works just the way I hoped it would."*
- *"The utility was great. They responded quickly to the paperwork. They got a hold me and sent out a man promptly. …The whole process took 2-3 weeks".*
- *"The speed at which we received the incentive was impressive."*

B DHP INSTALLERS – SURVEY METHODOLOGY AND FINDINGS

We designed the DHP installer survey to explore:

- **The characteristics of firms actively installing DHPs through the pilot project** – including their previous experiences with DHP installation
- **Installers' programmatic interactions, experiences, and satisfaction** – including their initial awareness of the project, their assessment of project orientation sessions and the project websites, and the degree to which they were satisfied with the support they received from pilot staff
- **Installers' assessments of participant response to the program** – including the benefits and barriers to participant participation
- **Installers' marketing activities** – including their response to pilot-supplied marketing materials
- **Whether the pilot has affected the frequency with which installers recommend DHPs to customers**
- **Installers' interactions and coordination with partnering utilities**
- **The level(s) and type(s) of support installers received from DHP manufacturers and distributors** – including installers' assessment of manufacturer trainings, and the capacity of manufacturers and distributors to serve the residential DHP market

SAMPLE DISPOSITION

Firms that seek to install DHPs through the pilot project must send a staff member to a project orientation session, acquire manufacturer training for the equipment they install, and screen homeowners for project eligibility. Participating installation firms receive program benefits, including access to project marketing materials and customer outreach assistance.

We sought the feedback of participating installers through phone interviews conducted in July and August 2009. Each interview took approximately 20 minutes to complete. We obtained the contact information for participating installers from the DHP tracking database. We began with a list of all firms that had attended the project orientation (534 firms). To select the sample, we identified those firms that had performed at least one installation through the program. A total of 219 firms met that criterion.

To obtain a good sample distribution by cooling zone, use of heating, and utility service territory, we randomly ordered the list of participating firms and placed up to five calls in the resulting random order until we completed the survey with representatives of 30 firms. Table B.1 displays sample populations.

Table B.1: Population and Sample of Participating Installers

SAMPLING TARGET	POPULATION	ATTEMPTED BUT NOT REACHED	NOT ATTEMPTED	SAMPLE SIZE
DHP Installers	219	38	151	30

PARTICIPANT CHARACTERISTICS

We interviewed participating installers from three geographic areas: Seattle area, within 50 miles of I-5; Portland/Vancouver/Eugene area, within 50 miles of I-5; and all other areas, comprised of installer respondents throughout the four Northwest states, greater than 200 miles from I-5 (Table B.2)

Table B.2: Location of Installer respondents

GEOGRAPHIC AREA	SAMPLE (N=30)
Seattle I-5 Area (within 50 miles of I-5)	6
Portland / Vancouver / Eugene I-5 Area (within 50 miles of I-5)	16
Elsewhere (throughout the Northwest, greater than 200 miles from I-5)	8
TOTAL	**30**

For analytical purposes, we grouped participating installers into two groups (Table B.3). Group One consisted of installers working within Cooling Zone 1 (Less than 300 Cooling Degree Days) and Group Two consisted of installers working within Cooling Zones 2 and 3 (Greater than 300 Cooling Degree Days).[50]

[50] Cooling Degree Days (CDD) refers to the amount of air-conditioning needed, created by adding up all temperature differences of the form (daily temperature in °F - 65° F) for each day in a year in which the temperature exceeds 65° F. *Cooling Zone 1* = Less than 300 Cooling Degree Days; *Cooling Zone 2* = 300 to 600 Cooling Degree Days; and *Cooling Zone 3* = Greater than 600 Cooling Degree Days.

Table B.3: Participating Installer Sample

GROUP	COOLING ZONE(S)	SAMPLE (N=30)
One	1	16
Two	2 and 3	14
TOTAL		**30**

All 30 installer respondents reported that they provide heating and cooling equipment. The majority (26 of the 30) also sell water heaters. All 30 installer respondents are involved in sales, installation, repair, and maintenance.

PRE-PILOT DHP INSTALLATIONS

Twenty-eight installer respondents provided valid responses concerning the number of DHPs installed by their companies prior to the pilot. Twenty-four of the 28 reported that they had completed at least one DHP installation prior to the pilot (Table B.4). The installation contractors most commonly reported having installed between one and ten DHPs prior to the pilot. Four installer respondents reported having installed more than 100 pre-pilot DHPs.

Table B.4: Number of Pre-Pilot DHP Installations

NUMBER OF PRE-PILOT DHP INSTALLATIONS	SAMPLE (N=28)
0	4
1 to 10	11
11 to 20	4
21 to 30	3
31 to 50	2
51 to 100	—
100+	4
TOTAL	**4**

Twenty-two installer respondents provided valid responses concerning the proportion of pre-pilot DHP installations their firms had made in residences. Of the 508 DHP installations completed by these firms, installer respondents reported that 159 (31%) were installed in residences (Table B.5).

Table B.5: Pre-Pilot DHP Installations

INSTALLATION CONTRACTOR	COMMERCIAL INSTALLATIONS	RESIDENTIAL INSTALLATIONS	TOTAL INSTALLATIONS (N=22)
Installer #3	183	17	200
Installer #6	92	8	100
Installer #1	20	30	50
Installer #2	5	25	30
Installer #4	6	17	23
Installer #5	3	9	12
Installer #10	6	6	12
Installer #13	8	4	12
Installer #7	2	8	10
Installer #14	7	3	10
Installer #8	0	8	8
Installer #9	1	7	8
Installer #11	0	6	6
Installer #12	1	5	6
Installer #17	6	0	6
Installer #15	2	3	5
Installer #18	4	0	4
Installer #16	0	3	3
Installer #19	3	0	3
Installer #20	0	0	0
Installer #21	0	0	0
Installer #22	0	0	0
TOTAL	**349 (67%)**	**159 (33%)**	**508**

Additionally, the 16 of the 22 installers who had pre-pilot residential DHP installations completed by their firms reported that 73 of the 159 (46%) were installed to displace existing zonal heat, as opposed to providing heating or cooling to a previously unconditioned space (Table B.6).

Table B.6: Proportion of Pre-Pilot Residential DHPs Installed to Displace Existing Zonal Heat

INSTALLATION CONTRACTOR	RESIDENTIAL INSTALLATIONS (N=16)	RESIDENTIAL INSTALLATIONS TO DISPLACE EXISTING ZONAL HEAT
Installer #1	30	20
Installer #2	25	0
Installer #3	17	0
Installer #4	17	17
Installer #5	9	8
Installer #6	8	4
Installer #7	8	0
Installer #8	8	0
Installer #9	7	6
Installer #10	6	2
Installer #11	6	6
Installer #12	5	3
Installer #13	4	2
Installer #14	3	0
Installer #15	3	2
Installer #16	3	3
TOTAL	**159**	**73 (46%)**

INSTALLERS' PROGRAMMATIC INTERACTIONS

Source(s) of Program Awareness

Installer respondents most commonly heard about the pilot project through their utilities (17 of 30) and/or from a DHP distributor (7 of 30) (Table B.7).

Table B.7: Installers' Source(s) of Program Awareness (Multiple Responses Allowed)

SOURCE OF AWARENESS	INSTALLERS (N=28)
Utility	17
DHP Distributor	7
City Government	3
DHP Manufacturer	2
Energy Trust of Oregon	2
NEEA	1
Trade Association	1
Don't Know	2

Installer respondents most commonly reported that they participated in the program in order to increase sales of residential DHPs and/or because they believed that installation of DHPs benefit homeowners (Table B.8).

Table B.8: Installers Reason(s) for Participating In the Program (Multiple Responses Allowed)

REASON FOR PARTICIPATION	INSTALLERS (N=30)
Increase Sales	16
DHPs/Program Benefit Homeowners	7
DHP Is a Good Technology	5
Utility Is Marketing Partner	5

Project Orientation

The majority of installer respondents provided high points regarding the usefulness of the information presented in the orientation meeting on household eligibility requirements. On a one-to-five-point scale, where one represents "not at all useful" and five represents "extremely useful," the majority of installer respondents (18 of 23) provided a rating of four or higher (Table B.9). Seven installer respondents did not attend an orientation; others within their firms attended.

Table B.9: Installer Ratings of Utility of Presentation on Program Eligibility Requirements

RATING (1-5)	INSTALLERS (N=23)
5 – Extremely Useful	10
4 – Very Useful	8
3 – Somewhat Useful	2
2 – Not Very Useful	3
1 – Not At All Useful	0
TOTAL	**23**

The installer respondents who rated this aspect of the program orientation to be a three or less, as well as one providing a higher rating provided the following comments:

- *"At the time of our orientation, the project was so new that the project staff actually didn't have all the information to give us – they weren't quite prepared."*
- *"The eligibility requirements aren't very cohesive between utility companies."*
- *"I needed more fine points and details, like whether customers that have gas or propane qualify."*
- *"The eligibility requirements changed after the program started. Initially, the program allowed DHPs with only one head and later on, allowed DHPs with two heads."*
- *"I needed a better understanding of what the utilities' require in terms of contractor's liability insurance."*
- *"It was a long way to go to Portland for the training. We could have just gotten the information that was gone over in a packet."*

On this same one-to-five-point scale, slightly more than half (14 of 22) of installer respondents provided a rating of four or higher regarding the utility of the project orientation presentation on how to accurately complete program paperwork (Table B.10).

Table B.10: Installer Rating of Utility of Presentation on How to Complete Program Paperwork

RATING (1-5)	INSTALLERS (N=22)
5 – Extremely Useful	6
4 – Very Useful	8
3 – Somewhat Useful	4
2 – Not Very Useful	2
1 – Not At All Useful	2
TOTAL	**22**

Some of the installer respondents who rated this aspect of the program orientation to be a three or less provided the following explanations for their ratings:

- *"The paperwork isn't consistent between utilities – and if the form is not right, it takes a long time to get the rebate payment – so you're talking about thousands of dollars that you're waiting to collect."*
- *"The Oregon Department of Energy and the utilities do not understand the difference between a startup sheet and a startup form (procedure) – so the terminology used in the program needs to be consistent."*[51]
- *"Some of the paperwork was a little confusing – on what qualified and what didn't."*
- *"It wasn't very clear how systems with multiple heads would qualify."*
- *"Their communication could have improved. They change their forms every two weeks. I think they're now sending out e-mails that say there are new forms, but that's a little late."*

On this same one-to-five-point scale, 16 of 23 installer respondents provided a rating of four or higher regarding the utility of the project orientation presentation on the *displace, not replace* theory (Table B.11).

[51] Oregon offers a Residential Tax Credit for homeowners using DHPs with variable speed compressors (Oregon Department of Energy Conservation Division 2008). The credit is approximately $200-$300 and the consumer supplies the ARI certificate. According to this interviewed installer, the Oregon Department of Energy (ODOE) tax credit application requires submission of a copy of DHP system "start up" or "test running page(s)" from the manufacturer's installation instructions manual, while the pilot project requires submission of a DHP "startup sheet." According to this installer, pilot staff and ODOE staff do not realize that a "startup sheet" is different from a "startup procedure form" and that this lack of clarity has resulted in rejected applications.

Table B.11: Installer Rating of Utility of Presentation on the *Displace, Not Replace* Theory

RATING (1-5)	INSTALLERS (N=23)
5 – Extremely Useful	5
4 – Very Useful	11
3 – Somewhat Useful	5
2 – Not Very Useful	2
1 – Not At All Useful	0
TOTAL	**23**

In general, the installer respondents who rated this aspect of the program orientation to be a three or less either reported that the *displace, not replace* theory was not adequately covered in the orientation or expressed that they disagree with the theory.

Additionally, one interviewed installer reported that although the webinar version of the project orientation was convenient, the webinar question-and-answer period was awkward because "only one person could speak at a time" and "Internet connection problems resulted in unanswered questions and issues that were left unaddressed."

Contact with Project Staff

Twelve of 30 installer respondents reported that they contacted project staff to obtain additional project information beyond what project staff covered in the program orientation (Table B.12).

Table B.12: Installers Who Contacted Project Staff to Obtain Additional Project Information

CONTACTED PROJECT STAFF	INSTALLERS (N=30)
Yes	12
No	17
Don't Know	1
TOTAL	**30**

As shown in Table B.13, of the twelve installer respondents who contacted project staff for additional input, the most commonly sought information related to program requirements (9 of 12), paperwork requirements (5 of 12) and/or issues related to the program rebate process (1 of 12).

Table B.13: Installers Reason(s) for Contacting Project Staff (Multiple Responses Allowed)

TYPE OF INFORMATION	INSTALLERS (N=12)
Program Requirements	9
Paperwork / Rebate Checks	5
Market Data / Marketing Materials	1

On a one-to-five-point scale, where one represents "not at all helpful" and five represents "extremely helpful," 10 of the 12 installer respondents provided ratings of 4 or higher (Table B.14). The interviewed installer who provided a rating of three reported, "I did not feel that the Northwest Ductless staff understood the program very well."

Table B.14: Installer Rating of Degree of Helpfulness of Project Staff

RATING (1-5)	INSTALLERS (N=12)
5 – Extremely Helpful	8
4 – Very Helpful	2
3 – Somewhat Helpful	1
2 – Not Very Helpful	0
1 – Not At All Helpful	0
Don't Know	1
TOTAL	**12**

Project Website

Twenty-four of thirty installer respondents reported that they viewed webpages from one or both of the project websites (Table B.15). Installer respondents most frequently reported having viewed the *Contractor Participation Forms* page on the *www.nwductless.com* website (20 of 24) and the *Find an Installation Contractor in Your Area* page on the consumer website *www.goingductless.com* (8 of 24). Additionally, 8 of the 30 installers reported that they had visited the consumer website to confirm that their companies were listed there.

Table B.15: Installer WebPages Viewed (Multiple Responses Allowed)

WEBPAGE VIEWED	INSTALLERS (N=30)
Contractor Participation Forms Page	20
Consumer Website *www.goingductless.com* (to confirm being registered as an installer)	8
Contractor Getting Involved Page	5
Contractor Product Information Page	5
Contractor Resource Page	4
Marketing Materials Page	3
Calendar Page	2
Contact Information Page	2
Participating Utilities Page	2

Overall, those installer respondents who viewed the websites provided high marks regarding the degree of relevance of the information contained on the sites. On a one-to-five-point scale, where one represents "not at all relevant" and five represents "extremely relevant," 10 of the 12 installer respondents who provided relevant responses gave ratings of four or higher (Table B.16).

Table B.16: Installers' Rating of the Degree of Relevance of the Information Contained On the Project Website(s)

RATING (1-5)	INSTALLERS (N=12)
5 – Extremely Relevant	6
4 – Very Relevant	4
3 – Somewhat Relevant	1
2 – Not Very Relevant	1
1 – Not At All Relevant	0
TOTAL	12

NORTHWEST RESIDENTIAL DHP MARKET

As noted previously, we interviewed participating installers from three geographic areas.[52] Twenty-five of the 30 installers provided responses regarding the percentage of their customers who are eligible for the DHP pilot. The majority of installer respondents from the Seattle I-5 and Portland I-5 areas estimated that less than 33% of customers are eligible to install DHPs through the pilot (Table B.17). Notably, each of the seven installer respondents not located in the Seattle I-5 or Portland I-5 areas estimated that more than 34% of their customers are eligible to participate in the pilot.

