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Northwest Ductless Heat Pump Initiative: Market Progress Evaluation Report #2

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Northwest Ductless Heat Pump Initiative

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A Report to the Northwest Energy Efficiency Alliance

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1 Executive Summary

This report is the second Market Progress Evaluation Report (MPER) of the Northwest Energy Efficiency Alliance's (NEEA's) Northwest Ductless Heat Pump (DHP) Initiative. This report presents evaluation findings based on telephone surveys of households that purchased DHPs through the Initiative and other general population households, and also in-depth interviews with Northwest utilities that support the Initiative, DHP manufacturers/distributors and installers. The report also includes current data on the DHPs market in the Northwest.

Progress Towards Goals

Over 4,800 DHPs were installed by utilities that participated in the Initiative in 2011. One-quarter of these installations were in rural areas of the region. In comparison, the Initiative installed 5,525 DHP systems in 2010, resulting in a 13 percent decline for 2011. This is a relatively modest decline, considering that federal tax credits for DHPs were greatly reduced from $1,500 to $300. Since the Initiative launch over 15,800 DHPs have been installed in Northwest homes. It is estimated that there are almost one million electrically heated homes in the Northwest region.

Market Progress

Overall, NEEA's Northwest Ductless Heat Pumps Initiative appears to be well designed and is performing well. General population awareness of DHPs (excluding gas heated homes) is 34 percent and perceived to be growing. Households are learning about DHPs from a wide variety of sources, including utility information, friends/family/acquaintances and installation contractors. Most of the interviewed installers, manufacturers and distributors predict continued DHP market growth. Twenty-two percent of the surveyed general population households said they are "very" or "somewhat interested" in installing DHPs. The primary barriers to continuing market growth are insufficient customer awareness and purchase costs that are too high for many consumers (particularly in the poor economy).

Participant satisfaction is high; almost 90 percent of surveyed participants have had their overall expectations met, and 96 percent use their new DHPs for primary heating. Inadequate heating in very cold conditions is the largest customer issue. Fourteen percent of surveyed participants (distributed roughly equally across all three climate zones) stated that their DHPs had failed to provide adequate heat at some time, typically at temperatures less than 10 to 30 degrees. This performance issue needs to be addressed to maximize market penetration.

A robust network of DHP installers has been developed. Over 500 HVAC contractor firms are actively participating in the Initiative, and about 800 firms have been oriented to the Initiative. Interviewed Initiative staff were satisfied with the number of trained contractors, and no contractor "gaps" were noted by interviewed market actors. Manufacturers and distributors noted that there is healthy competition among the many Initiative contractors, which will keep installation prices fair and reasonable in the long run. Moreover, the quality of Initiative DHP installations is high, and surveyed participants noted few technical failures. Installers and utilities are emphasizing the "displacement theory" in their marketing.

Key manufacturers and distributors are engaged with the Initiative, have assisted in past contractor trainings and marketing efforts, and expect to do so in future. Initiative implementation staff reported that they have gained improved access to key manufacturing firm decision makers to affect strategic marketing initiatives. Manufacturers are continuing to support retail displays, and installation contractors are displaying DHPs in their own showrooms. Many market actors noted that allowing customers to see and touch DHPs is critical for future market growth. The interviewed manufacturers greatly appreciate NEEA's assistance in accelerating market growth and including them in Initiative activities.

Importantly, BPA's funding assistance is a key driver of many utility programs, and funding level changes and/or other implementation requirements could reduce future utility offerings and DHP installations. BPA recently changed its database and utilities reporting requirements, which has created problems for some utilities with limited staff capacity. Utilities with larger staffs or low customer demand (i.e. small utilities) have been less impacted, but medium sized utilities with high demand will be increasingly pressured to reduce their DHP rebates and/or outsourced forms processing assistance if BPA reduces its conservation rate credits to them.

To continue building on the Initiative's success, NEEA should:

1. **Continue broad based, multi-media marketing to further increase public awareness**. Many of the interviewed market actors perceived that the Initiative's marketing efforts had been effective, but that additional marketing is required to continue growing consumer awareness since DHPs market share is still low.

2. **Develop incentives to promote additional word of mouth marketing.** Recommendations from friends, family and acquaintances are particularly influential in the decision making process (even if DHP information is initially obtained from other sources). The Initiative could take additional steps to formalize and incentivize the referral process, to reinforce a growing "snowball effect."

3. **Coordinate with distributors to push new improved cold weather models into the market as soon as possible.** The Initiative might design special promotions and demonstrations around emerging low-temperature models.

4. **Work with banks and credit unions to expand financing options.** Few institutions currently offer financing for DHPs, and first costs are still a barrier to potential purchasers, even with widespread utility rebates.

5. **Provide additional funding/services for utilities program implementation to fill potential BPA gaps.** Utility marketing and rebates are key drivers of market transformation and need to be maintained until market share gains additional momentum. The Initiative might allocate additional contingency budget for the implementation contractor or separate contracts for specific marketing, rebates or other assistance.

2 Evaluation Methodology

2.1 Initiative Overview

This report is the second Market Progress Evaluation Report (MPER) of the Northwest Energy Efficiency Alliance's (NEEA's) Northwest Ductless Heat Pump Initiative. NEEA is supported by and works in collaboration with the Bonneville Power Administration (BPA), the Energy Trust of Oregon and more than 100 Northwest utilities on behalf of more than 12 million energy consumers. NEEA uses the market power of the region to accelerate the innovation and adoption of energy-efficient products, services and practices.

In October of 2008 NEEA launched the Northwest Ductless Heat Pump Project, a regional pilot aimed at demonstrating the use of inverter-driven ductless heat pumps (DHPs) designed to displace electric resistance heat in existing Northwest homes. It is estimated that there are approximately one million electrically heated homes in the Northwest region, and DHPs have high potential to deliver significant energy savings. Based on findings from the regional pilot that ended in December 2009, NEEA initiated a full-scale initiative in 2010. Fluid Market Strategies (Fluid) is the program management contractor (PMC) in charge of implementing the Initiative. Additional information can be accessed at: www.goingductless.com.

Over 90 Northwest utilities currently offer DHP rebates for their customers while NEEA's work is focused upstream to promote product availability, support local utility initiatives, and build consumer and market awareness, with the ultimate goal of market transformation. Since the Initiative launch over 15,800 DHPs have been installed in Northwest homes.[1]

Following are some of the key activities the Initiative conducted in 2011:

- The Initiative partnered with a key manufacturer to get DHPs displayed in Northwest Home Depot retail stores, so potential customers could see experience the technology.[2]
- Over 12,000 Public Service Announcements were delivered by 158 radio and television stations for the first time during the Initiative.
- Quality Assurance inspections policies were adapted, allowing utilities to perform more discretionary inspections (to address new/problematic installers) and fewer completely random inspections. Fluid also shared inspection and recording templates with the utilities to facilitate inspections.

[1] Communications with Fluid, July 17, 2012.

[2] Six manufactured homes retailers also installed working DHP display units. A long-term goal of the Initiative is to increasingly have manufactured homes built and shipped "DHP-ready."

- A social media campaign was delivered during the heating season to increase awareness and sales of ductless heating and cooling systems. The campaign utilized a "retro 70's" theme and encouraged visitors to interact by entering to win a cash prize of $10,000 at goingductless.com or by creating customized postcards to share with others. Sub-prizes were offered on Facebook to generate word-of-mouth referrals and generate project leads. To capitalize on homeowners' positive experiences with DHPs, the Initiative offered additional contest entries through unique referral codes to Initiative participants (via mailed post cards and email) encouraging them to inform friends and family of ductless systems. The campaign website received almost 21,000 unique visitors, and the Facebook sweepstakes reached over 9,300 visitors.

- The Initiative partnered with Umpqua Bank to offer specialized (Green Streets) financing, and informed installers of this new funding source.

- The Initiative gave Contactor Orientation training to 294 attendees. Over 150 contractors also attended Installation Best Practices Workshops. (According to PMC implementation staff, the Contractor Orientations are 70 percent funded by market actors (e.g., utilities, DHP manufacturers)).

- The Initiative worked with Central Electric Cooperative, Energy Trust of Oregon (ETO), four local contractors and sponsors Mitsubishi and Thermal Supply to develop the Bend Blitz to promote DHPs in an area slow to adopt ductless technology. The promotion resulted in 158 Bend-area installations; prior to the promotion there was only one installation through the Initiative.