Table B.17: Installers Estimate of Proportion of Customers that Are Eligible for the Pilot Project

PERCENT OF CUSTOMERS ELIGIBLE FOR PILOT (N=25)	AREA 1: SEATTLE I-5 (N=5)	AREA 2: PORTLAND I-5 (N=13)	AREA 3: OTHER (N=7)
0% to 33%	5	8	0
34% to 66%	0	2	6
67% to 100%	0	3	1
TOTAL	**5**	**13**	**7**

The same twenty-five installers estimated the interest of their customers in the DHP pilot. In each of the three geographic areas, the majority of installer respondents reported that less than 33% of their customers had expressed interest in DHPs. However, one installer working in Clark County, Washington, reported that 80% of customers had expressed such interest (Table B.18).

Table B.18: Installers Estimate of Proportion of Customers that Expressed Interest in DHPs

PERCENT OF CUSTOMERS EXPRESSING INTEREST (N=25)	AREA 1: SEATTLE I-5 (N=5)	AREA 2: PORTLAND I-5 (N=13)	AREA 3: OTHER (N=7)
0% to 33%	3	9	7
34% to 66%	1	4	0
67% to 100%	0	1	0
TOTAL	**4**	**14**	**7**

[52] *Area 1* installer respondents: located in the Seattle area, within 50 miles of I-5. *Area 2* installer respondents: located along the Portland/Vancouver/Eugene I-5 corridor, within 50 miles of I-5. *Area 3* installer respondents (Other): comprised of installer respondents throughout the four Northwest states, greater than 200 miles from I-5.

Of the three geographic areas, installer respondents in the Seattle I-5 region reported the lowest percentage of customer uptake relative to installer's recommendations for DHP installation (Table B.19). There is a significant correlation between geographical location and the installer-reported likelihood that customers to whom DHPs were recommended chose to have one installed (p=.017, n=27).

Table B.19: Proportion of Customers to Whom DHPs Were Recommended that Chose To Install

PERCENT OF CUSTOMERS EXPRESSING INTEREST (N=27)	AREA 1: SEATTLE I-5 (N=5)	AREA 2: PORTLAND I-5 (N=14)	AREA 3: OTHER (N=7)
0% to 33%	4	3	0
34% to 66%	0	3	4
67% to 100%	1	8	4
TOTAL	**5**	**14**	**8**

DHP MARKETING ACTIVITIES

Participant Response

Twenty-eight installer respondents provided valid responses concerning the most common scenario which lead their customers to install DHPs; 18 of the 28 reported that the majority of their DHP customers contacted them to specifically request a DHP consultation (Table B.20). Most frequently, installer respondents reported that DHP customers had heard about the pilot project from their utilities and located the installer's name and contact information via utility links to websites listing eligible installers. Additionally, one interviewed installer reported a "huge customer response" to a newspaper article describing the program. Conversely, ten of the 28 installer respondents reported that it was most often the case that customers became aware of DHPs and the program only after consulting with installers.

Table B.20: Most Common Scenarios Leading Customers to Install DHPs

NATURE OF CUSTOMER INQUIRY TO INSTALLER	INSTALLERS (N=28)
Customer Called Installer Requesting DHP Consultation	18
Customer Called Installer Asking for a General HVAC Consultation	10
TOTAL	**28**

As Table B.21 shows, installer respondents reported that the most common concerns customers raised when considering purchase of a DHP were the appearance of DHPs (16 of 30) and the ability of DHPs to effectively condition a given space (10 of 30).

Table B.21: Commonly Heard Customer Concerns (Multiple Responses Allowed)

REASON	INSTALLERS (N=30)
Appearance	16
Space Conditioning Effectiveness	10
Noise	7
Cost	6
Unfamiliar Technology	4
Installation Concerns	2
Reliability / Ease of Use	2
Energy Cost Savings	2

Installers' Use of Pilot-Supplied Marketing Materials

Fourteen of the 28 installers who provided valid responses reported that they used marketing materials supplied by the pilot project (Table B.22). Of the 13 installer respondents who reported that they did not use pilot-provided marketing materials, five reported that they relied solely on utility-marketing of the program. One of the installer respondents reported not being aware of the availability of pilot-provided marketing materials. This installer reported issuing a direct mailing of a marketing piece designed in-house to customers with electric heat. This contact further reported, "The fact that we are spending marketing dollars shows that we are making money from DHPs."

Table B.22: Installers Who Used Pilot Marketing Materials

USED PILOT MARKETING MATERIALS	INSTALLERS (N=28)
Yes	14
No	14
TOTAL	**28**

Thirteen of the 14 installer respondents who reported that they used marketing materials supplied by the project reported using contractor sales sheets (Table B.23). Two of the 14 reported that they used pilot-supplied door-hanger templates.

Table B.23: Pilot Marketing Materials Installers Reported Using (Multiple Responses Allowed)

PILOT MARKETING MATERIALS USED	INSTALLERS (N=14)
Contractor Sales Sheets	13
Door Hanger Template	2

Of the 14 installers that reported using pilot-provided marketing materials, 12 reported limiting their use of the materials to provision of contractor sales sheets to customers during sales calls (Table B.24). A small number of installer respondents reported distributing pilot-provided marketing materials at home shows (2 of 14), displaying materials at businesses (1 of 14), and/or distributing materials to neighbors in the vicinity of completed DHP installations (1 of 14).

Table B.24: Installers Use of Pilot-Provided Marketing Materials (Multiple Responses Allowed)

HOW INSTALLERS USED PILOT-PROVIDED MARKETING MATERIALS	INSTALLERS (N=14)
Provided Materials to Customers During Sales Calls	12
Distributed Materials at Home Shows	2
Displayed Materials at Businesses	1
Distributed Materials to Neighbors in Vicinity of DHP Installation	1

Eight of the 30 installer respondents requested that the pilot provide additional resources (Table B.25).

Table B.25: Need for Additional Program Resources

ARE ADDITIONAL RESOURCES NEEDED	INSTALLERS (N=30)
Yes	8
No	18
Don't Know	4
TOTAL	**30**

Marketing-related requests from the 8 installers included increased advertising of the pilot project, provision of contact information for households with electric heat, and provision of

oversized postcards for installers to distribute to prospective customers (Table B.26).[53] Installer respondents also requested that the pilot's eligibility requirements be expanded to include new construction and that the training required for approved installers be increased.[54]

Table B.26: Additional Resources Requested By Installers (Multiple Responses Allowed)

ADDITIONAL RESOURCE	INSTALLERS (N=8)
Increased Program Marketing	4
Provide Postcards Explaining the Program	2
Expand Program Qualifying Requirements	1
Extend Rebate Period	1
Provide Additional Training	1
Provide Contact Information for Households with Electric Heat	1

Effects of the Pilot Project on Installers' Marketing Activities

The majority of installer respondents providing valid responses (23 of 29) reported that, as a result of the pilot, they now offer DHPs to customers more frequently than they did before the pilot (Table B.27). According to one installer, "We didn't know much about them before the pilot project. When the pilot came along, we started to receive requests for DHPs and then we then we really started pushing them."

Table B.27: Effect of Pilot on the Frequency with Which Installers Offer DHPs to Customers

OFFERING DHPS	INSTALLERS (N=29)
More	23
About the Same	6
TOTAL	**29**

[53] One of the installer respondents suggested that postcards would be more eye-catching and would require less postage than the existing project flyer.

[54] This interviewed installer explained that if the program were to qualify such installations, building contractors would be more likely to display DHPs in their showrooms, thus increasing referrals. The contact further explained that HVAC equipment displayed at building contractors' showrooms generate the majority of customer referrals.

Installer respondents most commonly reported that they recommend DHPs to customers when they consider the DHP to be the most appropriate option for a given space (21 of 30). Installer respondents frequently reported that DHPs are the most appropriate option for homes that lack ductwork (Table B.28). Additionally, Installer respondents commonly cited DHPs cost-effectiveness as a reason to recommend DHP installation (12 of 30).

Table B.28: Installers Reasons for Recommending DHPs (Multiple Responses Allowed)

REASON FOR RECOMMENDING DHP	INSTALLERS (N=30)
Appropriateness for Space	21
Cost	12
Energy Efficiency	8
Ease of Installation	6
Safer than Other Options	1
Quiet	1
Provides Both Heat and Air Conditioning	1

Twenty-five installer respondents provided valid responses concerning the circumstances in which they would not recommend DHP installation (Table B.29). Installer respondents most commonly reported that they would not recommend DHPs when more appropriate space-conditioning options exist (13 of 25). In general, installers reported that DHPs are less than optimal in larger homes, in homes with multiple rooms, and in situations where customers want temperature uniformity throughout an entire house. However, the majority of installer respondents (28 of 30) reported that they would recommend multiple DHP units for larger homes if installation of ductwork was not possible, or if other cost considerations rendered DHP installation most appropriate.

Table B.29: Installers Reasons for Not Recommending DHPs (Multiple Responses Allowed)

REASON FOR NOT RECOMMENDING DHP	INSTALLERS (N=25)
Appropriateness for Space	13
Cost	5
Appearance	2
Comfort / Effectiveness	2
Existing Ductwork	2
Unfamiliar Technology	1

The majority of installer respondents (26 of 30) reported that they will continue to offer DHPs after the incentive period ends. Table B.30

Table B.30: Will Installers Continue to Offer DHPs After Incentive Period?

CONTINUE TO OFFER DHPS	INSTALLERS (N=30)
Yes	26
No	—
Don't Know	4
TOTAL	**4**

DHP PROFIT MARGINS

Twenty-nine of 30 installer respondents provided valid responses concerning the relative profitability of DHPs, as compared with other types of space-conditioning equipment. Twenty-three of the 29 reported that their profit margins for DHPs were the same in comparison with other equipment they install (Table B.31). Of the 23, eight offered spontaneous comments regarding their DHP profit margins. Four of the eight reported reduced DHP profit margins in comparison with other types of equipment due to the reduced amount of equipment needed for installation; however, they achieved standard profit margins via the reduced amount of time necessary to install DHPs. Conversely, two of the eight reported that the reduced amount of time necessary to install DHPs resulted in decreased profits, but that they achieved standard profit margins via an increased markup on DHP equipment. Three of the eight reported that they achieved standard profit margins via application of the same labor and equipment margins applied to the other equipment they install.

Table B.31: Degree of DHP Profitability Compared with Other Types of Equipment

DHP PROFITABILITY	INSTALLERS (N=29)
Same	23
Higher	4
Lower	2
TOTAL	**29**

Four of the 29 installer respondents reported that DHP profit margins were higher in comparison with other equipment. Three of the four offered spontaneous comments regarding DHP profit margins; each reported increased profits due to decreased labor hours necessary for installation.

Two installer respondents reported that DHP profit margins were lower in comparison with the other equipment they install. Each offered spontaneous comments regarding DHP profit margins. One reported that at program launch, DHP profit margins were initially equal to other equipment they install, but that the popularity of the pilot program resulted in increased market competition, prompting this installer to reduce the amount charged to customers in order to remain competitive. The other one of the two reported lower profit margins due to the reduced amount of equipment needed for DHP installation.

INSTALLERS' INTERACTIONS WITH UTILITY DHP PROGRAMS

Eighteen of 30 installer respondents reported program participation in multiple service territories and 12 of 30 installers reported program participation in only one utility service territory (Table B.32).

Table B.32: Installer Utility Service Territory Involvement

INSTALLER SERVICE TERRITORY	INSTALLERS (N=30)
Works In Multiple Service Territories	18
Works In One Service Territory	12
TOTAL	**30**

Of the 18 installers that reported program participation in multiple service territories, 12 reported that program-related processes varied between utilities and 6 reported that program-related processes were the same across utilities (Table B.33).

Table B.33: Installers Comparison of Utility Program Processes

PROGRAM PROCESSES ACROSS UTILITIES	INSTALLERS (N=18)
Differed	12
Same	6
TOTAL	**18**

Regarding variations in utility programs, installer respondents most frequently reported that the participant pre-approval processes required within some utility service territories result in increased paperwork and lengthier project timeframes (Table B.34). In addition, one interviewed installer reported that the customer screening processes used by one utility screens out some customers that should be eligible. According to this interviewed installer, "Utility billing analysis suggested that some customers were not using electric baseboard heat as their primary heat source, when, in fact, the customers had been turning their thermostats down low because

electric baseboard heat is so expensive." Another interviewed installer reported that one utility posted incorrect information about the program, resulting in disappointed customers, and lost sales.

Table B.34: Differences in Program Processes Among Utilities (Multiple Responses Allowed)

DIFFERING PROGRAM PROCESSES ACROSS UTILITIES	INSTALLERS (N=9)
Additional Program Paperwork	5
Different Eligibility Requirements	2
Lesser Rebate	1
Different Quality Assurance Processes	1

MANUFACTURER TRAINING

Twenty-eight installer respondents provided valid responses concerning the manufacturer trainings they attended (Table B.35). These installers most commonly reported attending Mitsubishi (25) and Fujitsu trainings (18).

Table B.35: Installer Manufacturer Training Attended (Multiple Responses Allowed)

MANUFACTURER SPONSORING DHP TRAINING	INSTALLERS (N=28)
Mitsubishi	25
Fujitsu	18
LG	7
Daikin	6
Sanyo	5
Carrier	2

Eleven of the 28 installer respondents provided spontaneous remarks concerning their experiences with various DHP brands. Three installer respondents provided positive reviews of Mitsubishi DHPs quality and performance. One of the three reported that Mitsubishi's warranty is superior to the other brands. Two installer respondents offered negative reviews of Mitsubishi's technical assistance. One of the two reported that Mitsubishi DHPs are not reliable. One of the 11 reported that Fujitsu offers excellent technical support and that their DHPs are very easy to trouble-shoot. Additionally, one of the 11 expressed praise for Fujitsu's policy to sell their product only to licensed contractors. One of the 11 reported that Daikin is the only DHP manufacturer that offers a two-zone DHP model that qualifies both for ENERGY STAR® and the federal tax rebate. One of the 11 reported that LG has done the most of any DHP manufacturer to

address participants' aesthetic concerns.[55] One of the 11 installer respondents reported that "Carrier makes the nicest remote control."

Eighteen installer respondents provided valid responses concerning why they selected a particular manufacturer's training (Table B.36). The installer respondents most commonly reported that they selected the training on the basis of the extent to which a particular brand is available through their distributor (12 of 18) and/or because of their perception of a particular brand's quality and performance (6 of 18).

Table B.36: Reason(s) for Selecting a DHP Manufacturer's Training (Multiple Responses Allowed)

REASON FOR SELECTING A MANUFACTURER'S TRAINING	INSTALLERS (N=18)
Brand Is Readily Available Through Distributor	12
Brand Quality and Performance	6
Previous Experience with Brand	5
Brand Has Best Warranty	1

Twenty-three installer respondents provided valid responses concerning the adequacy of the manufacturer's trainings. Twenty-one of the 23 reported that training was adequate (Table B.37). Despite these positive reviews, installers offered several suggestions for improvement. Multiple installer respondents suggested increased DHP technical training on optimal DHP placement and additional training on installation procedures, including "how to cut the vents into houses."