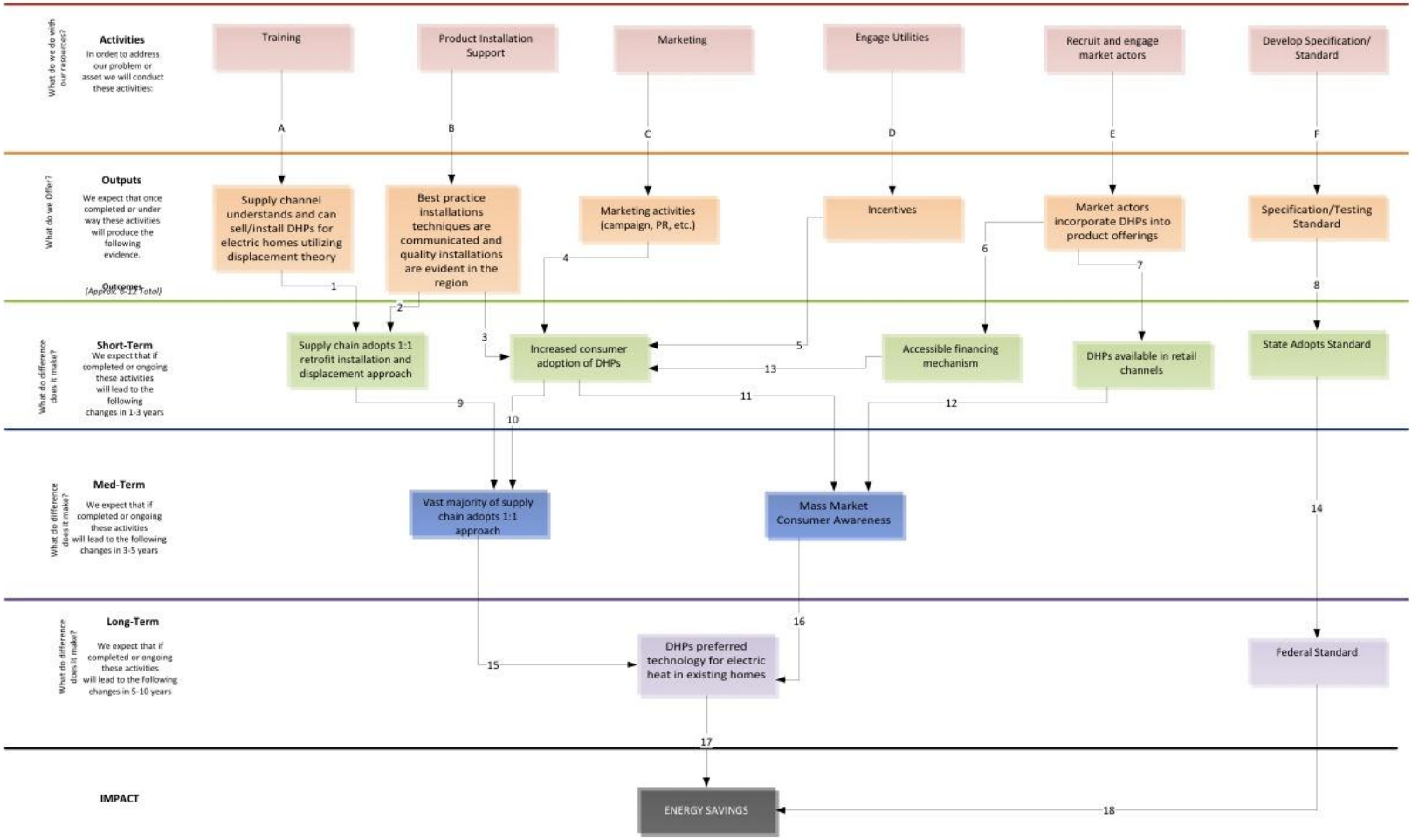
2.2 Initiative Goals and Logic Model

Following are some of the key objectives of NEEA's DHP Initiative:

- Partner with Northwest utilities and energy efficiency organizations to achieve a 15 percent market share of ductless heat pumps by 2014 in single family electrically heated homes
- Increase consumer awareness of ductless heat pump technology
- Maintain and enhance robust trade ally network
- Increase DHP product variety and availability throughout the region
- Increase affordability of DHPs throughout the region

The objectives above are reflected in various activity-outcome linkages in NEEA's Initiative logic model, which is presented in Figure 1. Measurement and tracking of these objectives in past, current and future evaluations can provide an indication of the success of the overall Initiative design. More information on the logic model activities and linkages are included in Appendix C, which presents the theory underlying the logic model.

Figure 1: Ductless Heat Pumps Initiative Logic Model



3 Evaluation Methodology

3.1 Market Characterization and Progress

One task of the evaluation was to characterize the DHPs market in the region. In particular, the objectives include:

- Describing the residential housing stock in the region so that the potential for DHP installations can be assessed.
- Showing current progress toward Initiative goals, including the number of DHPs installed in various parts of the region.
- Describing various aspects of the supply-side infrastructure, including DHPs manufacturers, distributors and installers.

These tasks were addressed by utilizing secondary data sources such as US Census Bureau data and current participation data obtained from the Initiative tracking databases maintained by Fluid.

3.2 Telephone Survey

A key part of the evaluation focused on obtaining detailed information via quantitative telephone surveys of households that installed DHPs through the Initiative in 2011, and general population households. Some of the key information included in these surveys includes: DHPs awareness, interest in purchasing DHPs, DHP usage and maintenance characteristics and DHPs satisfaction.

Evergreen Economics and John Stevenson developed the survey instrument and Quantum Market Research (QMR) fielded the surveys. The survey findings section describes the sampling that was used, and the survey instrument is included in Appendix D.

3.3 In-depth Interviews

Extended phone interviews were conducted with representatives of 20 Northwest utilities with DHPs programs, 31 contractor firms that install DHPs in the region and 10 DHPs manufacturing and/or distribution firms.[3] The interviews focused on Initiative implementation issues (rebate levels and Initiative promotions, technical training and challenges, customer purchase trends and barriers, technological developments) and were also designed to elicit suggestions for improving the current Initiative. Appendix D also includes the interview guides that were implemented.

Appendix B includes a chart summarizing all the evaluation activities that have been completed for both MPERs.

[3] We attempted to interview a total of 20 manufacturers and/or distributors, however several firms did not respond to multiple interview requests.

4 Market Characterization

This section provides an overview of the DHPs market for Washington, Oregon, Idaho, and Montana through 2011. These data give a high-level overview of the market and provide context for evaluation results presented in subsequent chapters.

4.1 Target Market and Initiative Achievements

The primary target markets for the Initiative are single-family, site-built homes using electric resistance zonal heating systems or central forced-air furnaces as the primary home heating source. Many of these homes also use propane, kerosene and/or wood heating (and several DHPs have been installed in attached multi-family housing units through the Initiative).

Table 1 shows the distribution of these single-family home types in NEEA's four-state territory, by cooling zone (CZs) and urban/rural classification; see Appendix F for additional information on NEEA's urban/rural classifications methodology.

Table 1: Northwest Homes with Electric, Propane, Kerosene or Wood Heat[4]

Cooling Zone, Urban/Rural	Number of Homes	Percent of Total
CZ1		
Rural	259,220	19%
Urban	641,276	47%
CZ2		
Rural	112,649	8%
Urban	179,173	13%
CZ3		
Rural	49,650	4%
Urban	128,975	9%
Total	**1,370,943**	**100%**

Source: Estimates by Evergreen Economics from US Census Bureau, 2010 American Community Survey

As shown in Table 2, over 4,800 DHP systems were installed by utilities participating in the Initiative in 2011, and the largest share of these were in urban locations within cooling zone 2 (44 percent). Not surprisingly, relatively few DHPs (5 percent) were installed in cooling zone 3, which has the coldest climate and is somewhat less suitable for (current) DHP technology. Appendix E includes maps of each state providing additional detail regarding DHP installation rates by urban and rural zip codes.

[4] This data source does not distinguish between *types* of electric heat, e.g., baseboard zonal versus forced air furnace. Over 950,000 of these homes have electric heat of some type.

Table 2: Distribution of Homes that Installed Initiative DHPs in 2011

Cooling Zone, Urban/Rural	Number of Homes	Percent of Total
CZ1		
Rural	1,090	23%
Urban	1,256	26%
CZ2		
Rural	106	2%
Urban	2,127	44%
CZ3		
Rural	47	1%
Urban	207	4%
Total	**4,833**	**100%**

Source: Fluid database provided April 3, 2012

Participating utilities installed 5,525 DHP systems in 2010, resulting in a 13 percent decline for 2011. This is a relatively modest decline, considering that federal tax credits for DHPs were greatly reduced from $1,500 to $300.

4.2 Supply Side Characteristics

The Initiative has established strategic relationships with eight manufacturing companies and seven key distributor firms (other distributors also participate in the Initiative). Table 3 lists the DHP manufacturing and distributing companies that are most involved in supporting the Initiative.

Table 3: DHP Manufacturing and Distribution Companies Involved with Initiative

Manufacturing Companies	Distribution Companies
Daikin AC	Airefco (Hadco/Nor-Air)
Mitsubishi Electric	Geary Pacific
LG	Gensco
Sanyo	Keller Supply
Lennox	Thermal Supply
Fujitsu General America	York, Johnson Controls
Quietside Corporation	Ductless Supply
Friedrich Air Conditioning	

Across 2010 and 2011, Mitsubishi has remained the most popular DHP brand. Mitsubishi's market share in the Northwest went up by roughly 9 percent between 2010 and 2011. Installations of Daiken DHPs also increased, while Sanyo and LG installations decreased.

Table 4: DHP Manufacturer Market Shares – 2010 and 2011

Brands	2010 Installs	2010 Percentage by Brand	2011 Installs	2011 Percentage by Brand
Comfort Aire	2	0%	0	0%
Daikin	530	9.6%	627	13.0%
Fujitsu	1,304	23.6%	1,027	21.3%
Friedrich	0	0%	2	0%
Lennox	0	0%	16	0.3%
LG	475	8.6%	134	2.8%
Mitsubishi	2,739	49.6%	2,818	58.4%
Samsung	1	0%	5	0.1%
Sanyo	442	8.0%	186	3.9%
Toshiba-Carrier	32	0.6%	14	0.3%
Total	**5,525**	**100%**	**4,829**	**100%**

Source: Fluid database provided April 3, 2012

Over 500 DHP installation contractor firms are actively participating in the Initiative (others have been oriented/trained, but are considered to be "inactive" if they have not completed recent installations). Table 5 shows that the vast majority of firms have completed 20 or fewer installations, and that the most active firms are concentrated in Washington and Oregon (with the largest residential markets).

Table 5: Active DHP Contractor Firms by State and Installations Volume

Number of DHP Installations	WA	OR	ID	MT	Total
1 to 20	161	163	60	25	409
21 to 50	35	19	5	5	64
51 to 200	34	15	2	1	52
201+	5	6	0	1	12
Total	235	203	67	32	537

Source: Fluid data provided January 2012

The Initiative has also trained over 80 Master Installers. In addition to attending Orientation and Best Practices training, Master Installers have completed at least 15 installations and submitted customer testimonials and photographs proving compliance with specific installation guidelines.

Lastly, the over 90 Northwest utilities (i.e. the vast majority) provide rebates as high as $1,500 for customers that upgrade existing electric resistance heating systems to a ductless system. Twenty-seven utilities also offer loans at 0 to 7 percent interest, which can be paid back through "on-bill" energy savings, or traditional off-bill payment mechanisms.

5 Findings

5.1 Homeowners Phone Survey

A total of 300 phone surveys were completed with single-family homeowners in May and June of 2012. As shown in Table 6, 101 surveys were completed with households that installed a DHP through the Initiative anytime in 2011, and 199 surveys were completed with general population households. The surveys were stratified by cooling zones and urban/rural locations, and provided a confidence/precision level of 90/06 at the regional level. (NEEA's definitions of urban and rural areas are in Appendix F; for our sampling and analysis the two rural sub-classifications were combined.) In addition, this sample design provided 90/15 confidence at the cooling zone level, and 90/10 for both the urban and rural portions of the region.

Table 6: Final Survey Completes

Cooling Zone, Urban/ Rural	2011 Participant Completes	General Population Completes
CZ1		
Rural (n=57)	22	35
Urban (n=56)	21	35
CZ2		
Rural (n=47)	12	35
Urban (n=58)	24	34
CZ3		
Rural (n=37)	7	30
Urban (n=45)	15	30
Total (n=300)	101	199

Initiative Participant Results

The most common sources from which Initiative participants learned about DHPs were utility sources (52 percent), word-of-mouth (friends, relatives and acquaintances; 47 percent), and materials from contractors or installers (30 percent). Other sources of DHPs awareness were newspapers (19 percent), the Internet (19 percent) and TV or radio (six percent). Sixteen percent of the participants initially heard about DHPs from other, less common sources such as magazines (see Appendix G for additional details).

The information sources that most influenced Initiative participant DHP purchasing decisions are shown on Page 8. Thirty-two percent of participants reported that hearing about DHPs from friends or acquaintances impacted their DHP purchasing decisions, and 24 percent indicated that materials from contractors or installers encouraged their DHP purchases. Information on the Internet and utility print advertising or bill stuffers impacted the decision

for 16 and 14 percent of participants, respectively. In addition, 13 percent indicated that their DHP purchasing decisions were driven by other, less common sources of information (e.g., trade shows, magazines, their own construction/mechanical work experience).

Table 7: Sources of Information that Influenced Initiative Participants to Install DHPs

Source	Initiative Participant Responses (Percentage) (n=101)
Friend/ Relative / Acquaintance	32%
Materials From Contractor/ Installer	24%
Internet information	16%
Utility print advertising/bill stuffer	14%
Newspaper	8%
Utility Website	2%
Social Media	1%
Other	13%

Q21.Could you also please tell me what sources of information, including the one(s) you mentioned earlier, were especially important in your decision to install the DHP - your top two?

Table 8 shows the main reasons Initiative participants became interested in DHPs. Over half (57 percent) of the participants were initially interested in DHPs because they wanted to be more energy efficient. Twenty-three percent of the participants considered DHPs to add cooling to their homes and 22 percent needed supplemental space conditioning (typically because their existing heating was inadequate). Twenty percent of the Initiative participants initially considered DHPs because their existing heating was not working well enough and another 17 percent reported that they needed space conditioning and had no ducts. As this information illustrates, general energy efficiency is the most important single factor contributing to DHP interest, but the need for additional/improved space conditioning is a significant driver of DHP interest among participants.

Table 8: Initial Reasons for Interest in DHPs

Reason	Initiative Participant Responses (Percentage) (n=101)
Wanted to be more energy efficient	57%
Wanted to add cooling	23%
Needed additional /supplemental space conditioning	22%
Existing heating was not working well enough	20%
Needed space conditioning and had no ducts	17%
Existing heating was broken	1%
Other	15%

Q24. What initially interested you in the DHP? Multiple responses allowed.

The majority of Initiative participants (73 percent) sought out a contractor to install a DHP, whereas 24 percent stated that the DHP installation was a suggestion from a contractor they were already working with.

As shown in Table 9, most participants used either wall heaters or baseboard heaters as their primary household heating source prior to installing a DHP (27 and 25 percent, respectively). Approximately 16 percent of participants used wood heat, with an equal proportion relying on electric ceiling heat. Since installing a DHP, however, nearly all participants have switched to rely on their DHP as the primary heat source (96 percent).

Table 9: Primary Heating Before and After DHP Installation

Equipment Type (n=101)	Percent Using as Primary Heat Before DHP	Percent Using as Primary Heat After DHP
Wall heater	27%	0%
Baseboards	25%	3%
Wood heat	16%	1%
Ceiling heat	16%	2%
Electric radiant heat	8%	0%
Forced air furnace	6%	0%
Space heater	3%	0%
Propane/Oil stove	3%	1%
No heat	1%	0%
DHP	0%	96%

Q26D.Before the DHP, what was your primary heat? Q26E. What is your primary heat now? Multiple responses allowed.

Approximately 30 percent of the Initiative participants had window or room air conditioning units prior to their DHP installations, compared to 68 percent with no cooling. Only two percent reported using other types of air conditioning units (e.g. swamp coolers). Among Initiative participants that had air conditioning units, 19 percent still use these units.

Table 10 depicts the level of importance for various factors that can potentially influence DHP purchasing decisions. As shown, 62 percent of Initiative participants stated comfort level and 59 percent reported cheaper operating costs as “very important” influencers of DHP purchasing decisions. Out of pocket purchase costs are also a “very” or “somewhat” important consideration, while cooling capacity had relatively lower importance.

Table 10: Importance of Factors in Purchase Decision

Factor/Importance (n=101)	Very Important	Somewhat Important	Not too Important	Not at all Important	Don't Know
Comfort potential	**62%**	**21%**	**13%**	**1%**	**0%**
Cheaper operating costs	**59%**	**20%**	**12%**	**1%**	**7%**
Purchase/install cost	**49%**	**36%**	**8%**	**3%**	**4%**
Cooling capacity	**44%**	**20%**	**10%**	**10%**	**16%**

Q30.Please rate how important each of the following factors was in your decision to purchase a DHP, were 1 is not at all important, and 5 is very important: A. The comfort potential offered by the DHP. B. The cost of the DHP, including any incentives. C. The potentially cheaper operating costs of the DHP compared to your previous heating/cooling system. D. The cooling capability of the DHPs.

Table 11 depicts the common ways Initiative participants collected information about DHPs prior to installing one. Thirty-nine percent of the Initiative participants indicated that they received information from contractors before their DHP purchases. Slightly lower proportions of participants gathered information on DHPs using the Internet (34 percent) and by speaking with somebody that had already installed a DHP (34 percent). Approximately one-quarter of participants found information from utilities. Some of the other, less common DHP information gathering sources newspapers, magazines and home shows.

Table 11: How Participants Gathered Information Before DHP Purchase

Source of Information	Initiative Participant Responses (Percentage) (n=101)
Contractor provided information	**39%**
Internet/ online	**34%**
Spoke to somebody who already had a DHP installed	**34%**
Utility provided information	**25%**
Did not look for any information	**2%**
Other	**24%**

Q32. How did you gather information about the DHP before you made your purchase? Multiple responses allowed.

Table 12 displays the concerns of Initiative participants when they were considering DHPs. Overall, 47 percent of the Initiative participants had no concerns. However, 22 percent stated that the functionality or capability of DHPs concerned them. Furthermore, the appearance of DHPs and equipment cost were a concern for 17 percent and 12 percent of participants, respectively. Some of the other, less common concerns cited by Initiative participants included determining how many DHP heads they would need and finding appropriate contractors.

Table 12: Participant Concerns When Considering DHPs

Concern	Initiative Participant Responses (Percentage) (n=101)
No concern	47%
Capability/ functionality	22%
Appearance	17%
Cost	12%
Reliability	10%
Noise	5%
Other	9%

Q33. Was there anything you were concerned about when you were considering a DHP? Multiple responses allowed.

Few households utilized financing for their DHP purchase and installation. Approximately six percent received financing from a utility company and four percent used financing from local bank or credit union. Less than one percent obtained financing from installation contractors and three percent used other financing. The majority, 84 percent, used no financing.

Amongst participants, 71 percent reported that they had single-headed DHP systems and 20 percent stated that they had multi-headed DHP systems (nine percent did not know).

Table 13 shows the distribution of DHP head installation locations among Initiative participants. Approximately 29 percent have a DHP head installed in their family or living rooms, 25 percent in their dining rooms, 21 percent in bedrooms, and 16 percent in kitchens. There are very few DHP heads installed in other locations.

Table 13: Location of Participants' DHP Installations

DHP Installation Location	Initiative Participant Responses (Percentage) (n=101)
Family or living room	29%
Dining room	25%
Bedroom or Bedrooms	21%
Kitchen	16%
Office or studies	3%
Entertainment or rec room	3%
Basement	2%
Bathroom or Bathrooms	1%

Q37. I'm going to read a list of types of rooms in your house. For each, please tell me if you have your DHP installed in the room.

Seventy-one percent of Initiative participants have used their new DHPs for both heating and cooling, while 28 percent have only used their DHPs for heating. This may be due to the timing

of the survey, which occurred in spring 2012, directly following the cooler winter months when cooling was not needed.

Overall, 74 percent reported that their DHPs provide sufficient heating and cooling for their household. Twenty-one percent indicated that DHPs had been unable to meet their heating needs at some time. These participants most often reported that their DHPs did not provide adequate heat in temperatures below 10 to 30 degrees, and were distributed roughly equally across all three northwest climate zones. The majority of these DHPs were installed in family or living rooms. (A few other respondents reported refrigerant leaks or electric parts failures). Less than two percent indicated that their cooling needs had not been met, and only two percent stated that their DHPs have met neither their heating nor cooling needs.

Eighty percent of Initiative participants have cleaned or hired someone to clean their DHP filters. Of those participants, 84 percent reported that their filters are cleaned more than once a year. Among Initiative participants whose DHP filters have not been cleaned, 44 percent stated that their DHPs were too new to clean and 39 percent stated that there were no particular reasons as to why their DHPs have not been cleaned.

Overall, 89 percent of the Initiative participants stated that the DHPs have met their expectations. Table 14 displays the satisfaction levels for specific DHP performance criteria. Sixty-eight percent of Initiative participants stated that they were very satisfied with the new heating comfort from their DHPs. Sixty-seven percent were very satisfied with amount of maintenance the DHP requires, and 66 percent were very satisfied sound level of indoor units. More than half of participants reported that they were very satisfied with the DHPs cooling comfort (55 percent), but many were unable to comment on the cooling (29 percent).

Table 14: Participant Satisfaction with DHP Performance Criteria

Criteria/Satisfaction Level (n=101)	Very Satisfied	Somewhat Satisfied	Not too Satisfied	Not at all Satisfied	Don't Know
Comfort of the new heat	68%	21%	3%	3%	3%
Maintenance the DHP requires	67%	11%	10%	0%	11%
Sound level of the indoor unit	66%	21%	8%	3%	2%
Comfort of the new cooling	55%	14%	4%	0%	29%
Electricity bill since installing DHP	50%	27%	13%	4%	5%

Q45. Please rate your satisfaction with the following aspects on a 5-point scale, where 1 is "very dissatisfied" and 5 is "very satisfied".

Fifty-nine percent of the Initiative participants stated that they have recommended DHPs to a friend, colleague or family member. Another 34 percent said that they would suggest DHPs, while only four percent said that they would not.