Table B.37: Adequacy of Manufacturer Training

WAS MANUFACTURER TRAINING ADEQUATE?	INSTALLERS (N=23)
Yes	21
No	2
TOTAL	**23**

Installer respondents reported that manufacturer trainings consist of approximately one-half technical information and one-half product marketing information. Multiple installers reported that they did not consider the product marketing portion of the trainings useful (according to one contact, HVAC salespersons are not typically responsible for installation of equipment and installers are not typically involved in sales). To address this issue, one interviewed installer

[55] Installer respondents reported that, in an effort to address participants' aesthetic concerns, LG manufactures an interior DHP unit that also serves as a picture frame.

suggested that manufacturers separate the technical portion of trainings from the marketing portion, so that DHP installers may attend the technical portion and DHP salespersons may attend the marketing portion.

DHP PROCUREMENT AND INSTALLATION

Twenty-seven installer respondents provided valid responses concerning the relative difficulty of obtaining DHPs, as compared with other types of space-conditioning equipment. Nearly all of the installer respondents (26 of 27) reported that the degree of difficulty in obtaining DHPs was "easier" or "the same" as obtaining other space-conditioning equipment (Table B.38).

Table B.38: Relative Degree of Difficulty in Obtaining DHPs

DEGREE OF DIFFICULTY	INSTALLERS (N=27)
Same	19
Easier	7
More Difficult	1
TOTAL	**27**

According to one interviewed installer, "Now that there's an incentive, it's easier to obtain DHPs, because almost all distributors carry at least one brand of DHP and some carry multiple brands." The interviewed installer who reported that DHPs were more difficult to obtain reported that this difficulty was limited to "some rushes on DHPs that qualify for the federal tax credit at the beginning of the pilot project."

Most (26 of 30) installer respondents reported that DHP installation is easier than installing other types of space-conditioning equipment; the remaining (4 of 30) reported that installation of each is equally difficult (Table B.39).

Table B.39: Relative Degree of Difficulty of DHP Installation

DEGREE OF DIFFICULTY	INSTALLERS (N=30)
Easier	26
Same	4
More Difficult	—
TOTAL	**30**

Six of the thirty installers spontaneously remarked that DHP installation requires less time than installing other types of space-conditioning equipment. Of the six, multiple installers reported

completing DHP installation in approximately one-half the time required for installation of other types of space-conditioning equipment. Two installers reported difficulty with installation of DHP line-sets, particularly into interior walls.

The majority (23 of 26) of installer respondents reported that DHP installations require the involvement of a licensed electrician (Table B.40). Two of the 26 reported that only some DHP installations require a licensed electrician. According to one of the two installer respondents, this is because installers are authorized to complete the "minor" electrical work required for certain DHP installations. Three of the thirty reported some initial difficulty with meeting electrical code requirements associated with DHP installations. According to each of the three, ambiguous DHP electrical code requirements have resulted in different interpretations of these codes by electricians and by electrical code inspectors.

Table B.40: Involvement of Licensed Electrician in DHP Installation

REQUIRES LICENSED ELECTRICIAN	INSTALLERS (N=26)
Yes	23
Some	2
No	1
TOTAL	**26**

The majority of installer respondents (20 of 29) reported that DHP installations require return visits less frequently than installation of other space-conditioning equipment (Table B.41). In general, installers reported that return visits are less frequent because DHPs are simpler than other types of space conditioning equipment and have fewer components. Each of the three installer respondents who reported that DHPs require more return visits than other types of space conditioning equipment reported that these visits focused on familiarizing customers with DHP controls.

Table B.41: Customer Follow-Up Required by DHP installations

DHP REQUIRES CUSTOMER FOLLOW-UP…	INSTALLERS (N=29)
Less Frequently than Other Space-Conditioning Equipment	20
About the Same As Other Space-Conditioning Equipment	6
More Frequently than Other Space-Conditioning Equipment	3
TOTAL	**29**

Twenty-eight installer respondents provided valid responses concerning the technical support they received from manufacturers. The majority (23 of 28) of installer respondents reported

being satisfied with manufacturer technical support (Table B.42). Five of the 28 reported some degree of dissatisfaction. Four of the installer respondents reported dissatisfaction with Mitsubishi support. Interviewed installer complaints about Mitsubishi included lengthy wait-times to have technical issues addressed, not being notified of mandatory classes and trainings, and general dissatisfaction, because, according to one of the installer respondents, "Mitsubishi technical support is handled by subcontractors." Multiple installers provided positive comments regarding Fujitsu support. However, one installer reported "Fujitsu does not include codes in their manuals, so you have to call their support line to get help." In addition to the support installers receive from manufacturers, multiple contacts reported that they receive technical support from DHP distributors.

Table B.42: Installer Satisfaction with Manufacturer Support

SATISFIED WITH MANUFACTURER SUPPORT	INSTALLERS (N=28)
Yes	23
Somewhat	3
No	2
TOTAL	**28**

C PILOT IMPLEMENTATION PROCESSES

This chapter provides a summary of pilot project implementation processes. The chapter includes information on training and support activities, utility response to the pilot project, customer outreach and recruitment, and project incentives. In order to summarize all findings related to pilot implementation processes some content from other appendices is duplicated in this section.

MANUFACTURER CONTACTS SAMPLE DISPOSITION

RIA interviewed manufacturer contacts (including manufacturers, distributors, and manufacturer representatives) participating in the project via phone in September and October 2009. Each interview took approximately 30 minutes to complete. Our sample of 20 manufacturer contacts included respondents from each of the six participating DHP manufacturers and reflected the population in terms of geographical location.[56]

TRAINING AND SUPPORT

Project Orientation

To build an installer infrastructure to serve the DHP market, project stakeholders conducted outreach regarding the pilot to HVAC installers. As shown in **Error! Reference source not found.**, installer respondents providing valid responses most commonly heard about the pilot project through their utilities (17 of 28) and/or DHP distributor (7 of 28).

Installation firms that seek to install DHPs through the project are required to send a staff member to a project orientation session, acquire manufacturer training for the equipment they install, and screen homeowners for project eligibility. Orientations cover the purpose and key elements of the project, and discuss the short-term and longer-term opportunities for installers. Project implementation procedures and expectations regarding eligible products, installer performance, quality assurance, and incentive payments are also outlined.[57]

---

[56] See Appendix A for participant sample disposition and Appendix B for installer sample disposition.

[57] Ductless Heat Pump Project. 2008. *The Northwest Ductless Heat Pump Pilot Project – Project Implementation Document.* Draft, November 17. Portland, Ore.: Northwest Energy Efficiency Alliance. *http://www.nwductless.com/images/pdf/project%20implementation%20document%2012_16_08.pdf..*

Table C.1: Installer Rating of Utility of Presentation on How to Complete Program Paperwork

RATING (1-5)	INSTALLERS (N=22)
5 – Extremely Useful	6
4 – Very Useful	8
3 – Somewhat Useful	4
2 – Not Very Useful	2
1 – Not At All Useful	2
TOTAL	**22**

On this same one-to-five-point scale, 16 of 23 installer respondents provided a rating of four or higher regarding the utility of the project orientation presentation on the *displace, not replace* theory (Table C.2). In general, the installer respondents who rated this aspect of the program orientation to be a three or less either reported that the *displace, not replace* theory was not adequately covered in the orientation or expressed that they disagree with the theory.

Table C.2: Installer Rating of Utility of Presentation on the *Displace, Not Replace* Theory

RATING (1-5)	INSTALLERS (N=23)
5 – Extremely Useful	5
4 – Very Useful	11
3 – Somewhat Useful	5
2 – Not Very Useful	2
1 – Not At All Useful	0
TOTAL	**23**

Additionally, one interviewed installer reported that although the webinar version of the project orientation was convenient, the webinar question-and-answer period was awkward because "only one person could speak at a time" and "Internet connection problems resulted in unanswered questions and issues that were left unaddressed."

Twelve of 30 installer respondents reported that they contacted project staff to obtain additional project information beyond what project staff covered in the program orientation (Table C.3).

Table C.3: Installers Who Contacted Project Staff to Obtain Additional Project Information

CONTACTED PROJECT STAFF	INSTALLERS (N=30)
Yes	12
No	17
Don't Know	1
TOTAL	**30**

As shown in Table C.4, of the twelve installer respondents who contacted project staff for additional input, the most commonly sought information related to program requirements (9 of 12), paperwork requirements (5 of 12) and/or issues related to the program rebate process (1 of 12).

Table C.4: Installers Reason(s) for Contacting Project Staff (Multiple Responses Allowed)

TYPE OF INFORMATION	INSTALLERS (N=12)
Program Requirements	9
Paperwork / Rebate Checks	5
Market Data / Marketing Materials	1

On a one-to-five-point scale, where one represents "not at all helpful" and five represents "extremely helpful," 10 of the 12 installer respondents provided ratings of 4 or higher (Table C.5). The interviewed installer who provided a rating of three reported, "I did not feel that the Northwest Ductless staff understood the program very well."

Table C.5: Installer Rating of Degree of Helpfulness of Project Staff

RATING (1-5)	INSTALLERS (N=12)
5 – Extremely Helpful	8
4 – Very Helpful	2
3 – Somewhat Helpful	1
2 – Not Very Helpful	0
1 – Not At All Helpful	0
Don't Know	1
TOTAL	**12**

Manufacturer Training

As noted previously, eligible installers are required to acquire manufacturer training for the equipment they install. Twenty-eight installer respondents provided valid responses concerning the manufacturer trainings they attended (Table C.6). These installers most commonly reported attending Mitsubishi (25) and Fujitsu trainings (18).

Table C.6: Installer Manufacturer Training Attended (Multiple Responses Allowed)

MANUFACTURER SPONSORING DHP TRAINING	INSTALLERS (N=28)
Mitsubishi	25
Fujitsu	18
LG	7
Daikin	6
Sanyo	5
Carrier	2

Eighteen installer respondents provided valid responses concerning why they selected a particular manufacturer's training (Table C.7). The installer respondents most commonly reported that they selected the training on the basis of the extent to which a particular brand is available through their distributor (12 of 18) and/or because of their perception of a particular brand's quality and performance (6 of 18).

Table C.7: Reason(s) for Selecting a DHP Manufacturer's Training (Multiple Responses Allowed)

REASON FOR SELECTING A MANUFACTURER'S TRAINING	INSTALLERS (N=18)
Brand Is Readily Available Through Distributor	12
Brand Quality and Performance	6
Previous Experience with Brand	5
Brand Has Best Warranty	1

The majority of both manufacturer contacts and installer respondents reported that existing pilot training protocols are adequate. Despite these satisfactory ratings, several contacts recommended promoting or requiring additional training.[58] Regarding the need to increase training on pilot

[58] For instance, one interviewed distributor contact reported that they require installers to obtain North American Technician Excellence (NATE) certification.

protocols, one interviewed installer reported, "There are a lot of installers participating in the pilot that have no idea what they're talking about." Additionally, many installer respondents suggested increasing DHP technical training on installation procedures, including optimal DHP placement and "how to cut vents into houses." As noted previously, respondents from among each of the groups surveyed reported issues with installation of DHP line sets.

Additionally, an interviewed manufacturer contact reported that HVAC installers are more comfortable marketing technologies that they have experienced firsthand. Therefore, the contact suggested that DHP installation trainings provide installers with the opportunity to see and experience a working DHP unit.

Program implementation staff reported that particularly in the case of larger HVAC firms, HVAC salespersons are typically not responsible for installation of equipment and HVAC installers are typically not involved in sales. However, staff reported that because they had not been aware of this distinction, the pilot required training of HVAC installers only and thus failed to reach a sizeable portion of those individuals responsible for marketing DHPs (frequently HVAC salespersons). To address this issue, pilot staff reported that future training efforts should include both HVAC installers and HVAC salespersons.[59]

Consistent with the remarks of installer respondents, several utility respondents reported that, while installer orientation sessions are effective at presenting background information on the project itself, installers need additional information regarding specific utility program requirements. Utility contacts reported that they successfully conveyed utility-specific program information to installers by maintaining frequent contact with installers and by being available to answer their questions. Additionally, one utility contact attributed the high level of installer knowledge of utility program requirements to the utility's maintenance of a preferred list of installers on its website.

One utility contact reported that the pilot project's installer recruitment and designation is in need of improvement. According to this contact, "Thirty percent of the installers listed as authorized to install on the project's website didn't know how they ended up on the website and had not heard of the pilot project." This contact reported that although the installers had attended manufacturer training to learn about DHP installation, where they were exposed to project information, the installers were unaware that they had been registered with the pilot project. Additionally, this contact reported having received a request from program implementation staff to allow installers who did not go through trainings to install DHPs through the pilot project. The

[59] Installer respondents noted that manufacturer trainings consist of approximately one-half technical information and one-half product marketing information. Multiple installers reported that they did not consider the product marketing portion of the trainings useful (presumably because they are not involved in marketing). To address this issue, one installer suggested that manufacturers separate the technical portion of trainings from the marketing portion, so that DHP installers can attend the technical portion and DHP salespersons can attend the marketing portion.

contact reported denying the request, because, "This request was not in line with the program requirements."

The majority (23 of 28) of installer respondents reported being satisfied with manufacturer technical support (Table C.8). Five of the 28 reported some degree of dissatisfaction. Four of the installer respondents reported dissatisfaction with Mitsubishi support. Interviewed installer complaints about Mitsubishi included lengthy wait-times to have technical issues addressed, not being notified of mandatory classes and trainings, and general dissatisfaction, because, according to one of the installer respondents, "Mitsubishi technical support is handled by subcontractors." Multiple installers provided positive comments regarding Fujitsu support. However, one installer reported "Fujitsu does not include codes in their manuals, so you have to call their support line to get help."

Table C.8: Installer Satisfaction with Manufacturer Support

SATISFIED WITH MANUFACTURER SUPPORT	INSTALLERS (N=28)
Yes	23
Somewhat	3
No	2
TOTAL	**28**

Pilot Websites

The pilot design included launching a website (*www.nwductless.com*) to provide utility sponsors, industry partners, and installers access to: project information and marketing materials; participant screening tools; product and application information; testimonials; and other promotion oriented pieces; and to highlight variations in utility programs. Following the launch of *www.nwductless.com*, project staff subsequently launched a consumer-facing website (*goingductless.com*) to provide participants with project information, general DHP information, and an interface to locate eligible installers.

Manufacturer contacts reported that the pilot's reliance on the Internet to communicate program information represented a barrier to increased installer participation in the pilot project.[60] According to one interviewed manufacturer contact, "In general, installers do not use the web very much and do not visit the pilot's website." Consistent with this, project staff reported

[60] One DHP distributor reported being unclear about which utilities were participating in the pilot, and was therefore unable to provide clarifying information to participating installers.

difficulty with driving installers to the project website, and reported that installers often requested faxed documents and/or telephone assistance.

Despite this reported barrier, the majority of installer respondents (24 of 30) reported that they viewed webpages from one or both project websites (Table C.9). Installer respondents most frequently reported having viewed the *Contractor Participation Forms* page on the *www.nwductless.com* website (20 of 24) and the *Find an Installation Contractor in Your Area* page on the consumer website *www.goingductless.com* (8 of 24). Additionally, 8 of the 30 installers reported that they had visited the consumer website to confirm that their companies were listed there.