Amongst the Initiative participants that would or already have recommended DHPs to others, 58 percent cited lower energy bills, 26 percent mentioned operational reliability, and 25

percent named improved cooling comfort as their reasons for recommending DHPs. In addition, 23 percent stated that they would recommend DHPs based on improved heating comfort and 19 percent cite reasonable equipment costs. Some of the other, less common stated reasons were low noise levels, convenience of installation and ease usage and control.

Table 15: Reasons Why Participants Have or Would Recommend DHPs

Reasons	Initiative Participant Responses (Percentage) (n=97)
Lower energy bills	58%
Operates reliably	26%
Improved cooling comfort	25%
Improved heating comfort	23%
Equipment cost is reasonable	19%
Requires little maintenance	8%
Appearance is good/ acceptable	2%
Other	19%

Q48. What are some of the reasons you (would) recommend(ed) the DHP? Multiple responses allowed.

General Population Results

Among the general population of single-family homeowners, 34 percent were aware of DHPs before completing the survey and approximately three percent had actually installed a DHP system in their home. DHPs awareness was very similar across the three cooling zones, and also across urban and rural locations. Additional details are included in Appendix G.

Among the general population that have seen or heard of DHPs, 41 percent learned about DHPs was from friends, relatives or acquaintances. Eighteen percent heard of DHPs from the TV or radio and 11 percent from newspapers. Twenty five percent of the general population learned of DHPs from other sources such as in-store visits, magazines and technical journals.

Table 16: Sources of General Population DHPs Awareness

Source	General Population Responses (Percentage) (n=64)
Friend/ Relative / Acquaintance	41%
TV/ Radio	18%
Utility Sources	11%
Newspaper	11%
Internet	8%
Materials from Contractors/Installers	5%
Other	25%
Don't Know	20%

Q2. How did you first hear about DHPs? Q 3. Did you hear about it anywhere else? Or learn more about it from another source?

Forty-one percent of the respondents who are aware of DHPs but do not have one installed have considered installing a DHP in their household. Among the 59 percent that had *not* considered installing DHPs in their homes, common reasons included high costs (56 percent), performance in certain weather conditions (e.g., cold weather, 21 percent) and satisfactory performance of existing equipment (11 percent). In addition, a quarter of this group gave other reasons for not installing DHPs (e.g., lack of time and/or initiative).

Thirty-six percent of the general population who are aware of DHPs are also aware that financing for DHPs is available through banks in the Northwest. In addition, 55 percent are aware that utilities in the Northwest offer rebates for DHP installations. Among these Northwest residents aware of utility rebates, approximately 62 percent knew that rebates of up to $1,500 are available.

Table 17 depicts the overall interest level in DHPs among the general population and their likelihood of using bank and utility financing to install DHP systems in their homes. Twenty-two percent of the general population reported that they were "very" or "somewhat interested" in installing DHP systems (those that were initially unaware of DHPs were read a brief description). Amongst this group, 38 percent said that they were very or somewhat likely to use bank financing, while 59 percent were somewhat or very likely to use local utility financing for DHP installations.

Table 17: General Population Interest in DHPs and Likelihood of Using Financing for DHP Systems

Response	Very Interested / Likely	Somewhat Interested/ Likely	Not Too Interested / Likely	Not at All Interested / Likely	Don't Know
Overall Interest in DHPs (n=199)	5%	17%	11%	65%	2%
Likelihood of Using Bank Financing (n=39)	15%	23%	25%	35%	2%
Likelihood of Using Utility Financing (n=39)	21%	38%	17%	21%	3%

Q13. How interested would you be in installing a DHP system in your home? Q14. (If very or somewhat interested) If bank financing like this were available in your area, how likely would you be to use it to finance your DHP purchase and installation? Q 16. (If very or somewhat interested) If utility financing like this were available in your area, how likely would you be to use it to finance your DHP purchase and installation?

During the general population survey, respondents were given brief information about average DHP installation costs, potential energy savings, typical rebate levels and zonal heating/cooling advantages. Most respondents did not want to know anything else about DHPs. Those that wanted more information were curious about technical/installation issues (in general), ways to make DHPs work in colder climate regions and specific operations (e.g. if different temperatures can be set in different rooms). Table 18 shows that 29 percent of the respondents would rely on a utility if they wanted more information. Another 18 percent would seek out a contractor or installer.

Table 18: Where General Population Would Gather More Information About DHPs

Source of Information	General Population Responses (Percentage) (n=199)
Utility	29%
Contractor/installer	18%
Friend/ Relative / Acquaintance	12%
NEEA	7%
Manufacturer	5%
Other	33%
Don't know	10%

Q19. Where would you go if you wanted more information about DHPs? Multiple responses allowed.

5.2 DHP Installer Interviews

A total of 31 interviews were completed with DHP installers during March 2012. The interviewees included company owners, key managers and sales employees of the contractor firms. The primary objectives of the installer interviews were to comprehend their marketing and business practices, understand customer installation trends, identify barriers to increased Initiative participation, assess the effectiveness of Initiative processes and identify desired Initiative assistance.

The interview results presented in this section are grouped by the number of DHP installations that had been completed by the interviewee's company through 2011, as recorded in Fluid's database in January 2012. Firms with 50 to 850 DHP installations were categorized as being "highly active" and firms that had installed between 1 and 20 installations "less active". Table 19 displays the DHP installer interview sample by participation level and by state.

Table 19: DHP Installer Interview Sample, by Participation Level

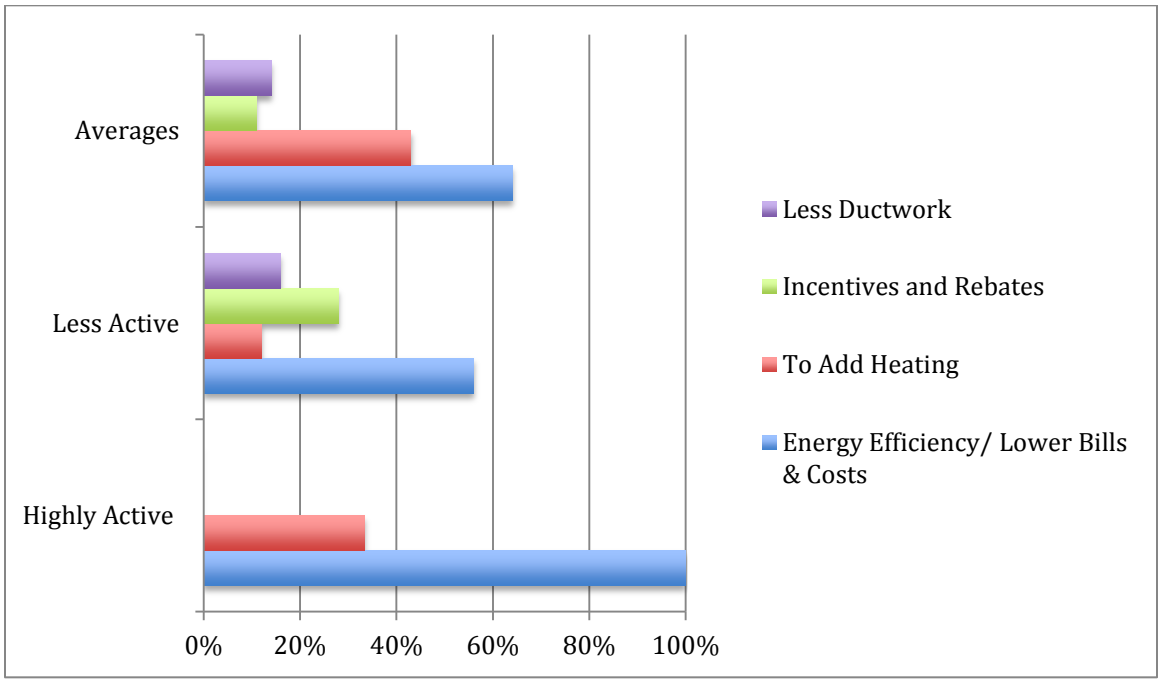
State	Less Active	Highly Active	Total
WA	8	2	10
OR	8	3	11
ID	6	1	7
MT	3	0	3
Total	**25**	**6**	**31**

Business Scope and Practices

The DHP brands that the sampled firms offered are Mitsubishi (the majority of the firms offered this brand), Fujitsu, Daikin, Panasonic and LG. Nineteen of the interviewees do not stock DHPs at their business location but order them as needed for installation projects. Some firms began stocking DHPs as early as 2003 and others as recently as 2011.

According to the installers, the top drivers of DHP installation are cost effectiveness (e.g., energy efficiency and lower utility bills), less ductwork and available utility incentives. Figure 2 displays the factors that encourage patrons to install DHPs, disaggregated by firm type.

Figure 2: Main Reasons Customers Install DHPs



About 58 percent of residential DHPs projects are one-to-one systems versus multi-headed systems. Among highly active firms, 56 percent of residential DHP projects involved one- to-one systems versus multi-headed. This figure was approximately 59 percent for less active firms.

In aggregate, about 15 percent of new DHP installations were in newly heated areas of homes (i.e. garages converted to work spaces, bonus rooms or in-law units). The installers reported that 81 percent of their customer homes have baseboard/zonal electric heating at the time of the installations. In comparison, relatively few homes have gas heating or electric forced air furnaces (although a few installers reported serving a high percentage of gas homes).

Across all firms, the average residential installation cost for single-headed DHP installations was $3,593. Highly active firms had an average installation cost $3,188 and less active firms had installation costs around $3,694. Overall, the installers believed that 23 percent of DHP customers use financing to pay for their installations. Table 20 depicts average DHP costs and utilization of financing by firm type.

Table 20: Average DHP Installation Costs and Financing Utilization

Type of Firm	Average Single-Headed Residential DHP Installation Costs	Customers that Use Financing to Pay for Installations
Highly Active	$3,188	23%
Less Active	$3,694	26%
Averages	$3,592	23%

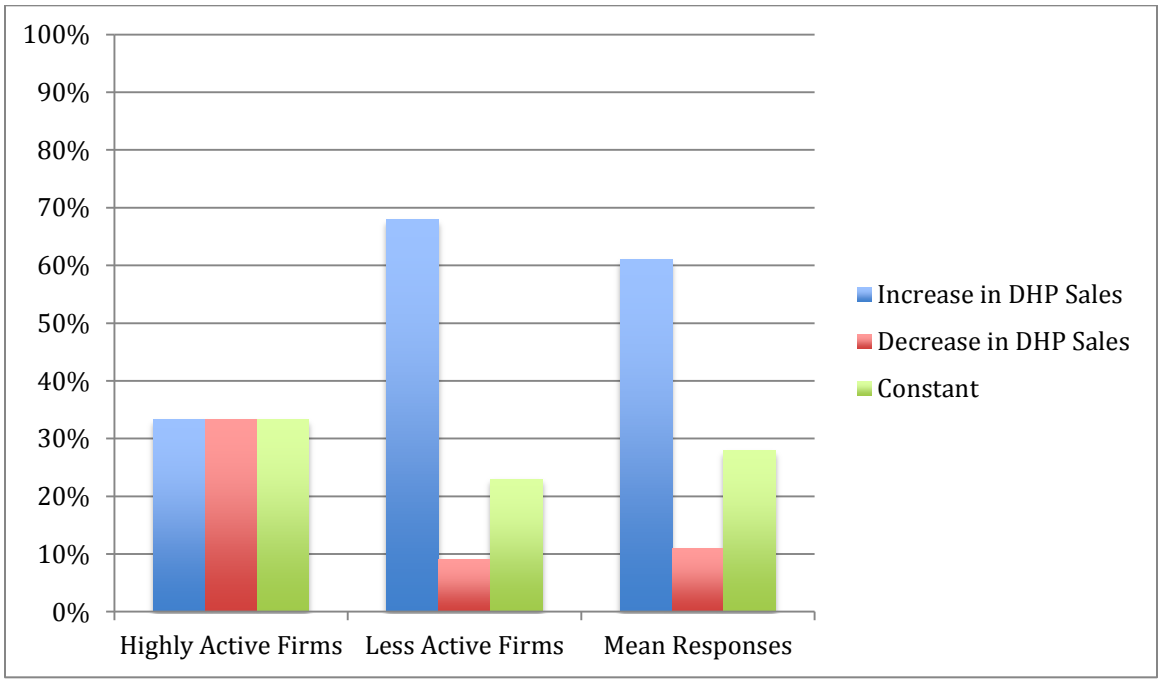
Overall, the installers estimated that 83 percent of eligible residential DHP customers get rebates from utilities. Interviewees at active firms estimate that 77 percent of residential DHP sales receive rebates from utilities; the estimated percentage for less active firms was 85 percent. Respondents were also asked to rate the extent to which utility incentives drive DHP sales; on a scale of 1 (not at all important) to 5 (extremely important), the average rating is 4.6. As shown in Table 21, the highly active contractor firms derive 70 percent of their revenue from DHPs sales.

Table 21: Prevalence and Importance of Utility DHP Incentives

Type of Firm	Residential DHP Sales that get Utility Rebates	Importance of Utility Rebates to DHP sales (scale of 1 to 5 (highest))	Contractor Revenue From DHP sales
Highly Active	77%	4.50	70%
Less Active	85%	4.64	18%
Averages	83%	4.61	29%

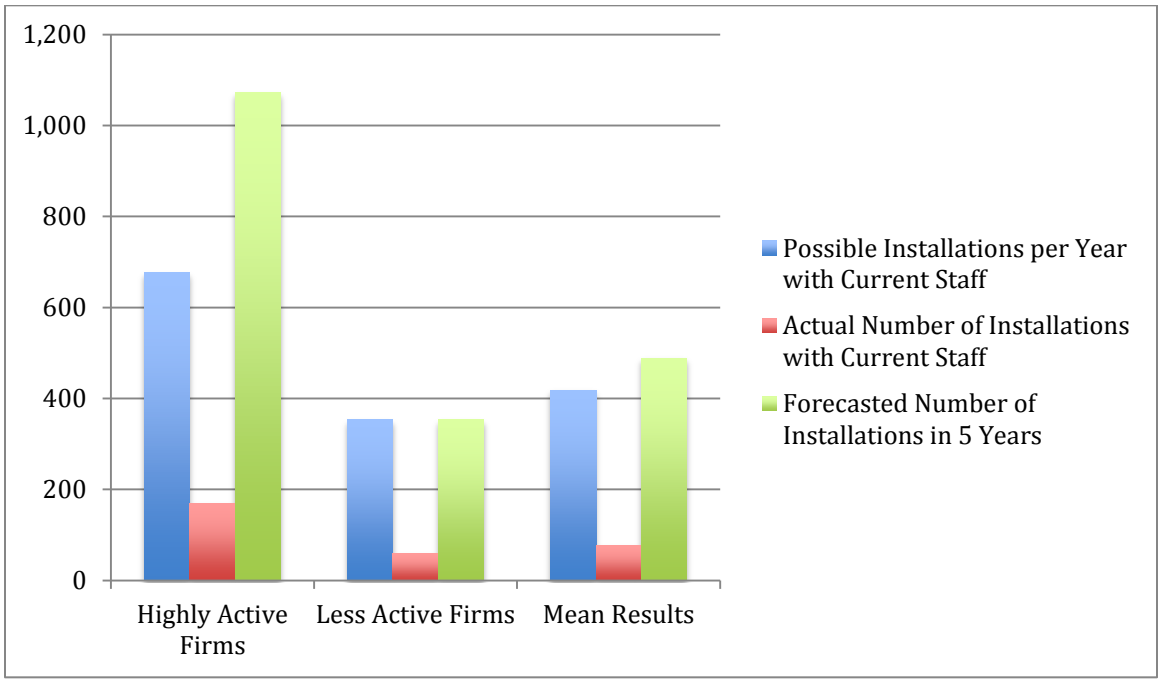
When asked to forecast future DHP sales, 61 percent of respondents expected their DHP sales to increase in the next two years, 11 percent believed that DHP sales would decrease and 28 percent of the interviewees said that DHP sales would remain constant. Installers that expected future DHP sales to decrease based their predictions on the lowering of the federal tax credits, less utility rebates, increased costs and the (perceived) deteriorating economic climate. The installers that expected future DHP sales to increase based their responses on the increasing public awareness of DHPs, availability of incentives, reduced utility restrictions, increasing energy prices, higher demands for comfort, increases in future advertising and Internet presence and more project leads from manufacturers. Figure 3 depicts the expected DHP sales trends by firm type.

Figure 3: Expected DHP Sales Trends



The interviewees were asked to make forecasts about the maximum number of installation they could perform with their current staffing, the actual number of installations they would complete in 2012, and the number of installations in five years. On average, the respondents estimated that their individual firms could complete up to 418 DHP installations per year. The predicted actual number of 2012 installations, per firm, was 77 and the forecasted number of installations in five years was 489 (per firm). Importantly, these forecasts show that most firms do not have current service capacity constraints, and that they are optimistic about future sales growth.

Figure 4: Installations Capacity and Forecasts



Marketing Practices and Consumer Barriers

For marketing and promotion, HVAC companies most often use their own websites, mailed flyers/ product literature and receive consumer referrals from the utilities. Installers in remote and rural communities often rely on word-of-mouth and local newspaper advertisements for marketing. The firms that do not actively market DHPs (8 of 31) noted that they have budget constraints and perceived low returns on marketing investments.

When giving price quotes for DHP installations, 90 percent of the interviewees give fairly specific estimates. Interviewees that quote price ranges typically have to go and inspect the home to better understand the specific installation conditions and requirements.

Overall, 83 percent of the interviewees emphasized displacing, and not replacing, existing heating equipment in their customer marketing. All of the highly active firms reportedly emphasize displacing heating equipment, while 76 percent of the less active firms emphasize displacement. Numerous interviewees noted that the additional costs of removing existing equipment makes "replacement" a poor option.

In general, the most common barriers reported for selling DHPs were the appearance of the equipment and the high costs associated with DHP installations. Some of the other barriers that were reported include the lack of incentives in some service areas, removal of federal tax breaks for energy efficiency and the general lack of adoption for DHP technology. A few installers stated that DHPs do not provide adequate heat in colder regions and that remote

locations often lack utility incentives. Also, homes with gas heat are less likely to qualify for rebates.

Fifty seven percent of the interviewees knew that certain utilities offer on-bill financing for DHP installations. All of the "highly active" participants knew this information and40 percent of the "less active" interviewees were aware of on-bill financing. (Those that did not know about utilities offering on-bill financing were referred to http://www.goingductless.com, where the utilities that offer this service are listed).

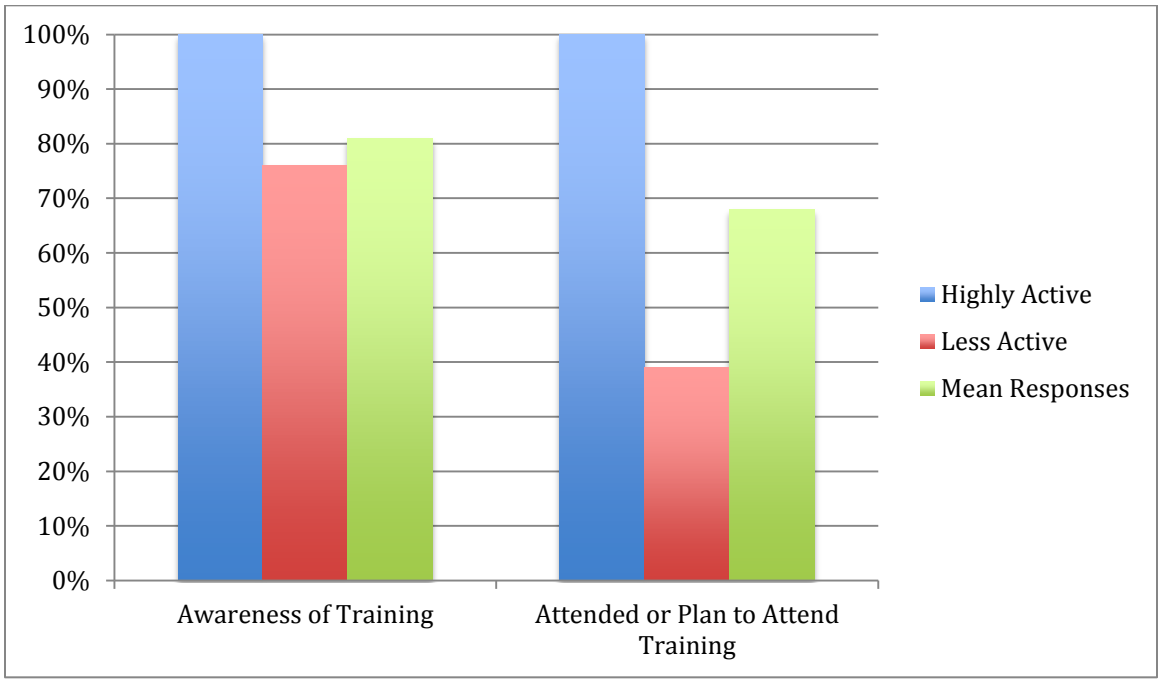
Regarding additional marketing assistance, the installers would like to see NEEA and the utilities put DHP related material in utility bills and increase general public advertising to increase consumer awareness. Many stated that the utilities are already doing a good job with marketing.