Table C.9: Installer Webpages Viewed (Multiple Responses Allowed)

WEBPAGE VIEWED	INSTALLERS (N=30)
Contractor Participation Forms Page	20
Consumer Website *www.goingductless.com* (to confirm being registered as an installer)	8
Contractor Getting Involved Page	5
Contractor Product Information Page	5
Contractor Resource Page	4
Marketing Materials Page	3
Calendar Page	2
Contact Information Page	2
Participating Utilities Page	2

Overall, those installer respondents who viewed the websites provided high marks regarding the degree of relevance of the information contained on the sites. On a one-to-five-point scale, where one represents "not at all relevant" and five represents "extremely relevant," 10 of the 12 installer respondents who provided relevant responses gave ratings of four or higher **(**Table C.10**).**

Table C.10: Installers' Rating of the Degree of Relevance of the Information Contained On the Project Website(s)

RATING (1-5)	INSTALLERS (N=12)
5 – Extremely Relevant	6
4 – Very Relevant	4
3 – Somewhat Relevant	1
2 – Not Very Relevant	1
1 – Not At All Relevant	0
TOTAL	**12**

Installer respondents' positive responses concerning the project website indicate that installers are not collectively averse to the web. We hypothesize that the pilot may be successful in attracting a larger number of installers to participate in the pilot project by providing both web-based and paper-versions of project information.[61]

Utility Response to Pilot

In general, interviewed utility contacts provided positive feedback regarding the pilot project and commented that it had been a success. However, given that project literature specified that utilities were free to participate in the pilot project at "whatever level they choose," it is unsurprising that the type and level of involvement among utilities varied greatly. Almost unanimously, interviewed utilities reported a high level of participant satisfaction.

Comments from interviewed utility project managers included:

- *"It was highly effective, at least in our area, and almost to the point where it's been too effective. We get so many calls that we're spending a disproportionate amount of time on this one project."*
- *"It is a good program that gives customers the ability to have a heat pump in a home that wouldn't ordinarily be able to afford one."*
- *"The project was extremely successful and customer satisfaction is extremely high."*
- *"This has proven to be a successful business model for installers to get into and they are able to market it successfully."*

[61] Lending credibility to the efficacy of this approach, one DHP distributor reported having created a booklet that provides detailed descriptions of the various utility program offerings. This booklet was reportedly very well received by installers.

Most interviewed utilities reported meeting or exceeding their DHP installation goals. In general, utilities that reported having not met their installation goals attributed this to the climate in their service territory and/or a lack of marketing. Regarding climatic barriers, one utility contact reported, "This program is a very good idea, but there are a couple of climate zones that are going to struggle and mine is one of them."

Sample Disposition

We interviewed managers of utilities participating in the NW Ductless Heat Pump Project via phone in September of 2009. Each interview took approximately 60 minutes to complete. Our sample of 23 utilities reflected the population of participating utilities in terms of geography, program structure, customer size, and incentive amount. Seventy-four total utilities registered to participate in the project, although 15 had completed no installations at the time of the interviews.

Population Characteristics

Of the total population of 74 utilities, 46 utilities followed the standard $1,500 incentive structure while 17 offered smaller incentives ranging from $400 to $1,350. Two utilities offered an incentive over the standard amount up to $2,375. Fifteen utilities intended to perform quality assurance inspections on 100% of their installations.

Table C.11 illustrates the number of utilities operating in each of the three cooling zones used to segment participants.

Table C.11: Utility Count by Cooling Zone

COOLING ZONE	NUMBER OF OPERATING UTILITIES
1	24
2	30
3	10
NA	10

Utility Program Design

The utility pilot projects followed the NW Ductless Pilot Project design to varying degrees. The basic element of awarding an incentive to offset the costs of the DHP remained consistent but the amount of the incentive and who received the incentive varied. Some utilities signed the incentive over directly to the contractor to offset the cost of the installation immediately. The majority of incentives went directly to the participants in the form of a rebate check. In addition

to the one time incentive, some utilities offered a loan program or financing to further assist the participants in paying for their DHP.

Pilot project design around paperwork, forms, preapproval, and qualification also differed by utility. Some utilities performed their own preapproval by verifying usage histories while some sent forms to program implementation contractor for review and preapproval. Other utilities required only one stage of approval. Utilities could create custom forms or use the original forms from the project itself. Contractors submitted forms or customers submitted the forms themselves. It was important that contractors understand which forms were for customers of each utility and to know enough about the individual pilot program structures.

Even the final approval for acceptance into the pilot programs varied. Some utilities allowed forced air homes to qualify for the incentive while others did not. Other projects allowed multifamily homes, homes with gas lines, or homes that had met minimum levels of insulation to participate. According to utility contact interviews approval criteria, such as the number of indoor heads allowed or natural gas hookups, changed during the span of the pilot and may change again as utilities design their continuing programs for DHPs.

The variation across utility pilot projects resulted in some confusion among contractors although the majority of utilities stated that they were able to reduce confusion through orientations, outreach to contractors, and providing information to contractors when they contacted the utilities. Utility staff indicated that they maintained frequent contact with contractors to answer questions and address issues around paperwork.

Utility managers cited a desire to control their own programs, wanting to deal directly with their customers, or special circumstances related to their own organization as reasons for differing from the pilot project design. Utilities also had various justifications for allowing homes with natural gas hookups or forced air furnaces. Usually utilities that chose to allow forced air did so because there was not a high percentage of a forced air furnace homes in their service territory.

The two interviewed utility project managers whose utilities had the largest amount of completed installations reported having followed the NW Ductless Pilot Project as initially developed without major modification. The utility with the most installations commented “We don’t divert from the program at all- 100% as written- we have had great success with it”. This program did offer loans for their customers along with the incentives, which were not standard in the project. Utilities with completed few to no installations attributed their low installation rates to the climate in their territory and a lack of marketing. One such utility representative commented that “it’s a very good idea, but a couple of climate zones are going to struggle and mine is one of them”. This utility represents a region with very cold weather.

Incentive Structure

Incentives offered by the participating utilities ranged from $400 to $2,375. Bonneville Power Administration (BPA) provided an incentive of $1,500 which could split into incentives for both the contractor and customers, pay for administration associated with the program, or go entirely

to the participant. Forty-five utilities offered exactly $1,500. All of the interviewed utilities with incentives over $1,000 reported that their incentive amount was sufficient to motivate participants to act. Interviewed utilities that were planning to expand their program into the next year are considering decreasing the incentive amount. Table C.12 shows the incentives amounts offered for the population of utilities participating in the NW Ductless Pilot.

Table C.12: Incentive Amount

INCENTIVE AMOUNT	NUMBER OF OPERATING UTILITIES
$100 to $500	1
$500 to $1,000	2
$1,000 to $1,250	18
$1,250 to $1,500	51
$1,500 and Over	2

In addition to the standard incentives offered through the pilot project, participants also were eligible to receive other incentives in the form of state and federal tax credits and rebates from manufacturers. Mitsubishi, for example, offered an additional $150- $300 rebate on qualifying units for a six week period towards the end of the pilot[62].

Utility Project Designs and Processes

Responses from interviewed utility contacts indicate that utility program structures followed the pilot project design to varying degrees. Project forms, preapproval, and qualifications frequently differed among interviewed utilities.[63] It is noteworthy that contacts representing the two utilities reporting the largest number of DHP installations, reported implementing the project as designed, without major modification.

Regarding challenges associated with project implementation, utility contacts most frequently reported "maintaining quality DHP installations" and "processing paperwork." Additionally, utility contacts representing utilities reporting high numbers of DHP installations frequently reported being somewhat overwhelmed with the large customer response. In general, utility contacts reported that project implementation staff's efforts to support their programs (including staffs' provision of administrative, customer, and marketing support) were helpful.

---

62 Mitsubishi Website, *http://www.mehvac.com/rebate/* , accessed 10/1/09

63 Utilities varied in regards to whether they qualified supplemental gas lines, forced-air furnaces, and multi-family homes. Contacts from one utility reported that participating homes were required to have minimum levels of insulation.

Three-quarters (15 of 20) of interviewed utility contacts reported that their utilities required preapproval for DHP installations.[64] Although some utilities reported conducting their own preapproval process, most relied on the program implementer. Contacts from among each of the groups we interviewed – from utility program managers to participants – reported delays due to pre-approval paperwork processing.[65] Program implementation contacts reported that they successfully increased the speed of paperwork processing by hiring additional staff.

Utility contacts expressed frustration that pre-approval processes conducted by the program implementer do not effectively screen out all customers who should not be eligible to receive incentives. Similarly, program implementation contacts questioned the overall value of their conducting pre-approvals on behalf of utilities. According to one program implementation contact:

- *"More often than not, our pre-approval processing isn't very effective, because we rarely, if ever, reject forms during the pre-approval process. When we do, it's because the homeowner placed a check in the grey zone of the form, or because utility staff tells us to reject it based on their own screening processes."*

Cost of DHP Installations

The cost of a DHP unit was an important consideration in determining incentive amounts. Prior research estimates that installation cost ranged between $1300 to $1500 per ton for the units, plus an additional $1500 or more for the installation. The same study indicated that distributors' average mark-up is similar to other HVAC equipment at 34-36% including costs associated with shipping, damaged units, support, and marketing[66].

The cost of DHPs installed during the program varied by area. Interviewed pilot project staff cautioned against making decisions based on the prices of DHPs, since the market remains untransformed and supply chains could be reformed, potentially decreasing the cost of DHP's. Utility representatives also indicated that they were waiting for data on energy savings to inform their decisions about the value to DHP's.

Interviewed utility contacts reported that the average DHP installation ranged from $2,600 to $6,200, with most installations costing around $5,000. Those utilities whose installations were over $5,000 reported frustration since the program implementation contractor had estimated $5,000 as the install costs and some had given their customers that figure. Another utility contact

---

64 In general, the interviewed utility contacts who reported performing customer preapproval in-house indicated that they verified customer usage by performing billing analysis.

65 One utility respondent commented that delays may have been the result of "the number of hands involved with the paperwork." This contact further explained that project paperwork goes first to the program implementer, next to installers, and then back to the program implementer.

66 NAHB Research Center, " Ductless Heat Pump Market Research and Analysis", June 2008, p. 17

suggested that the suppliers were driving up the cost of the units. One utility contact stated that "The units cost $1,800- $2,000 and they can be installed in a day." Another utility respondent commented that the prices along the I-5 corridor seemed elevated because the markets in that area could support those cost.

Marketing Activities

Utilities had the opportunity to adapt marketing materials supplied by the NW Ductless Heat Pump Project or develop their own advertising materials. Several utility contacts reported difficulty deciding which customers to target with advertising efforts. One commented, "We've done a couple of mailings, and we do get a response, we get a lot of calls, but not a lot of 'takers'". The majority of utility respondents mentioned targeting customers based on their electric usage; however, one contact mentioned that this approach can be problematic because many potential pilot participants have wood heat as a primary heat source.

Utilities with smaller goals for total installations tended to have more limited marketing efforts. Those utilities that put effort into marketing reported having the most success with mailings and bill inserts (Table C.13).

Table C.13: Marketing Efforts

TYPE OF MARKETING	NUMBER OF UTILITIES (N=20)
Newspaper/Print	9
Bill Stuffer	8
Contractors	6
Direct Mail	6
Website	5
Newsletter	4
Radio	3
TV	1
Attended Events	1

Bill inserts were reported as highly successful measures as well as other print media[67]. Utility contacts also frequently mentioned that word of mouth was a large factor in generating interest for the pilot project. Contacts appreciated having available as well as the opportunity to put their logo on the materials. On utility contact commented that the language provided by the program

[67] Responses from participants also indicated that print media was the most effective marketing strategy.

implementation contractor resources assisted them in communicating about the project and DHP technology in ongoing marketing efforts.

None of the utilities suggested a desire for any additional marketing materials. One utility contact commented that the website, while being an excellent resource, did not early on have enough pictures of what the units looked like. This omission forced participants to do research on other sites to address their concerns about the appearance of the units. Another utility contact reported that the utility had created its own "how to participate" guidelines sheet for their contractors because the process flow on the website was confusing.

Utility Interactions with Pilot Staff

Utility contacts, aside from one, reported frequent interactions with project staff. Most frequently, utility contacts reported interacting with project staff to address participant questions or check on the status of paperwork processing. Typically, utility contacts addressed questions regarding paperwork and consumer eligibility to the program implementer and turned to NEEA when the program implementer was unable to answer questions. In general, utility respondents provided high ratings regarding the responsiveness of both the program implementer and NEEA. However, interviewed contacts from at least three utilities reported that the program implementer was frequently delayed in responding to requests for information and (as noted previously) in processing pre-approval forms.[68]

Utility Successes

Interviewed utility contacts gave positive feedback about the pilot project as a whole and reported that the project had been a success. Most interviewed utilities met or exceed their installation goals with only a few reporting that they had not, due to funding issues or lack of consumer interest. A common thread throughout the interviews was the high levels of participant satisfaction. Utility contacts reported that their customers love the DHP units and were happy with the program experiences. Customer satisfaction translated into more installations for the utilities. Several utility contacts reported that word of mouth was a valuable tool for increasing installations. Some contacts reported that there were 'a lot of homes with DHPs' on the same street" due to word of mouth and participant enthusiasm for the units.

Contacts considered the pilot project to have been successful in the following areas: generating awareness, creating demand, training contractors, and maintaining cost effectiveness. In some cases utility contacts reported having "a higher level of success than anticipated". Utility contacts described the program as "valuable", "worthwhile" and "a successful market transformation period." Other successes listed by utility respondents included making DHPs affordable to

[68] One utility contact commented that the program implementation contractor's turnaround time for processing forms was closer to a week than the promised three days, which delayed installations.

customers who would not have been able to afford them otherwise and educating contractors about a relatively new technology.

Utility Challenges

Along with the many successes, utility respondents also discussed the challenges for their utilities and outcomes. It was a challenge for some utilities to determine which customers to target with early marketing efforts. One utility contact suggested that the technology was slow to catch on until a few people got them and others could actually see the units in action. Utility contacts also mentioned DHP appearance, a common concern mentioned by contractors, as an initial concern for customers. A small number of interviewed utilities also noted issues with some of the early DHP installations. Quality assurance efforts and continuing contractor education as the program progressed addressed these issues. Installation issues included line sets left uncovered which results in ugly wiring outside the home and leaves components exposed to UV ray damage.

When programs did catch on, sometimes due to unexpected attention such as a newspaper article, some utility project managers reported being overwhelmed by customer contacts and interest. Some project managers expressed that they like their customers to deal with them directly, rather than program implementation contractor. However, in this case, this preference resulted in a drain on their staff handling so many calls and applications. Since the project had provided alternative means for handing participant interest some utilities mentioned plans to keep the NW Ductless or the program implementation contractor involved assisting in the future.