Training

Installers were asked how many of their company staff had received manufacturers training on DHPs, or attended a contractor orientation for NEEA's DHP Initiative. The number of staff that were trained or attended a contractor orientation ranged from one person to 16 people. On average, six people from the highly active firms and four people from the less active businesses received DHP training or attended a contractor orientation session from NEEA's DHP Initiative.

Eighty-one percent of the interviewees were aware of the Master Installer Training that is available to DHP contractors. All of the highly active firms' representatives knew about the training and 76 percent of the less active firms' interviewees were aware of the training. All of the highly active firms and 56 percent of the less active firms had attended or planned to attend the trainings. The primary reasons given for not attending the trainings were time constraints and the minimum number of installations that are required to sign up for the trainings (a few installers could not meet this requirement.)

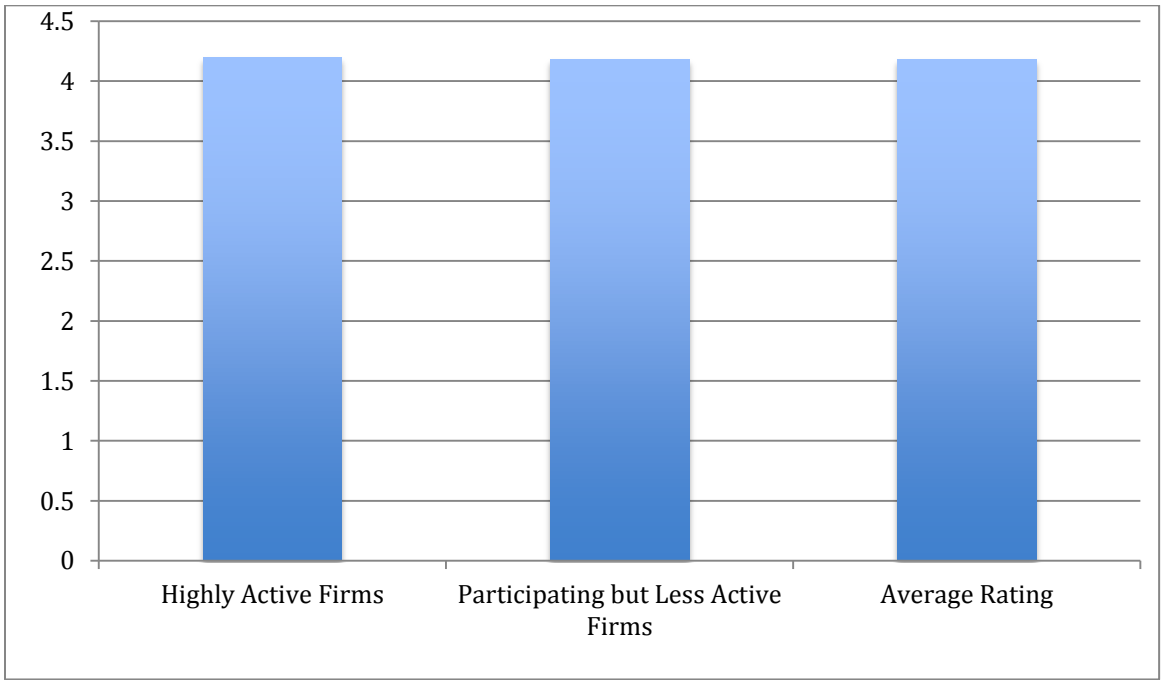
Figure 5. Master Installer Training Awareness and Participation



Satisfaction and Initiative Feedback

Overall, the interviewees were very satisfied with the technical information provided to installers. One a scale of 1 (not at all satisfied), to 5 (extremely satisfied) the average rating was 4.2. Figure 6 depicts the attitudes towards the technical information provided to installers by firm type.

Figure 6. Satisfaction with Technical Information Provided



The interviewees were generally satisfied with the quality of communications between the Initiative and DHP contractors. However, some indicated that more marketing to the general public would be helpful. Specifically, some respondents would like NEEA and/or the utilities to enhance consumer awareness of DHP technology with user-friendly information, flyers and online videos that highlight energy efficiency and energy bill savings benefits.

5.3 DHP Manufacturer and Distributor Interviews

In-depth interviews were conducted with regional and national sales managers for five DHP manufacturing firms and five DHP distributor companies in May and June of 2012. The primary objectives of the interviews were to learn about their marketing and business practices, understand their interactions with the Initiative, distinguish expected market trends and identify any additional assistance needed from the Initiative.

DHPs Marketing

All of the companies are primarily marketing to installation contractors and localized dealers (versus end consumers); one sales representative has also started targeting home remodelers. Manufacturer sales staff often do personal marketing visits to distributors/dealers and sometimes give them co-funding for their own marketing. At a higher level, manufacturer corporate marketing departments promote DHPs through Internet and targeted trade magazine advertising, and by providing information to regional trade associations. One manufacturer that is relatively new to the market is doing national print and television advertising (e.g., USA Today, Better Homes and Garden Show). Another manufacturer with

high market share advertises its general brand widely via sponsored golf events, multiple television shows, trade magazines and regional magazines. Distributors primarily promote DHPs to contractors via email blasts, product trainings, cold calls and mailed literature. One distributor also helps local dealers with billboards, newspaper advertising and direct mail.

All of the interviewees promote both single and multiple head systems, as both can serve different customer needs (and contribute to firm revenues). In their messaging, the firms primarily emphasize economic factors (i.e. energy efficiency/bill savings, low cost installations) and secondarily zonal temperature control for increased comfort.

None of the interviewees described any conflicting marketing from the Initiative, and the Initiative has caused firms to change their marketing in various ways. One manufacturer developed new Northwest literature describing available rebates and DHPs models best suited for electric replacements. Other firms began running regional Public Service Announcements and/or donated equipment for Initiative marketing contests. Manufacturer sales staff are now working more closely with distributors – coaching them on sales strategies and helping with their advertising materials (resulting in higher DHPs sales). One has dedicated staff to work with regional utilities on their promotions and rebates. Only one respondent had not changed their marketing, perceiving that there had not been many Initiative promotions in their area. Four companies had increased their marketing budgets in past year (by unspecified amounts).

One manufacturer representative displays units in Home Depot stores and did not know if other retailers would be added, as contractors are still the company's target market. Another representative had placed units in nine Seattle area Costco stores where sales had increased significantly. A different representative was working with multiple Oregon retailers on a display pilot (details not disclosed), even though they have concerns about installation quality (they will be monitoring this). Multiple respondents noted that more contractors are adding showrooms with DHP display units, and that the contractors perceive increased DHP sales. Most of the interviewees stated that hands-on displays are critical for sales, so customers can get familiar with the technology and judge the aesthetics first hand.

DHPs Sales

Consumers are buying a wide range of models for different reasons. One sales representative noted that most customers prefer the most efficient units they offer (single zone 15,000 and 18,000 BTU models), while another representative added that some customers simply want the lowest cost models. Another representative has high demand for units that give full capacity at 5 degrees (most brands do not), while a different representative sells many highly efficient units that are also "the best looking", while another sells mostly 20+ SEER multi-head units. Overall, multi-head sales are growing most rapidly now, and Mitsubishi and Daiken models (single and multi-head).

All of the interviewees except one distributor perceived that NEEA's Initiative had helped to grow the market in recent years, although they could not precisely quantify this impact. One representative noted a high increase in regional DHP awareness and sales, and speculated that the Initiative may have increased total regional market sales by 25 to 30 percent. They also reported that many sales do not get rebates due to eligibility restrictions. A different representative noted that sales in Washington and Oregon have increased two to three times since 2008, outpacing national growth (also robust), and said that, "NEEA must be impacting this." Others also perceived that NEEA's efforts had accelerated utilities' acceptance of the technology, and regional sales generally. One representative was particularly appreciative of the Initiative's marketing activities, since "customers don't always trust the manufacturers."

The interviewees had difficulty distinguishing the Initiative's impacts in the past 12 months, as multiple factors are affecting sales simultaneously (e.g., weather patterns, economic conditions). Four respondents said their sales were continuing to increase, four said they had decreased, and two said they were about level. One interviewee perceived that the Initiative had recruited most regional contractors as participants ("there may be some saturation"), and expected that sales may level (for an unspecified period). Although there has been some "recovery" from the reduction in federal tax credits, the interviewees reported that their annual sales may have been reduced by 10 to 30 percent. They also noted that the rebates offered by the utilities have been critical for sustaining sales in the short term.

Regarding sales challenges, two distributors cited delayed deliveries by manufacturers (up to four months), and one manufacturer's representative said that distributors were not adequately planning for high expected future sales of their specific brand. One distributor noted that the local utility did not offer financing tools, which could improve sales.

Interactions with Installers

Both manufacturer's representatives and distributors have high interest in ensuring that installation contractors are using proper messaging and doing high-quality installations, and they often team to educate and train contactors in local areas. Collectively, they give them training on: specific products, how to identify sales opportunities, how to describe energy savings, and also literature to distribute, presentation materials, and advertising development assistance. One distributor said they have territorial service managers to focus specifically on assisting contractors.

Technical training is a high priority for quality assurance and typically covers: installation, circuit boards, troubleshooting (e.g., hot/cold spots) and servicing. Most manufacturers and distributors said they require the contractors to "touch and fix" DHPs systems during the training. In addition, most distributors require their specific training unless the contractor is known to be very experienced.

Overall, the respondents did not describe pervasive technical challenges, and a few described the installations as "simple" after contractors do their first few. One specifically noted that

earlier problems related to making good refrigerant line flare fittings have gone away. Most of the challenges mentioned pertained to electrical issues. Two distributors stated that generalist electricians have more problems than well-trained mechanical installers. Another noted that installers (all types) sometimes forget to use shielded wire. One sales representative perceived that historic unfamiliarity with inverter technology and circuit boards were the greatest (and declining) challenge, while another reported that some installers do not do load calculations or install the wrong refrigerant charge amounts.

All of the respondents noted that price-gouging by installers (due to the rebates) was highly unlikely, since the Initiative has many participating installers now, and there is high competition across all firm types (e.g., established firms with storefronts to single-operators from home). Consumers have also become more savvy and price-conscious in the poor economy. That said, one respondent noted that selling units through retailers increases the risk of price gouging, since it is more difficult to quote realistic installation prices and wide ranges may be given.

Two distributors said they would sell DHPs to electricians with refrigerant licenses, while another already does this, adding that for them it is more important to sell to conscientious trainees than regular HVAC contractors that do not focus attentively on installation details. The other two distributors did not want to work with electricians; one was convinced that few electricians are well trained to work with refrigerant, while the other did not want to upset their established contractor clients. Overall, the distributors did not think electricians could grow the market significantly, since HVAC contractors are participating at a high level already.

Interactions with Initiative

While one interviewee had not had any direct interactions with Initiative staff, all the (nine) others had attended infrequent meetings with Fluid, NEEA and utilities staff. Most of these respondents had also attended Northwest Ductless Workshops in 2011 (Tacoma) and/or 2009 (Portland). Two respondents are regular sponsors of Initiative trainings for installation contractors, and one of them had contributed products for Internet sweepstakes. None of the respondents described any problems supporting the Initiative, and the only challenges mentioned related to staying current with the Initiative (e.g., ensuring their most current products are posted on qualifying lists, keeping contractors trained on new models).

Most of the interviewees noted that NEEA had not changed their view of the Northwest Market, as they had been selling DHPs before NEEA's Initiative launch and recognized that the Northwest has high potential for DHP installations. Four respondents did note that NEEA's primary contribution has been to accelerate market acceptance and first-cost entry barriers. One noted that, "NEEA can touch many more people than three or four makers", while another said NEEA has "reinforced" the market.

One distributor had no plans to directly support the Initiative in 2012, and two respondents were unsure of their corporate plans. The other sales representatives and distributors

expected to assist the Initiative generally with technical installer trainings and marketing collaboration. One manufacturing representative noted that their company has high interest in supporting the Initiative, as continued growth in the Northwest should also increase sales in other regions of the US.

The respondents had few requests for additional Initiative support. One would like NEEA to list all available DHP brands in Initiative literature (e.g., 70's flier) so that customers are aware of the variety that exists, and less influenced by contractors that only carry selected models. One manufacturer representative would like more marketing metrics from Initiative staff to better understand their expected/actual marketing reach. This would help them to collaborate more quickly and effectively on marketing initiatives. A general theme was that the Initiative should continue its current marketing strategies, as their commercials, sweepstakes and website are all helping to grow awareness.

Future Expectations

Most of the respondents expected relatively minor gains in efficiency for single-head units, which already can have a seasonal energy efficiency ratio (SEER) of 28. Two manufacturers are introducing models that significantly enhance cold weather performance, some of which provide full capacity at -5 degrees. Besides improved inverter technology, the respondents expected most improvements would relate to: aesthetics, wireless controls (motion sensors, smart phones), infrared sensors to find and fix hot/cold spots and applications for water.

According to the interviewees, prices for DHP installations are not expected to decline further, due to recessionary pressures and the competitive installer market. Price reductions are possible on the manufacturer/product side, however, if component costs decrease and as new brands come to market.

Half of the respondents expect DHPs sales to increase generally, while five specifically noted high or "significant" growth. One sales representative expected 25 percent annual growth in the short term for their brand, while another expects 35 percent total growth over the next few years. Different respondents noted that many households are still installing room air conditioners (i.e., there is large market opportunity for cooling units), retail displays are increasing overall customer awareness, and improving installation quality is reinforcing word-of-mouth referrals. Seven respondents perceived that utility rebates have a strong impact on DHPs sales, while two perceived relatively minor influence (one did not know).

Multi-head sales are expected to comprise 30 to 60 percent of total sales across the range of respondents, except for one brand that expects to sell 15 to 20 percent. According to the interviewees, multi-head sales will likely grow faster than single-head sales, as new construction rebounds and because homeowners increasingly want whole-home solutions.

Besides new construction, the respondents also perceived growing market opportunities in manufactured homes, and to a lesser extent, multi-family housing and nursing homes/hospitals. In general, DHPs are a very flexible technology and very customizable

products are available now. At the site level, growing single-head applications are remodels, media rooms, elevators and computer rooms.

According to the interviewees, the primary challenge for future market growth is consumer awareness – DHPs still have a low market share and are not commonly seen, although this is changing with growing retail displays. The poor economy and initial first-costs are also key barriers, while aesthetic concerns and competition from cheap natural gas were each mentioned by one respondent.

5.4 Northwest Utility Interviews

A total of 20 interviews were completed with utility representatives in February and March of 2012. The primary objectives of the utility interviews were to:

- Understand utility program offerings and promotions, and expected changes
- Identify utility program delivery challenges
- Understand satisfaction with NEEA's Initiative and if needs are adequately met
- Determine how NEEA can improve its assistance to utilities

Table 22 shows the number of interviews completed by state and total number of DHPs installed through the Initiative. The 20 utilities interviewed collectively account for about 70 percent of all DHPs installed through the Initiative.

Table 22: Utility Respondents by State and Total DHP Installations

	Cumulative Initiative Installations						No. of
State	<50	50-100	101-500	501-1000	> 1000	Total	Units
WA		1		3	2	6	5,376
OR*	1		2	1	2	6	4,193
ID	2		2			4	534
MT	3		1			4	507
Total	6	1	5	4	4	20	10,610

* Oregon respondents include Energy Trust, which comprises two utilities
Source: Fluid installations data provided January 31, 2011

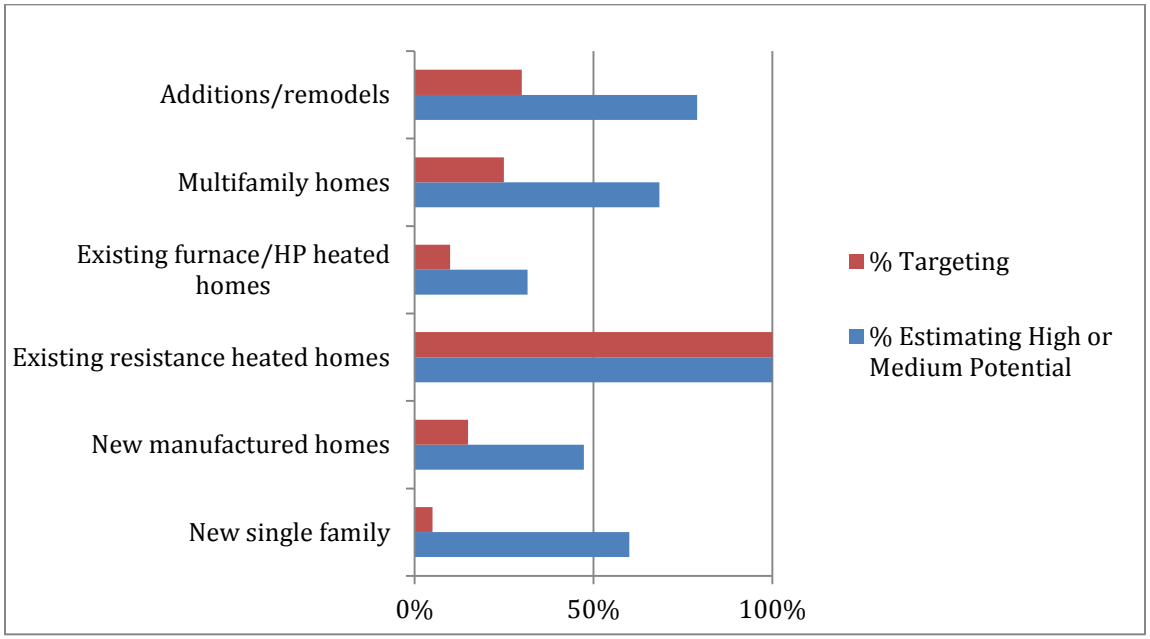
Target Markets and Perceived Potential

When asked why their utility was participating in the Initiative, most respondents noted a) their obligation to provide energy efficiency alternatives to their customers b) the appropriateness of DHPs for customers with zonal heating in particular, who have relatively few energy efficiency options, and c) the role of BPA and NEEA in providing the funding and programs infrastructure, enabling their utility to offer DHP incentives to their customers.

Utility program managers were asked which market segments they are targeting and the level of DHP potential they perceived in each. The next figure shows the percentage of respondents

targeting each segment as well as the percentage who perceive medium or high potential for DHPs in each.

Figure 7: Targeted Market Segments and Perceived Potential



Not surprisingly, existing resistance-heated homes are the most widely targeted and are seen as offering the greatest potential. However, several segments that are not currently being targeted - additions/remodels, multifamily homes and new single-family houses - are also perceived to have medium or high potential.

Marketing Methods and Messages

Overall, the utilities are using a wide variety of tools to promote their own programs:

- Half of the utilities (10) use bill stuffers to inform customers about their programs, while another three include information in newsletters that are sent out with bills.
- Half of the utilities use newspaper advertising. One said they had done so only once and had not found it very effective. Two other respondents said newspaper ads are placed by participating contractors.
- Eight respondents said they use radio ads, and three of those also used TV.
- Social media are used by only three respondents, one of whom said they are using Facebook, while two said they are in the early stages of using social media.
- All but two of the utilities use their own website or the Initiative website to promote DHPs.
- Four respondents specifically stated that they rely heavily on contractors to do most of the marketing.

- Other less common strategies included magazine articles (e.g., Ruralite, Rural Montana), attendance at home shows and contractor word of mouth.

Nine of the 20 utilities reported having a DHP display unit; six of those received the unit through a distributor, while the others said their unit had been provided by a contractor (two) or though NEEA and Fluid. Most of the units were displayed in the utilities' lobbies and were said to be operational, although several respondents noted that while the "interior" unit blows air, the compressor is not hooked up. Six of the utilities with display units said they had been effective or very effective in helping to market DHPs, since the displays help people to see the size of the unit and how quietly it operates. The other three were not sure how effective the displays had been.