Utilities contacts also expressed frustration with the amount of paperwork required by the pilot project, forms being changed during the pilot program lifespan, and the processing of approvals. Lost paperwork, delays, and confusion from contractors over the approval process were common complaints. These issues reportedly decreased as the program continued, although one utility contact noted that contractor turn-over resulted in new hires not understanding program requirements. As the contractors who were oriented may have left their companies the companies remained on the approved contractor list without further education and therefore new employees who were not oriented themselves required more clarification and guidance later in the pilot.

Some program structures required preapproval and entry of all data into project tracking systems before issuing approval. In such cases, paperwork went back and forth between utilities and the program implementation contractor several times creating opportunity for the paperwork to be misplaced. Utility respondents with paperwork issues indicated that they will be modifying paperwork processing if they continues to offer the DHP incentives.

Utility Satisfaction with Pilot Project Structure

Elements of the pilot project structure that were positively reviewed by utilities included having the program implementation contractor available to do quality assurances or field work and program implementation staff handling approvals and paperwork. Since the program

implementation staff was able to take over some of the project related tasks utilities did not need to provide additional staff to support the program. Respondent's comments about the project structure included that it was "simple compared to other projects" and that "having program implementation contractor handle the paperwork and approvals took a lot of the weight off our shoulders".

The contacts at utilities whose programs completed many more installations or whose programs required more in-house paper work and customer assistance felt that they did not have enough staff to support the demand. Even with the potential need for staff one utility contact commented that "dollar for dollar this is one of the best programs".

Customer satisfaction was universally high but utilities stressed that they are waiting for evaluation and metering results to determine the overall effectiveness of the program.

Utilities had few complaints about the program structure. Since utilities had some flexibility to determine their incentive amount, paperwork flow, and eligibility requirements most were satisfied with the structure of the project and their individual programs. Utility contacts reported that in some cases the paperwork processing causes delays. One respondent commented that delays may have been the result of "the number of hands involved with the paperwork since paperwork has to go through the program implementation contractor, to contractors, back to the program implementation contractor, etc. It creates confusion". The few issues that utilities had were characteristic of a pilot program and included frustration over changes to forms partway through the pilot and a lack of numbers to demonstrate energy savings from the new technology. One utility contact also commented that there was too much focus on marketing for a pilot program and that the marketing money would have been better spent getting the technology to the customers and measurement.

Utility Interactions with Project Staff

Utility contacts, aside from one, reported frequent interaction with project staff. Utility respondents rated the responsiveness of NEEA, the program implementation contractor, and NW Ductless all highly. The typical interaction between a utility and project staff was usually to address a participant question or check on the status of paperwork. NEEA was the source of answers for unusual requests or special circumstances while the program implementation contractor addressed paperwork concerns and consumer eligibility questions. Respondents described NEEA staff as "prompt and thorough". Program implementation contractor staff also received positive comments although at least three utilities mentioned delays in the processing of forms or getting information. Another utility contact commented that the turnaround time for forms was closer to a week than the promised three days which delayed installations and placed the utility in an awkward position of waiting.

Utility Interactions with Contractors & Installers

The NW Ductless Heat Pump Project required oriented contractors perform all installations. All except one of the interviewed utility managers used the list of approved contractors provided by the project. The one utility that had their own preferred contractor list used the same contractors for all programs and had the list constructed prior to the project. Most interviewed utility contacts had frequent contact with the installers and contractors performing installations in their area. The amount of contact ranged from bi-weekly phone conversations to daily emails. Contractors often contacted the utilities to get information about the project or discuss the qualification of a potential DHP participant. Some utility managers reported that they had more interaction with contractors early in the project but this had tapered off. Utilities which were planning to continue their programs on past the end of the pilot are seeing an increase in contacts from contractors who want to know the specifics and requirements of the ongoing programs.

Utility contacts reported some challenges around the contractors in their pilot projects. One contact mentioned that contractors may have attended the contractor orientation to get information and did not realize they would be opting into the program. This same utility representative reported contacting utilities directly to see if they were actually participating and contracting the program implementation contractor to get contractors from the list who had not been actively participating removed. Another utility also reported having to eliminate contractors who had no installs from the list.

One contact noted that some contractors did not understand the DHP technology or have faith in it. Some contractors "aren't very confident of the long range reliability of the DHP". Contractors also may not have understood the project requirements. At least two utility contacts reported that contractors were installing whole house systems instead of just adding one indoor unit to displace electrical load as the program intended. Several utility respondents mentioned having to educate their contractors, even after the contractor orientations. Those utility managers who were able to attend some of the contractor orientations reported that while the sessions were effective at presenting background information on the project itself contractors still needed more information about the specific program structures in their service area.

At least three utility managers also reported issues with low quality installations. The most mentioned issue with installations was contractors leaving the linesets uncovered, which is unsightly and against project requirements. Utility contacts attempted to work with contractors to address these issues and clarify requirements. One contact who mentioned this issue said that it has been resolved and now "I don't have any reservations about 99 percent of the installations". One respondent noted that the amount of quality assurance inspections actually performed was less than expected and was concerned that an insufficient amount of quality assurance monitoring took place.

Other utility managers reported that the contractors were driving the project: "our excellent group of contractors are really running the program- they have taken this on and are out selling the product for us". At least three utility contacts reported successfully co-branding the marketing resources the program implementation contractor provided with their contractors. One

commented: “This thing is selling itself now; our contractors are seeing that this really sells, and now contractors are marketing it themselves”. Another contact added that contractors who did some advertising have been much more successful than those who did not. Most interviewed utilities maintained strong communication with their contractors and acknowledged that the contractors were a major influence on the success of their programs.

Utility Plans for Future DHP Programs

At least sixteen of the interviewed utility managers said that the region should continue to offer incentives for DHPS. Two more tentatively said yes, pending the demonstration of energy savings. The others were not sure. Respondents placed importance on the results of the ongoing evaluation of the pilot and explained that they want to see results as soon as possible to inform their choices about future expansion plans. Those utilities that had already made the decision to continue the programs on were considering minor tweaks to eligibility and paperwork processing. Some wanted to include homes which had been previously been disqualifying based on the pilot restrictions. Others wanted to bring the paperwork in house, lower the incentive amount offered, or eliminate preapproval processes. Some, however, did not want to make any substantial changes to their programs. At least four utilities saw a role in their on-going programs for the current program implementation contractor while only two thought NEEA would be involved. Two other utilities hoped to have the program implementation contractor and NEEA as consulting resources but not formally involved in their programs. One commented that their utility “doesn’t have much expertise in house with DHPs’ so they would need to use a consultant for that so NW Ductless could be helpful there”.

Outreach and recruitment

Manufacturer contacts reported that their pre-pilot residential DHP marketing messages emphasized energy efficiency, zonal control, simple installation, energy savings, comfort, quiet, brand recognition, and environmental attributes. Representatives from the majority (5 of 6) of participating DHP manufacturers reported that they adjusted marketing activities in response to the pilot project (Table C.14). These changes included: advertising the pilot project and the available rebates; increasing the number of installer DHP trainings; and emphasizing heating (as opposed to cooling) capabilities of DHPs to appeal to northern climates.

Table C.14: Pre- and Post-Pilot DHP Marketing Activities Among Manufacturer Contacts (N=20)

MANUFACTURER	PRE-PILOT MARKETING MESSAGE	CHANGES IN MARKETING RELATED TO PILOT
Mitsubishi	Manufacturers reported emphasis on energy efficiency, zonal control, and simple installation. Distributors reported emphasis on energy efficiency and environmental attributes.	Manufacturers reported increased emphasis on heating attributes of DHPs to appeal to pilot participants. Distributors reported working to increase contractor participation in the pilot.

Continued

MANUFACTURER	PRE-PILOT MARKETING MESSAGE	CHANGES IN MARKETING RELATED TO PILOT
Fujitsu	Manufacturers and manufacturer representatives reported emphasis on energy efficiency, energy savings, comfort, and environmental attributes.	Manufacturers reported increased advertisement. Distributors reported changing marketing messages to emphasize available rebates.
Daiken	Manufacturers reported emphasis on energy efficiency and environmental attributes.	Manufacturers and distributors reported increased marketing.
LG	Manufacturers focused on public recognition of the LG brand (90% brand recognition in U.S.).	Distributors conducted direct mailings to potential pilot participants.
Sanyo	Sanyo's marketing slogan is: *Think Gaia*. Manufacturers reported, "The entire focus of Sanyo is green and Mother Earth."	Sanyo distributors reported increasing contractor DHP trainings.
Comfort Star	Manufacturer contacts reported emphasis on comfort quiet, efficiency, and simple installation.	No reported changes.

Program staff reported that utility marketing is a key component of the success of the pilot project. Installer respondents reported that DHP customers had most frequently heard about the pilot from their utilities, locating the installer's name and contact information via utility links to lists of approved installers.

Project implementation staff developed various marketing materials to assist utilities and installers in their marketing efforts. In general, utility contacts reported that these marketing materials were helpful. Utility contacts reported that bill inserts and other print media were highly successful marketing strategies. Additionally, several utility contacts reported that because of the high level of participant satisfaction with DHPs and with the project, word-of-mouth proved to be a valuable tool for increasing the number of DHP installations. Consistent with these remarks, participant respondents frequently mentioned word-of-mouth (16%) as a source of project awareness.

Participating installation firms received program benefits, including access to project marketing materials and customer outreach assistance. Half (14 of 28) of installer respondents reported that they used marketing materials supplied by the project (Table C.15). Of the 13 installer respondents who reported that they did not use pilot-provided marketing materials, five reported that they relied solely on utility-marketing of the program. One of the installer respondents reported not being aware of the availability of pilot-provided marketing materials. This installer reported issuing a direct mailing of a marketing piece designed in-house to customers with electric heat. This contact further reported, "The fact that we are spending marketing dollars shows that we are making money from DHPs."

Table C.15: Installers Who Used Pilot Marketing Materials

USED PILOT MARKETING MATERIALS	INSTALLERS (N=28)
Yes	14
No	14
TOTAL	**28**

Thirteen of the 14 installer respondents who reported that they used marketing materials supplied by the project reported using contractor sales sheets. Two of the 14 reported that they used pilot-supplied door-hanger templates.

Of the 14 installers that reported using pilot-provided marketing materials, 12 reported limiting their use of the materials to provision of contractor sales sheets to customers during sales calls (Table C.16). A small number of installer respondents reported distributing pilot-provided marketing materials at home shows (2 of 14), displaying materials at businesses (1 of 14) and/or distributing materials to neighbors in the vicinity of completed DHP installations (1 of 14).

Table C.16: Installers Use of Pilot-Provided Marketing Materials (Multiple Responses Allowed)

HOW INSTALLERS USED PILOT-PROVIDED MARKETING MATERIALS	INSTALLERS (N=14)
Provided Materials to Customers During Sales Calls	12
Distributed Materials at Home Shows	2
Displayed Materials at Businesses	1
Distributed Materials to Neighbors in Vicinity of DHP Installation	1

Eight of the 30 installer respondents requested that the pilot provide additional resources (Table C.17).

Table C.17: Installer Requests for Additional Resources

ARE ADDITIONAL RESOURCES NEEDED?	INSTALLERS (N=30)
Yes	8
No	18
Don't Know	4
TOTAL	**30**

Installer respondents' marketing-related requests included increased advertising of the pilot project, provision of contact information of households with electric heat, and provision of

oversized postcards for installers to distribute to prospective customers.[69] Installer respondents also requested that the pilot's eligibility requirements be expanded to include new construction and that the training required for approved installers be increased (Table C.18).[70]

Table C.18: Additional Resources Requested by Installers (Multiple Responses Allowed)

SATISFIED WITH MANUFACTURER SUPPORT	INSTALLERS (N=8)
Increased Program Marketing	4
Provide Postcards Explaining the Program	2
Expand Program Qualifying Requirements	1
Extend Rebate Period	1
Provide Additional Training	1
Provide Contact Information For Households With Electric Heat	1

PARTICIPANT SATISFACTION WITH PILOT PROCESSES

Overall, participant respondents reported high levels of satisfaction with pilot project implementation processes. Eighty-eight percent of participant respondents reported being "very or extremely" satisfied with the ease of understanding incentive qualification requirements, 90% reported being "very or extremely" satisfied with the ease of finding a installer, 81% reported being "very or extremely" satisfied with the ease of locating program information, and 83% reported being "very or extremely" satisfied with the speed with which they received their incentive checks.

Just under half (44%) of participant respondents surveyed had visited at least one website before making their DHP purchase, to research DHPs and/or the available incentives. Participants sought both general information on DHPs and specific information on DHP models that qualify for pilot incentives. Table C.19 displays the websites that participant respondents most frequently accessed before making their DHP purchase. In the *Other* category, participant respondents most frequently reported accessing the ENERGY STAR® website and/or websites providing general information on DHPs.

---

69 One of the installer respondents suggested that postcards would be more eye-catching and would require less postage than the existing project flyer.

70 This interviewed installer explained that if the program were to qualify such installations, building contractors would be more likely to display DHPs in their showrooms, thus increasing referrals to DHP installers. This contact further explained that HVAC equipment displayed at building contractors' showrooms generate the majority of customer referrals.

Table C.19: Websites Visited by Participants Before Purchase of a DHP

WEBSITE	PERCENT VISITING (N=102)
Utility	34%
Manufacturer	23%
Contractor	15%
NEEA	6%
Energy Trust of Oregon	3%
Other / Don't Remember	19%
TOTAL	**1%**

DHP installers were frequently participants' primary point-of-contact with the project. In general, participant respondents provided high ratings regarding the activities of installers. Over 90% of participant respondents "agreed" or "strongly agreed" that "the installer was not disruptive during the installation," "the installer did good quality work," "finding an installer was easy," and that "the installer was knowledgeable about the project" (Table C.20). A slightly lower percentage of participant respondents "agreed" or "strongly agreed" that "the installer had sufficient technical knowledge of DHPs" (89%) and that "the installer provided enough education on how to operate the DHP" (82%). As noted previously, multiple participant respondents reported that installers should spend additional time demonstrating proper operation and maintenance of DHPs.

Table C.20: Participant Satisfaction with Installers

SATISFACTION CRITERIA *	5	4	3	2	1
The installer was not disruptive during the installation (n=201)	83%	12%	2%	1%	1%
Installer did good quality work (n=220)	81%	12%	4%	2%	0%
Finding a contractor was easy (n=220)	79%	14%	4%	2%	2%
The installer was knowledgeable about the pilot (n=212)	74%	16%	7%	2%	1%
The installer had sufficient technical knowledge of DHPs (n=213)	69%	20%	7%	2%	1%
The installer provided enough education on how to operate DHP (n=221)	54%	28%	10%	7%	2%

* Participant respondents were asked to rate the activities of installers on a five-point scale, where "1" represented "strongly disagree" and "5" represented "strongly agree".

D SURVEY INSTRUMENTS

NEEA DHP PARTICIPANT SURVEY (WAVE 1)

1. Are you…
   - ❍ an owner occupant of this address
   - ❍ an owner of this address but renting out
   - ❍ renter
   - ❍ DK/REF

2. Since installing the DHP, have you used it for heating? How about cooling?
   - ❑ heating
   - ❑ cooling

Prior to DHP

3. What types of improvements, if any, have you made to your home during the past year? [DO NOT READ]
   - ❑ NONE
   - ❑ energy efficient upgrades
   - ❑ redecorated a room(s)
   - ❑ refurbished the outside of home
   - ❑ updated kitchen
   - ❑ updated a bathroom
   - ❑ added space (room addition, addition)
   - ❑ added storage space
   - ❑ finished basement to add more living space
   - ❑ Flooring
   - ❑ Painting
   - ❑ Other (please specify)

   If you selected other, please specify

4. What steps, if any, have you taken in the past year to reduce your energy use? [DO NOT READ]

- ❑ NONE
- ❑ added insulation
- ❑ installed/replaced windows or doors
- ❑ installed programmable thermostats
- ❑ replaced an appliance(s) with energy efficient appliance(s)
- ❑ installed CFLs or energy efficient lights
- ❑ caulked windows and doors, weather stripping
- ❑ installed ceiling fans
- ❑ installed solar panels
- ❑ installed low-flow shower heads, aerators
- ❑ installed new water heater
- ❑ Installing the DHP
- ❑ Behavior changes
- ❑ Other (please specify)

If you selected other, please specify

5. Have you participated in any energy-related programs in the last year other than the DHP incentive, such as a home audit or incentives for an energy-efficient product purchase?

Precodes

- ❍ Audit
- ❍ Appliance Rebate/Incentive

6. How would you rate your overall satisfaction with the heat you had before the DHP in your home? Were you…

- ❍ extremely satisfied
- ❍ very satisfied
- ❍ somewhat satisfied
- ❍ not very satisfied
- ❍ not at all satisfied
- ❍ DK/REF

Decision-Making

7. How did you first hear about DHPs? [DO NOT READ]

- ❍ Utility's website/email/bill insert
- ❍ Contractor/installer
- ❍ TV
- ❍ Radio
- ❍ Door hanger
- ❍ Newspaper
- ❍ Internet
- ❍ Friend/Neighbor
- ❍ DK/REF
- ❍ Other (please specify)

If you selected other, please specify

8. I'd like to know what influenced your decision to purchase a DHP. I am going to read a list of characteristics. For each one please tell me how influential it was on a scale of 1 to 5, where 1 means "not influential at all" and 5 means a "critical influence"—meaning you would not have purchased a DHP without it. How influential was…?

	1	2	3	4	5	DK/REF
Energy efficiency of DHP compared with other types of electric heat	❍	❍	❍	❍	❍	❍
Quiet operation	❍	❍	❍	❍	❍	❍
Having heating and cooling in a single unit	❍	❍	❍	❍	❍	❍
The possible reduction in your heating bill	❍	❍	❍	❍	❍	❍
Less expensive installation cost of DHP over a ducted system	❍	❍	❍	❍	❍	❍
The potential for increased comfort	❍	❍	❍	❍	❍	❍
Increasing the value of your home	❍	❍	❍	❍	❍	❍
The relative safety of DHP heating	❍	❍	❍	❍	❍	❍
Reduced environmental impact	❍	❍	❍	❍	❍	❍

9. Did anything else influence your decision to purchase a DHP?

10. Did you visit any websites before you made your purchase to look for information about the DHP or incentives?

- ❍ Yes
- ❍ No
- ❍ Not Sure/REF

11. Which Website(s)?

- ❑ NEEA
- ❑ Utility
- ❑ Energy Trust Oregon
- ❑ Contractor
- ❑ Manufacturer
- ❑ DK/Don't Remember/REF
- ❑ Other (please specify)

If you selected other, please specify

12. Did you find enough information on this website?

- ❍ Yes
- ❍ No
- ❍ Not Sure/REF

13. [IF NO] Can you please elaborate on what you did not find?

Free Ridership

14.

	When your contractor provided you with a pricing quote, what kind of incentives did they discuss with you or include in the bid? [DO NOT READ]		If [CHECKED ITEM IN Q7] was not available, would your decision to buy a DHP have changed?		
	Mentioned	Void	Yes	No	DK/REF
Utility's Incentive	❍	❍	❍	❍	❍
Energy Trust's rebate	❍	❍	❍	❍	❍
Oregon Department of Energy's Residential Energy Tax Credit	❍	❍	❍	❍	❍
Federal tax credit, stimulus credit, Obama's tax credit	❍	❍	❍	❍	❍
Montana Tax Credit	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍
Not sure, but some incentives included	❍	❍	❍	❍	❍
DK	❍	❍	❍	❍	❍

15.
- ❍ AT LEAST 1 "YES" OR "DK"
- ❍ ALL "NO"

16. If the incentive(s) you received were not available, how would it have changed? [DO NOT READ] [PROBE]
- ❑ installed the DHP anyway
- ❑ postponed the purchase of the DHP
- ❑ installed a less expensive DHP system
- ❑ installed some other type of heating equipment
- ❑ installed some other type of cooling equipment
- ❑ Not installed a DHP at all
- ❑ DK/REF
- ❑ Other (please specify)

If you selected other, please specify

17. Could you describe what you heard about your utility's rebate program?

18. Before learning about the DHP and incentives, how seriously had you considered installing some new heating equipment? Would you say you had …?
- ❍ seriously considered
- ❍ thought somewhat
- ❍ never considered installing new equipment
- ❍ DK/REF

19. What new heating equipment were you considering? [DO NOT READ]
- ❑ ducted furnace
- ❑ ducted heat pump
- ❑ gas conversion
- ❑ hydronic system
- ❑ boiler
- ❑ DK/REF
- ❑ Other (please specify)

If you selected other, please specify

20. I'd like to know whether you had any of the following concerns about the DHP prior to the installation. Please rate each possible concern using a five-point scale, where 1 means 'not at all concerned' and 5 means 'extremely concerned'. How concerned were you about…?

	1	2	3	4	5	DK/REF
The purchase cost	❍	❍	❍	❍	❍	❍
The cost of running the equipment	❍	❍	❍	❍	❍	❍
The time it would take to get your initial investment back	❍	❍	❍	❍	❍	❍
Having to purchase more than one indoor unit to heat/cool a sufficient area of your home	❍	❍	❍	❍	❍	❍
The amount of maintenance the equipment would require	❍	❍	❍	❍	❍	❍

21. Were there any other concerns you had about DHP?

22. Precodes for Concerns
- ❍ Size of DHP
- ❍ Appearance

23. In what room is the indoor unit installed?

24. In what rooms are the indoor units installed?

25. Why did you decide to install more than one unit? [Probe: any other reasons?]

26. [If contractor not mentioned in previous] Did your contractor discuss any advantages or disadvantages of installing multiple units? If so what were they?

27. Was this space heated prior to the DHP installation?
- ❍ Yes, existing living space
- ❍ No, new living space
- ❍ Other (please specify)

If you selected other, please specify

28. Was the DHP installation as a part of a larger…?
- ❍ remodeling project
- ❍ room addition project
- ❍ other home improvement project
- ❍ or, just equipment upgrade
- ❍ DK/REF

29. When considering installing a DHP, how important was the brand of equipment? Was it…?
- ❍ Extremely important
- ❍ Very important
- ❍ Somewhat important
- ❍ Not very important
- ❍ Not at all important
- ❍ DK/REF

Heating/Cooling Equipment, Energy Use Behavior

Heating

30. READ: The following questions refer to the heat for your whole house, not just the area serviced by your DHP.

	16	16a. Did it run off of...						16b	16c	16d
	Before DHP, which of the following types of heating equipment did you use?	Electric	Propane	Kerosene	Oil	Other	DK/REF	Do you still use it?	Before DHP, which equipment did you primarily use for heating?	Which equipment do you primarily use for heating now?
Forced air furnace	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Baseboard heaters [ELECTRIC]	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Wall heaters	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Electric radiant heat [ELECTRIC]	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Water radiant heat	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑

	16	16a. Did it run off of...						16b	16c	16d
	Before DHP, which of the following types of heating equipment did you use?	Electric	Propane	Kerosene	Oil	Other	DK/REF	Do you still use it?	Before DHP, which equipment did you primarily use for heating?	Which equipment do you primarily use for heating now?
Wood heat	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
DHP [ELECTRIC]	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Space heaters [ELECTRIC]	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑
Other	❑	❍	❍	❍	❍	❍	❍	❑	❑	❑

31. How many portable space heaters do you currently have?
_____# OF SPACE HEATERS

32. After the DHP, do you use your space heater(s)…
- ❍ more than before
- ❍ the same as before
- ❍ less than before
- ❍ or, you haven't used at all?
- ❍ DK/REF

33. Before the DHP, approximately how much wood or pellets did you use in a season? (probe to capture both quantity and unit of measurement)

OF CHORDS OF WOOD _____

OF POUNDS OF PELLETS _____

Additional comment: _____

34. After the DHP, how much wood or pellets do you use in a season?

OF CHORDS OF WOOD _____

OF POUNDS OF PELLETS _____

Additional comment: _____

35. Before installing the DHP, at what temperature did you keep your main living space?
_____FAHRENHEIT

36. About what percent of your whole house was heated to that temperature on a regular basis?
_____% OF WHOLE HOUSE HEATED

37. For that main living space, did you set back the temperature at night or during the day when your house was vacant?
- ❍ Yes
- ❍ No
- ❍ Sometimes
- ❍ Don't Know/REF

38. Now, approximately what percent of your living space do you regularly heat with the DHP?
_____% OF LIVING SPACE

39. Do you set back the temperature at night or during the day?
- ❍ YES
- ❍ NO
- ❍ DK/REF

40. And what percent of your total living space do you continue to heat on a regular basis by equipment other than the DHP?
_____% OF LIVING SPACE

41. So, would you say you are now heating the space served by the DHP more, less, or the same as before?
- ❍ less
- ❍ more
- ❍ no change
- ❍ DK/REF

42. Why do you heat the space? [DO NOT READ]

- ❑ More people at home during the day
- ❑ Change in comfort
- ❑ Change in the number of rooms heated
- ❑ Cheaper to operate
- ❑ DK/REF
- ❑ Other (please specify)

If you selected other, please specify

43. What temperature do you typically keep your DHP set at? [NOTE: Clarify is that is for now or winter, try to get both. If they provide any details include them.]

_____FAHRENHEIT

44. Before DHP, did you allow some rooms in your house to be cooler than the main living rooms?

- ❍ Yes
- ❍ No
- ❍ DK/REF

45. Which rooms?

46. After DHP, do you allow some rooms to be cooler than the main living rooms?

- ❍ Yes
- ❍ No
- ❍ DK/REF

47. Which rooms?

Cooling

48. Do you have any type of air conditioning in your home?

Central Air:

- ❍ Yes
- ❍ No
- ❍ DK/REF

49. [If they say they have window air conditioning] How many window units do you have?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10
- ❍ 11 or more
- ❍ DK/REF

Additional comments

50. Have any type of air conditioning other than DHP?

- ❍ no
- ❍ yes
- ❍ DK

51. Before DHP, did you have any plans to buy an air conditioner—either a central system or window units?

- ❍ Yes
- ❍ No
- ❍ DK/REF

52. Which type?

- ❑ central
- ❑ window
- ❑ DK/REF

53. How many window units did you think you might buy?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10
- ❍ 11 or more
- ❍ DK/REF

Additional comments

54. Now that you've installed a DHP, do you (still) plan to buy an air conditioner?

- ❍ Yes
- ❍ No
- ❍ DK/REF

55. Which type?

- ❑ central
- ❑ window
- ❑ DK/REF

56. How many window units do you plan to buy?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10
- ❍ 11 or more
- ❍ DK/REF

Additional comments

57. After DHP, have you used any air conditioning equipment in addition to or instead of using the DHP in cooling mode?
- ❍ Yes
- ❍ No
- ❍ DK/REF

58. Which type?
- ❑ central
- ❑ window
- ❑ DK/REF

Satisfaction and Early DHP Experience

Now, I'd like to ask you specific questions regarding your program participation, installation, and your DHP unit.

59. First, please tell me how much you agree with the following statements using a 5 point scale with 1 being "completely disagree" and 5 being "completely agree" . How much do you agree that…..

60. Participation Process

	1	2	3	4	5	DK/REF
Locating program information was easy	❍	❍	❍	❍	❍	❍
Finding a contractor was easy	❍	❍	❍	❍	❍	❍
It was easy to understand incentive qualification requirements	❍	❍	❍	❍	❍	❍
The incentive arrived quickly	❍	❍	❍	❍	❍	❍

61. **Installers, Contractors**
The next questions are about your experiences with installers and contractors. Please tell me how much you agree with the following statements using the same 5 point scale . How much do you agree that…..

	1	2	3	4	5	DK/REF
The contractors were knowledgeable about the program	❍	❍	❍	❍	❍	❍
The contractors had sufficient technical knowledge of DHP	❍	❍	❍	❍	❍	❍
The contractor did good quality work	❍	❍	❍	❍	❍	❍
The contractor provided enough education on how to operate the DHP	❍	❍	❍	❍	❍	❍
The contractor was not disruptive during installation						

62. Additional Comment Space

63. Was there any part of the process that you felt took too long? [If they mention one of check boxes below check it in addition to recording the open ended response]

64. Check All that Apply:
- ❑ Utility Approval Process
- ❑ Wait time for Installation
- ❑ Time it Took to Receive Incentive
- ❑ Time it took to get unit running

65. Now, I'd like to know how your experience has been using the DHP so far. Please rate your satisfaction with the following aspects using a 5-point scale, where 1= "very dissatisfied," and 5= "very satisfied." How satisfied are you with…

	1	2	3	4	5	DK/REF
Sound level of indoor unit	❍	❍	❍	❍	❍	❍
Your electricity bill using the DHP, compared with before	❍	❍	❍	❍	❍	❍
The comfort of the new heat	❍	❍	❍	❍	❍	❍
The comfort of the new cooling	❍	❍	❍	❍	❍	❍

66. Do you have anything particular you don't like about your DHP?
- ❍ Yes
- ❍ No
- ❍ DK/REF

67. What is it?

68. Precodes for dislikes:
- ❍ Appearance
- ❍ Size
- ❍ Maintenance

Demographic Characteristics

Finally, I have a few questions about your household that will help us analyze the data across all respondents.

69. Gender [CODE WITHOUT ASKING]
- ❍ MALE
- ❍ FEMALE

70. How long have you lived in this home? Has it been…
- ❍ Less than a year
- ❍ 1-2 yrs
- ❍ 3-5 yrs
- ❍ 6-10 yrs
- ❍ more than 10 years
- ❍ DK/REF

71. How many members of this household are 65 year-old or above?
_____# HH MEMBERS

72. How many members of this household are 5 year-old or younger?
_____# HH MEMBERS

73. How many total members of this household are there?
_____# HH MEMBERS

74. Please stop me when I get to your age group. Is it…
- ❍ 29 yrs or younger
- ❍ 30-39 yrs
- ❍ 40-49 yrs
- ❍ 50-59 yrs
- ❍ 60-69 yrs
- ❍ 70 yrs or older
- ❍ DK/REF

75. What is the highest level of education you have attained so far? [DO NOT READ]
- ❍ Some high school or less
- ❍ High school diploma
- ❍ Some college/associate degree/trade school
- ❍ Four year college degree
- ❍ Some post-graduate studies
- ❍ Post graduate degree/Masters, PhD, professional degree
- ❍ DK/REF

76. Please stop me when I get the range of your household's total before-tax annual income:
- ❍ Less than $50,000
- ❍ $50,000 up to $110,000
- ❍ $110,000 or more?
- ❍ DK
- ❍ REF

77. Is it…
- ❍ Less than $10,000
- ❍ $10,000 up to $30,000
- ❍ $30,000 up to $50,000
- ❍ DK
- ❍ REF

78. Is it…
- ❍ $50,000 up to $70,000
- ❍ $70,000 up to $90,000
- ❍ $90,000 up to $110,000
- ❍ DK
- ❍ REF

79. Is it…

- ❍ $110,000 up to $150,000
- ❍ $150,000 up to $200,000
- ❍ $200,000 or more
- ❍ DK
- ❍ REF

80. What is your primary source for getting news? [DO NOT READ LIST]

- ❍ Newspaper
- ❍ Commercial radio [commercial radio or public radio?]
- ❍ Public radio
- ❍ Magazines
- ❍ TV
- ❍ Websites
- ❍ Blogs
- ❍ Friends
- ❍ Don't follow the news
- ❍ DK/REF
- ❍ Other (please specify)

If you selected other, please specify

2nd Wave Survey Information

That's all of my questions. we'd like to contact you again in about a year; at which time we would enter your name in a drawing for a gift card to thank you for your participation. We are interested in learning how your experience will be after the full year of living in a DHP-installed home. We will send you a postcard about a week prior to our survey call to remind you of the event.

81. May we contact you again at that time?

- ❍ YES
- ❍ NO
- ❍ DK/REF

82. We'd like to speak to you next year for consistency- may I have your name?

Thank you very much for your participation in the DHP Pilot Project, and I look forward to speaking with you next year.

Thank you very much for your time today.

To be qualified for this survey, you need to be an owner occupant of this address. Thank you very much for your time.

To be qualified for this survey, you need to have used either heating or cooling feature of your DHP. You may receive a call in later this year again. Thank you for your time.

DHP INSTALLER SURVEY

1. I would like to get a general idea of the types of work that you do. What types of equipment do you provide to customers? [Use pre-coded responses when possible, record details]

2. Precodes for Equipment:
   - ❑ Heating Equipment
   - ❑ Cooling Equipment (AC)
   - ❑ Water Heaters

3. And which services do you provide?
   - ❑ Sales
   - ❑ Installation
   - ❑ Repair
   - ❑ Maintenance
   - ❑ Other (please specify)

   If you selected other, please specify

4. And what utility or utilities are you working with for the pilot project?

5. Precode utilities:
   - ❑ Working with one utility
   - ❑ Multiple utilities

6. The pilot project uses the term "ductless heat pump" to describe this technology. Is there any other term you use to describe these units? [IF SO] what and why?

7. If any, how many ductless heat pumps had you installed before the pilot program began?

8. How about your company- how many had they installed before?

Program Orientation

9. How did you find out about the NW Ductless Heat Pump Project?

10. What motivated you to participate in the NW Ductless Heat Pump Project? [DO NOT READ, Check all that Apply]
    - ❍ Already install ductless heat pumps, wanted to qualify for incentives
    - ❍ Opportunity to expand business in a new area
    - ❍ Wanted access to program resources other than incentives
    - ❍ Other (please specify)

    If you selected other, please specify

11. Thinking back to the project orientation and considering your experiences since- how useful was the orientation on the following topics. Please answer on a scale of 1-5 with 1 being not at all useful and 5 being extremely useful. How useful was the information presented on:

	1	2	3	4	5	DK/REF
Eligibility requirements for households to participate	❍	❍	❍	❍	❍	❍
How to accurately complete the paperwork	❍	❍	❍	❍	❍	❍
The displace not replace theory behind the project	❍	❍	❍	❍	❍	❍

12. Do you have any comments about the orientation?

Assessment of Program Support and Website

13. Have you sought any additional information from the NW Heat Pump Project beyond what was provided in the orientation?
    - ❍ Yes
    - ❍ No
    - ❍ Not Sure
    - ❍ Other (please specify)

    If you selected other, please specify

14. What information?

15. Did you contact the project staff?
    - ❍ Yes
    - ❍ No
    - ❍ Other (please specify)

    If you selected other, please specify

16. If yes, how responsive was the program staff on a scale of 1-5 with 1 being not responsive at all and 5 being extremely responsive?

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5

17. Have you visited the NW Ductless website?

- ❍ Yes
- ❍ No
- ❍ Not Sure
- ❍ Other (please specify)

If you selected other, please specify

18. What parts of the website have you used? [Do Not Read, probe to code- "Anything else?"]

- ❑ Viewed homepage only
- ❑ Contractors-Getting Involved page
- ❑ Contractors- Participation Forms page
- ❑ Contractors- Marketing Materials Page
- ❑ Contractors- Product Information Page
- ❑ Contractors- Resource Page
- ❑ Calendar page
- ❑ Contact Information Page
- ❑ Other (please specify)

If you selected other, please specify

19. On a scale of 1 to 5 with 1 being not at all relevant and 5 being extremely relevant- how relevant to your needs was the information on the NW ductless site?

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

20. Have you used any of the marketing materials provided by the NW Ductless Heat Pump Project?

- ❍ Yes
- ❍ No
- ❍ DK
- ❍ Other (please specify)

If you selected other, please specify

21. Which ones? [PROBE: Such as the contractors sales sheets, newspaper ad templates (which one(s), or door hanger templates?) (which one(s)]

- ❑ Contractors Sales Sheet
- ❑ "Save Money and Energy Every Month" newspaper ad template
- ❑ "Your Utility Wants to Help You Upgrade" newspaper ad template
- ❑ "You Need an Electric heat Upgrade" newspaper ad template
- ❑ "Save Money and Energy Every Month" door hanger template
- ❑ "Your Electric Heating System Needs an Upgrade" door hanger template
- ❑ News paper template, not sure which one
- ❑ Door hanger template, not sure which one

22. How have you used the marketing materials provided by the project? [Do not read, probe "anything else']

- ❑ Mailed them to potential customers
- ❑ Displayed them at business
- ❑ Took them along on sales calls
- ❑ DK
- ❑ Other (please specify)

If you selected other, please specify

23. On a scale of 1 to 5 with 1 being not effective at all and 5 being extremely effective, how effective do you think these marketing materials are?

- ❑ 1
- ❑ 2
- ❑ 3
- ❑ 4
- ❑ 5
- ❑ DK/Ref
- ❑ Other (please specify)

If you selected other, please specify

24. Comment Space (if needed)

25. Are there any other resources the project could provide that might help you increase the number of ductless heat pumps you install?

26. You mentioned you have worked with more than one utility- how has the process varied across utilities?

27. Precodes for multiple utilities:
- ❍ Differed
- ❍ Same

28. Please describe your experience working with the utility you've been working with for the project.

29. Do you have any feedback for the utilities concerning any aspect of the program procedures, incentives, or eligibility requirements?

30. Which manufacturer or manufacturers have you received training from?
- ❑ Daikin
- ❑ Fujitsu
- ❑ LG
- ❑ Mitsubishi
- ❑ Sanyo
- ❑ Other (please specify)

If you selected other, please specify

31. Did you receive adequate training from the manufacturers on how to install the ductless heat pumps- including where to install them for maximum effectiveness?
- ❍ Yes
- ❍ Somewhat
- ❍ No
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

32. Do you have any comments on how the manufacturer(s) training might be improved?

33. Compared to the other equipment you install- how easy is it to obtain ductless heat pumps? Would you say it is easier, the same, or more difficult?

- ❍ Easier
- ❍ Same
- ❍ More difficult
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

34. Are you satisfied with the support you have received from the ductless heat pump manufacturers you work with?

- ❍ Yes
- ❍ Somewhat
- ❍ No
- ❍ DK/Ref/NA
- ❍ Other (please specify)

If you selected other, please specify

35. Why do you say that?

36. Compared to the other equipment you install- is it easier, more difficult, or about the same to install a ductless heat pump?

- ❍ Easier
- ❍ About the same
- ❍ More difficult
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

37. Do DHP installations require the participation of a licensed electrician or other building professional?

- ❍ Yes
- ❍ No
- ❍ Don't Know
- ❍ Other (please specify)

If you selected other, please specify

38. Can you describe the process of coordinating DHP installations with licensed electricians (or other building professional)? (PROBE: HAVE ANY DIFFICULTIES ARISEN IN REGARDS TO COORDINATING DHP INSTALLATIONS WITH LICENSED ELECTRICIANS (OR OTHER BUILDING PROFESSIONAL)?

39. Compared to the other equipment you install is the installation of ductless heat pump less profitable, more profitable, or about the same?

- ❍ Less profitable
- ❍ About the same
- ❍ More profitable
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

40. With the incentive available are you recommending DHP's to your customers more, less, or the same as before?

- ❍ Less profitable
- ❍ About the same
- ❍ More profitable
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

41. Do you plan to continue recommending ductless heat pumps to your customers after the incentive is no longer available?

- ❍ Yes
- ❍ No
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

42. What are the most common reasons you would recommend a DHP over other options? [DO NOT READ, choose all that apply]

- ❑ Cost
- ❑ Comfort/Effectiveness
- ❑ Appropriateness for space
- ❑ Energy Efficiency
- ❑ Ease of Installation
- ❑ Provides both heating and cooling
- ❑ Reliability/Ease of use
- ❑ Supplemental to existing system
- ❑ Other (please specify)

If you selected other, please specify

43. What are the most common reasons you would not recommend a ductless heat pump to customers? [DO NOT READ, check all that apply]

- ❑ Cost
- ❑ Comfort/Effectiveness
- ❑ Appropriateness for the space
- ❑ Energy Efficiency
- ❑ Ease of Installation
- ❑ Provides both heating and cooling
- ❑ Reliability/Ease of maintenance
- ❑ Unfamiliar Technology
- ❑ Appearance
- ❑ Other (please specify)

If you selected other, please specify

Participant Responses, Benefits, and Barriers

44. Overall, what percentage of your customers have expressed any interest in ductless heat pumps?

45. And what percentage of your customers, overall, are eligible to install a heat pump through the program?

46. About what percentage of the customers that you have recommended a ductless heat pump to chose to have one installed?

47. [DO NOT ASK] Optional comment space:

48. Please describe (in order of most common to least common) the three most common scenarios which lead customers to install a DHP? For instance, are they specifically interested in DHP when they call, do they typically want to upgrade an existing system, are they initially interested in other heating equip. and then change their minds based on information provided?

Specifically interested in DHP	_____
Interested in other heating equip., changed mind	_____
Interested in other cooling equip, changed mind	_____
Wanted to reduce heating/cooling costs	_____
Wanted to upgrade existing system	_____
Need to supplement existing heat or AC source/Need to condition an addition to their home	_____
Other (put in comments box)	_____

49. Any Comments about customers interest or motivation:

50. What are some common concerns customers raise when they are considering a DHP? [DO NOT READ, check all that apply and probe for "anything else?"]

- ❑ No concerns raised
- ❑ Cost
- ❑ Comfort/effectiveness
- ❑ Appropriateness for space
- ❑ Installation concerns
- ❑ Reliability/ease of use
- ❑ Maintenance
- ❑ Unfamiliar technology
- ❑ Appearance
- ❑ Other (please specify)

If you selected other, please specify

51. Compared to the other equipment you install- do DHP customers require return visits less frequently, about the same, or more frequently?

- ❍ Less frequently
- ❍ About the same
- ❍ More frequently
- ❍ DK/Ref
- ❍ Other (please specify)

If you selected other, please specify

52. [OPTIONAL] Comments:

53. Are there any reasons you would recommend a customer install more than one DHP even though the pilot only covers one?

54. Do you have any final comments- positive or negative- about the project that you would like the pilot sponsors to hear?

E INTERVIEW GUIDES

PROGRAM STAFF INTERVIEW GUIDE

Interviewee Name: _____

Interviewee Program: _____

Date: _____

Interviewer: _____

PROGRAM FAMILIARITY

1.

a. First, can you briefly describe how the pilot project came about?

b. And why was NEEA chosen to run the pilot?

c. Please briefly describe your role as manager of the DHP pilot program?

d. [If not clear] What activities do you spend the most time on?

2. When did you get involved in the DHP pilot?

a. Can you tell me some of the rationale for the program design?

b. What considerations led to the eligibility requirements? [Interviewer see "NW DHP Eligibility Requirements" document]

3. How closely has the program been able to follow the design and anticipated processes?

a. (If deviations:) What led to the changes? [PROBE: Have there been any issues associated with balancing the pilot program's dual goals of 1. Understanding DHP market barriers and opportunities and 2. The technical measurement of DHP energy savings?]

4. What do you see are the major successes or achievements to date? [PROBE: Evidence of market progress, enhanced understanding of market barriers and opportunities, successes associated with metering effort to address energy savings performance questions.]

a. What do you think contributed to these successes?

5. What are the main challenges you have faced?[PROBE: Enhanced understanding of market barriers and opportunities, challenges associated with metering effort to address energy savings performance questions.]

    a. How have you addressed these?

Marketing

6. I have seen the newspaper ad templates and door hanger templates (Save Money and Energy Every Month" newspaper ad template; "Your Utility Wants to Help You Upgrade" newspaper ad template; "You Need an Electric heat Upgrade" newspaper ad template; "Save Money and Energy Every Month" door hanger template; and "Your Electric Heating System Needs an Upgrade" door hanger template). Who developed these materials?

    a. What are the main messages these materials convey?

    b. Have you tailored the messages for different utilities or contractors? [Probe for details]

7. What marketing activities have you done for the heat pump program?

    a. Which activities have been most successful?

    b. Which activities have been least successful?

    c. Have the activities led to any "lessons learned" regarding marketing DHPs? [If yes] What?

Interactions

8. How frequently do you interact with installers?

    a. Does that include trainings? How frequent are trainings?

    b. What information does the training include?

9. How frequently do you interact with utilities?

    a. How do the utilities keep you informed?

    b. What have you done to help the utilities?

10. Can you describe your other interactions with these installers? Any issues?

11. Have your interactions changed over the course of the pilot?

12. How frequently do you interact with manufacturers?

13. Can you describe your interactions with manufacturers? Any issues?

14. Have your interactions changed over the course of the pilot?

15. How often do you interact with distributors?

16. Can you describe your interactions with distributors? Any issues?

17. Have your interactions changed over the course of the pilot?

General Comments

18. Have you noticed any challenges or obstacles with the program so far? [PROBE: Why is that? What could be done to address this?]
    a. [If not addressed] Do you anticipate any future challenges associated with market adoption of DHPs in the Pacific Northwest? [PROBE: Issues that may arise further along the market adoption curve?]
    b. What are the major lessons you have learned from the pilot program?

19. Do you have any comments- positive or negative- you'd like to share about the program?

FLUID STAFF INTERVIEW GUIDE

Name: _____

Date: _____

Interviewer: _____

Program Processes

1. Can you, briefly, summarize how the NW Ductless pilot works?
    a. (probe:) Can you walk me through the activities Fluid is responsible for?

2. What is your role in the pilot program?
    a. About how much time per week do you spend on the DHP pilot?
    b. What activities do you spend the most time on?

3. What do you see are the major successes or achievements to date?
    a. What do you think contributed to these successes?

4. What are the main challenges you have faced?
    a. How have you addressed these?

5. How have you marketed the pilot? Probe: Anything else? Probe for activities re utilities as well as activities re installers.

6. What has worked well in the marketing?

7. What would you do differently?

8. Please describe your interactions with manufacturers or distributors? How about with installers?
    a. What has worked well in these interactions?
    b. What would you do differently?

9. How did the workshop come about?
    a. What is Fluid's role in it?
    b. What are your goals for the workshop?
    c. [Follow up to the workshop] How well do you think the workshop met your goals?

10. How closely has the program implementation been able to follow the design and anticipated processes?
    a. (If deviations:) What led to the changes?

Interactions with NEEA

11. Overall, how have your interactions with NEEA been regarding the pilot?

12. [Probe] Have management directives been clear and reasonable?

13. [Probe] Have expectations been clear and reasonable?

14. [Probe] Have any issues come up?
    a. [If yes] How have they been resolved?

Interactions with Utilities

15. The pilot design details differ among the utilities. Has this created any complications for Fluid in its implementation of the pilot program?

16. Can you comment on which of the design variations you think work well? [Elaborate what it is and why it works well]
    a. Probe whether/how the variant works for customers, for installers, and for Fluid.

17. Which variations do you think don't work so well? [Elaborate what it is and why it doesn't work well]
    a. Probe whether/how the variant works for customers, for installers, and for Fluid.

18. Have you experienced any differences between utilities in your interactions?
    a. Any issues?
    b. What sort of "extra" activities have you provided to assist utilities with the pilot? I'm thinking of the extra 800 line you set up for Idaho Power. Are there any other extra activities that you did for Idaho Power or for any other utilities?
    c. [For each activity reported] Can you tell me how [the activity] worked? How successful or effective do you think it was? Did you encounter any problems? If you were to do it again, would you do anything differently?

General Comments

19. Have you had any feedback from customers regarding the pilot? [IF SO, please describe what they said].

20. Have you had any feedback from contractors regarding the pilot? [IF SO, please describe what they said].

21. How effective do you think the pilot has been so far?

22. What lessons have you learned from your involvement with the pilot so far?

23. Have you noticed any pilot or obstacles with the program so far?

24. Do you have any final comments- positive or negative- you'd like to share about the pilot?

25. [Note to interviewer: Add to utility guide any "extras" described by Fluid staff in Q18c]

UTILITY STAFF INTERVIEW GUIDE

Utility Name: _____

Date: _____

Interviewer: _____

Program Design:

1. First, can you briefly summarize how your pilot program works?

2. In what ways, if any, does your project design differ from the basic pilot project designed developed by NEEA? [if not mentioned ask about their pilot requirements] [Note: Ask PSE about their efforts to separate gas conversion houses out from DHP based on house size. Why was this done? How successful was it?]

3. [If not clear] Can you tell me about the rationale for these unique aspects of your program?

4. [If not clear] Do you offer the same incentive as NEEA suggested?
    a. [If not] What incentive do you offer?
    b. Why did you select this incentive level?
    c. Comments on success of this strategy:

5. What is the typical cost of a DHP installation in your territory?
    a. Do you have any insights or concerns as to why your costs may differ from that of other utilities or regions?

6. [If not clear] Do you screen potential participants?
    a. [If yes] What are the screening criteria?
    b. What is the rationale for this screening?
    c. How do you accomplish this? (Probe to understand what data are looked at, by whom, how often [if done in batch; not relevant if done house by house in response to contractor requests], how do contractors learn who is eligible)
    d. Comments on success of this strategy:

7. [If not clear] Do you designate "preferred contractors"?
    a. [If yes] How do you find and qualify "preferred contractors"?
    b. What is the rationale for designating preferred contractors?
    c. Comments on success of this strategy:

8. [If not clear] Do you approve applications?
    a. What are your approval processes? (Probe to understand what data are looked at, by whom, how often [if done in batch—what frequency; or perhaps done as application is received], how do contractors learn application has been approved)
    b. Comments on success of this strategy:

9. Are there any other differences between your utility program and the basic pilot design that we might discuss the rationale for and success of this approach?

10. Does your utility allow homes with forced air furnaces to participate?
    a. Why is that? (ask regardless of whether they do or do not allow FAF)

11. [IF EWEB] How does your pilot program encourage weatherization, if at all?
    a. What is the rationale for weatherization tie-in?
    b. Comments on success of this strategy:

12. What do you see are the major successes or achievements to date?
    a. What do you think contributed to these successes?

13. What are the main challenges you have faced?
    a. How have you addressed these?

Marketing

14. What marketing activities have you done for the heat pump pilot?
    a. Anything else? Anything else?
    b. (Probes: bill stuffers to participants, direct marketing to participants, direct marketing to trade allies, radio ads, TV ads, newspaper ads, magazine ads, shared advertising with trade allies (both logos on ads))
    c. Did any of your marketing focus on the cooling/AC capability of the DHP? [If so] Do you feel that was effective? [If not] Why not?

15. In what ways did NW Ductless support you in undertaking the pilot?

16. How well do you think they did?

17. Have you used any of the marketing materials provided by the NW Ductless Heat Pump Project?
    a. ( ) Yes
    b. ( ) No

18. [If Q17=yes] Which ones? [Do not read; probe to code; check all that apply; probe "anything else?"]
    a. [ ] Have not used provided marketing materials
    b. [ ] Contractor sales sheet _____
    c. [ ] "Save Money and Energy Every Month" newspaper ad template _____
    d. [ ] "Your Utility Wants to Help You Upgrade" newspaper ad template _____
    e. [ ] "You Need an Electric heat Upgrade" newspaper ad template _____
    f. [ ] "Save Money and Energy Every Month" door hanger template _____
    g. [ ] "Your Electric Heating System Needs an Upgrade" door hanger template ____

19. Have you put your utility's logo on all the items you've used?

20. Please rate how effective the materials are using a five point scale where 1=not effective at all and 5=extremely effective [Link ratings to specific materials, Use blanks next to materials]

    a. [For each material they say they used:] Please elaborate on why you gave that score:

21. How are you using these materials?

22. Were you lacking any materials for your customers or contractors that you think would have been useful? What are they and why?

23. Are there any marketing activities or approaches that you would have liked to have seen in support of the pilot?

24. NW Ductless has conducted numerous contractor orientation sessions. Have you participated or listened in on any of these?

    a. [If yes] Do you think the sessions were effective in getting contractor interest and covering how to participate? [Note for Idaho Power interview: Probe on this one.]

    b. Do the sessions adequately represent the unique elements of your program?

    c. [If relevant] Are you aware of any confusion among oriented contractors about the unique elements of your pilot program?

    d. [If relevant] How do contractors learn the unique elements of your pilot program?

Interactions with NEEA

25. Have you had any interactions with the NEEA Staff?

    a. ( ) Yes

    b. ( ) No

26. [If Q10=yes] Please describe those interactions?

27. [If Yes] Please rate the responsiveness of the NEEA staff on a five point scale where 1=not responsive at all and 5=extremely responsive

28. Please elaborate on why you gave that score.

Interactions with NW Ductless (the Pilot Implementation Contractor)

29. Have you had any interactions with Fluid, the pilot program implementation contractor who staffs NW Ductless?

30. [If yes] Please describe these interactions?

31. How responsive was Fluid/NW Ductless staff to your requests for support? Please use a five point scale where 1=not responsive at all and 5=extremely responsive
    a. Please elaborate on why you gave that score.

32. Have you ever used the Fluid or NW ductless program tracking dataset?

33. [If yes] Please describe your experiences using the tracking dataset

General Interactions

34. How frequently do you interact with installers?
    a. Can you describe your interactions these installers? Any issues?
    b. Have your interactions changed over the course of the pilot?

35. How frequently do you interact with manufacturers?
    a. Can you describe your interactions with manufacturers? Any issues?
    b. Have your interactions changed over the course of the pilot?

36. How often do you interact with distributors?
    a. Can you describe your interactions with distributors? Any issues?
    b. Have your interactions changed over the course of the pilot?

General Comments

37. Have you had any feedback from customers regarding the program? [IF SO, please describe what they said].

38. How about any feedback from contractors? [IF SO, please describe what they said].

39. Do you have any concerns about the quality of the DHP installations occurring?

40. Do you perform your own quality assurance? [Probe especially with Snohomish and EWEB]

41. How effective do you think the pilot has been so far? [PROBE: Anything else? Ascertain their own criteria for "effective".]
    a. Why is that?
    b. Do you think your pilot met the expectations for ramp up time?
    c. Was there any part of the process that took too long?

42. Thinking over the past year, are there any changes to the pilot you would like to see?

43. Based on your experiences so far- do you think the region should continue to offer incentives for DHPs?

44. Does your utility plan to roll this out as a full-fledged program? Please explain why you do/don't.
    a. What criteria will you [are you] basing your decision on?
    b. Do you have any concerns that still need to be resolved before this decision will be made?
    c. [If might have have full program] Do you see any role for NEEA or NW Ductless in your full program?

45. Do you have any final comments— positive or negative—you'd like to share about the program?

DHP MANUFACTURER/ DISTRIBUTOR/REP INTERVIEW GUIDE

Contact: _____

Title: _____

Company: _____

Brand: _____

Manufacturer/Distributor: _____

Date: _____

Interviewer: _____

Involvement with Program Staff in Pilot

1.

a. Please describe the activities of [ORGANIZATION]?

b. Please describe your role at [ORGANIZATION]?

2. When were you first contacted about the NW Ductless Heat Pump Project?

a. Who contacted you? [PROBE FOR NEEA/FLUID MARKET STRATEGIES/OTHER]

b. [IF NEEA] Had you interacted with NEEA about other programs prior to the DHP pilot? [IF SO] Which ones?

c. [IF FLUID/OTHER] Are you familiar with NEEA—the Northwest Energy Efficiency Alliance, or with Alexis Allan who is managing the DHP Project?

3. Please describe the interactions you have had with project staff related to the pilot program? [PROBE: WERE THESE INTERACTIONS WITH FLUID/NEEA/OTHER?]

4. As the NW Heat Pump Project was gearing up, did your firm do anything to specifically support the effort?

a. Probe: I'm thinking of such things as increased marketing, or offering a time-limited price discount, or extended warranty, or anything that might further increase DHP installations beyond the activities of the pilot.

b. Probe after open-ended response: Anything else? Anything else?

5. Now that the pilot has launched, what do you think its strengths are?

6. Do you have any concerns about the pilot?
   a. [ ] Yes
   b. [ ] No
   c. [ ] Other:

7. What have you learned from the pilot program? [PROBE: Project staff, utility involvement, manufacturers, distributors, installers, res. customers]
   a. Is there anything that you are still hoping to learn from the pilot program?

Company Description and DHP Experience

8. [IF NOT COVERED IN Q1] [DISTRIBUTORS]: What region does your company serve?

9. [IF NOT COVERED IN Q1] [MANUFACTURERS]: What regions of the US does your company sell ductless heat pumps in?

10. How many different models of DHPs do you manufacture/distribute?

11. Who do you sell your equipment to [or Brand X] to? [PROBE: Any licensed contractor? Contractors who exclusively install your equipment and not the equipment of competitors? The general public?]
   a. What's the rationale for this policy?
   b. Do you offer the equipment at the same price to everyone (or do licensed contractors get a lower price)?
   c. We heard from some installers that they tend to get undercut by fly-by-night installers that are not licensed contractors. Do you have any experience with this? Any concerns about this?

12. Of the DHP models that your company manufactures/distributes, how many qualify for NW Ductless Heat Pump project incentives? Of the DHP models that your company manufactures/distributes, how many qualify for the federal tax rebate?

13. How many residential DHP's do you sell in the NW every year? [Or, please estimate the number of DHPs sold that are installed in residences? Or market share?]

14. Over the next two-to-five years, do you expect the market for residential DHPs in the four northwest states to grow, decline, or remain the same? Why do you say that?

    a. [IF INCREASED] Do you think that installers are capable of meeting this increased demand?[PROBE: WHY OR WHY NOT?]

15. [IF DISTRIBUTOR] What is the typical profile of the homeowner or residence that chooses to have a DHP installed? [PROBE: Is there a common type?]

16. [IF RESPONDENT DID NOT DESCRIBE THIS IN RESPONSE TO Q1] What other types of space conditioning equipment do you sell?

17. [IF RESPONDENT DID NOT DESCRIBE THIS IN RESPONSE TO Q1] [IF NOT OBVIOUS:] Do you manufacture/distribute both residential and commercial equipment?

18. [IF RESPONDENT DID NOT DESCRIBE THIS IN RESPONSE TO Q1] Do you also sell/manufacture other types of equipment, other than for space conditioning? What?

19. How have the sales of residential DHPs compared to your sales of other residential space-conditioning equipment?

Company Description and DHP Experience

20. Compared with other types of equipment, what do you see as the advantages of DHPs? [Probe for installation requirements, cost, energy use, comfort, home value, noise, reliability, maintenance, useful life, effectiveness in different climatic zones, other]

21. What do you see as drawbacks to DHPs, if any? [Probe for need for installation contractor instruction, need for consumer education, installation requirements, cost, energy use, comfort, home value, noise, reliability, maintenance, useful life, effectiveness in different climatic zones, other]

22. Of the DHPs that are installed in residences in the NW, what's your sense of the proportion that function optimally? [PROBE: WHY IS THAT?]

23. Is it more difficult to attain optimal DHP performance than optimal performance of other types of space conditioning? [PROBE: WHY IS THAT?]

24. What's required for DHP maintenance? [PROBE FOR FREQUENCY AND COST]

Company Description and DHP Experience

25. [IF MANUFACTURER] Can you describe the training your company provides for the installers working in the pilot project?

26. [IF MANUFACTURER] Do you think that installers need continuing training to effectively serve the residential DHP market? [IF YES, ASK FOR DETAILS.]

27. What is the main marketing message your company has used for sale of residential DHP's? [PROBE FOR DEGREE OF EFFECTIVENESS OF MARKETING MESSAGE]

28. Have there been any changes in your company's approach to marketing residential DHPs as a result of the pilot project?[PROBE: Changes in their strategies, actions, thinking, and expectations since the program started.]

29. What are the most common residential consumer's concerns regarding DHPs? What is your company doing to address these concerns? [Probe specifically for any actions they are taking to address the appearance concern frequently mentioned by residential customers]

30. Do you anticipate that the pilot project will have an impact on sales of residential DHPs?

31. [If not] Why not? [Is contractor sales force adequate?]

32. [Or if so] What do you expect that impact to be?

33. [And if so] Do you expect the impact to vary by climate zone or other location factors?

34. What support does your company provide to installers/contractors?

    a. Who handles technical support for your company?[PROBE: HOW ARE WARRANTY ISSUES ADDRESSED?]

    b. What is the typical turn-around time after a customer/installer contacts you with a concern?" [PROBE: FOR HOW SUPPORT MIGHT BE IMPROVED]

Pilot Impressions

35. What is your overall impression of the pilot project? [Probe for positive and negative responses, including reservations about participation process, incentive levels, installer response, consumer response, other]

36. Do you have any other thoughts or comments about the NW ductless heat pump project?