Thirteen utilities said their promotional spending had remained about the same over the past year, with four reporting an increase and three a decline. Most said that contractor efforts and word-of-mouth were the most effective promotional methods, with one citing comfort and energy savings as primary messages. Three-fourths of respondents said they do use the displacement theory to educate customers and contractors about DHPs, with most noting that while they tend to promote single head installations.

Thirteen respondents say they do not expect major changes in their promotional efforts in the next year. Among those who expect to make some changes, four said they would increase their use of various marketing channels, including social media, while one said they would increase the rebate and one said they would encourage contractors to increase their marketing.

Current and Anticipated Rebate Levels

All of the utilities provide rebates for existing zonal heating, with rebate levels ranging from $750 to $1,500. Among those who offer the highest rebates, the rebate level in most cases is based on the amount of the incentive provided by BPA (to the utilities).

- Eleven of the utilities pass the full $1,500 amount provided by BPA on to their customers; one provides $1,500 for low-income customers only, and $1,000 for the rest.
- Two offer customers $1,350 and pay the $150 to installation contractors.
- Two pay customers $1,250 and retain the rest of the BPA incentive for other program costs.

Utilities that do not pass through BPA money generally have lower rebates.

- One utility offers a $1,200 rebate based on "incremental cost of the product, what current adoption is and what other utilities are doing," noting that they "like to cover around 70 percent of the incremental cost." This utility pays the same rebate for installations where there is an existing electric furnace and for manufactured home zonal.

- Three other utilities, including Portland General Electric (PGE) and Pacific Power (through Energy Trust of Oregon), pay $800, and are based on Oregon PUC guidelines, and in the case of the other utility, on a combination of what they are reimbursed, what the region is doing, and what they perceive is needed to move the market and meet their goals. Energy Trust also pays the $800 incentive for DHPs installed in homes with electric furnaces and pays $600 for DHP installations in existing multi-family zonal heating applications.
- The lowest rebate for installations replacing zonal systems was $750, which, according to the respondent, was set by BPA guidance in 2008.

None of the representatives believed that their rebates will end in the near future. Several interviewees, however, noted that their ability to offer incentives is wholly dependent on BPA's decision to keep funding them, and that BPA's actions will affect their own rebate levels. Two interviewees expected to reduce their future rebate levels to follow (likely) BPA funding reductions. Another PUD, however, said that their rebates were more likely to increase because they want to "significantly increase use of DHPs." Two utilities said they expected the rebate to stay the same this year and then likely decline, because DHPs are gaining large market share, and funds might be better used for other programs or measures.

About half of the respondents said the Federal Tax Credit reduction had a significant impact, with three stating that the credit reduction had reduced installation activity by 50 percent.

Financing

Half of the interviewed utilities (mostly larger ones) offer financing for DHP purchases. Many smaller co-ops said they do not have the staff resources to support a financing offer or face regulatory hurdles that prevent financing services. Among those who offered financing, six said loan repayment was available on the utility bill. Interest rates ranged from zero percent for five years to six percent for as long as 20 years. The percentage of customers utilizing financing ranged from 5 to 25 percent, and the two utilities with the highest utilization both offer five-year loans at five to six percent (one on the utility bill, one not on the bill).

Contractor Support

Twelve of the 20 utility representatives said they provide support to DHP installers: most frequently through training (6), advertising or coop advertising (4) and the $150 rebate. Most said their support was unchanged in the past year, but one noted that they were planning to add co-op marketing, while two reported changes in training: one said that they were going to begin offering it, the other that they anticipated having to pay for the training rather than have it provided through NEEA.

Goals and Barriers

Eleven of the 20 respondents said they had met or exceeded their 2011 installation goals, although a number of utilities said they did not have explicit goals or had combined targets with other utilities. Washington and Oregon utilities were most likely to have reached their

goals. Utilities that did not meet their goals typically attributed the shortfall to economic recession, while a few mentioned overly ambitious goals, a lack of marketing, and difficulties getting landlords to install DHPs in rental units. Most utilities said their installation goals for 2012 would be about the same or slightly higher, while one said they were hoping to more than double their installations, and another expected to reduce the number by 75 percent due to reduced BPA funding.

When asked to list their largest participation drivers, respondents most often cited contractor marketing (8), customer word of mouth (7), rebates (5) and NEEA/utility marketing (5). While none of the respondents thought cold climate was an actual barrier to DHP installations, two mentioned the perception that the climate was unsuitable in Northern Idaho and Montana. Bigger concerns were the overall economy, a lack of zonal heating installations in some utility territories, lack of contractor and consumer awareness of the technology and, to a limited extent, aesthetic concerns. Several utility representatives said they saw no real challenges and found NEEA's DHPs Initiative to be one of the best programs they had worked with.

Inspections

Respondents were generally pleased with the inspection process, although five mentioned that BPA would no longer be paying for them starting in the fall of 2012, so that their utility would have to contract directly with Fluid for the inspections. Most utilities do random inspection on 5 to 20 percent of installations, although one said they only do a prequalification, while three said they do 100 percent inspections and one does inspections on all financed units (but random for others). Most said the inspections are going smoothly; the only issues mentioned were:

- Initial problems with some contractors not insulating outside refrigerant lines (mentioned twice)
- Improper siting or securing of the outdoor unit to avoid runoff or snow/ice buildup
- Ensuring that customers know how to change the temperature setting and confirming adequate insulation levels.

The only added assistance requested from NEEA with regard to inspections was clarification regarding Fluid's future role in the inspections process going forward.

Communications with NEEA

Three quarters (15) of respondents said they have had no difficulties staying informed about NEEA's current or planned Initiative activities, and did not have any confusion about BPA and NEEA's roles. Regarding Initiative webinar attendance, 18 of the 20 respondents said they or other staff regularly attend; one utility representative never attends and one said there is not enough time to attend.

Some specific communications and delivery issues noted by individual interviewees included:

- No direct contact from NEEA after requesting it
- Inadequate preparation time for 2011 activities, and confusion over Fluid's ongoing role
- Concerns that BPA funding for Fluid's communications and rebates processing assistance would be cut
- Confusion at one utility regarding NEEA's specific role in the Initiative
- Changing and conflicting messaging regarding BPA's plans for DHPs support

While respondents were generally very satisfied with the quality of their Initiative communications, some did not know if their primary contact worked for NEEA or Fluid. Suggestions for improving Initiative communications included:

- Establishing consistent points of contact for communications between NEEA and each utility, at different staff levels
- Issuing monthly or quarterly newsletters or e-letters
- Continue the webinars and have a twice annual meeting for DHP utility partners

Nine respondents said they do not or rarely use the Initiative database, while two said they use their own database. The remaining nine said the Initiative database works well for what they need – in most cases to check the approval status of rebate applications.

In contrast, the majority (75 percent) of utility staff said they had used the Initiative website in the past three months. All of those using the website said they had been able to find the information they needed, although one respondent said it was not as easy as she had hoped. Primary information sought included: contractor's names or certification status (7), Initiative information (6), forms (2), qualifying DHP models (2), and Initiative approval status (1).

Satisfaction with Initiative technical resources and marketing support was high among the utility respondents, as summarized in Table 23 below.

Table 23: Satisfaction with Initiative Technical Resources and Marketing Support

Satisfaction Level	Technical Resources (n=20)	Marketing support (n=20)
Extremely Satisfied	65%	75%
Somewhat Satisfied	25%	10%
Neither Satisfied nor Dissatisfied	5%	
Somewhat Dissatisfied		5%
Extremely Dissatisfied		
Don't Know or No Opinion	5%	10%

The "neither satisfied nor dissatisfied" response came from a utility manager who was concerned about losing Fluid's forms processing support, while the "somewhat dissatisfied" response came from another manager who appreciated a DHP marketing campaign but felt that NEEA had not involved his utility early enough.

When asked what features of the Initiative had worked particularly well for them, eight respondents mentioned the overall ease of use and turnkey nature of the Initiative, four mentioned the website, four said other marketing materials were helpful, and two cited Initiative updates and webinars from NEEA.

In response to how NEEA might be better able to serve the utilities, only about one-third of respondents had specific suggestions for Initiative changes or improvements, including providing materials to allow utilities to tailor marketing efforts to local needs (3), continued outreach to identify new installers and markets for DHPs (2), and continued marketing and promotion to the general public (2).

6 Review of NEEA Cost Effectiveness (ACE) Model

As part of this evaluation, Evergreen Economics reviewed the Alliance Cost Effectiveness Model (ACE Model) used by NEEA to calculate the cost effectiveness of the Initiative. In this section we present findings related to un-incented DHP installations, which are currently a model input, and estimates of commercial installations and manufactured home estimates, which may become future model inputs.[5] Other findings regarding the percentage of installation projects that utilize financing, and utility rebate level expectations are presented in earlier sections of this report.[6]

Incented and Non-Incented DHP Units

Fluid Market Strategies provided 2010 and 2011 incented and non-incented sales data for heating and cooling DHPs in the Northwest. Furthermore, they break down incented and non-incented DHP sales by installation location. This allowed us to determine the quantity of DHPs installed in NEEA's primary target market (the primary living space of single family homes, displacing zonal electric resistance heating).

Table 24 below, shows the numbers of incented and non-incented heating and cooling DHPs that were sold to single-family homes in the Northwest. The values reflect installations believed to displace zonal electric resistance heating. As shown, the number of incented units dropped from 5,312 in 2010 to 4,269 in 2011 (a 20 percent decrease). Conversely, non-incented sales have grown. In 2011, approximately 1,300 non-incented DHPs were installed in NEEA's target market, up from 1,065 non-incented DHPs in 2010 (a 22 percent increase). Importantly, these quantities may be adjusted in the future due to ongoing tracking and reporting by the participating utilities and Fluid.

Table 24: Heating and Cooling DHP Sales in Single-Family Homes Replacing Baseboard/Zonal ERH, Incented and Non-Incented, 2010 and 2011

Heating and Cooling DHP Sales	2010	2011
Incented	5,312	4,269
Non-incented	1,065	1,308
Total	6,377	5,577

Source: Evergreen Economics tabulations of data provided by Fluid March 14, 2012

[5] We reviewed a version of the model (V3) provided January 27, 2012. Findings related to the model review were provided in a memo to NEEA on March 14, 2012. That memo did not include estimates of commercial and manufactured homes installations, which were not a focus of the original review.

[6] Other model assumptions, such as the number of regional homes with baseboard/zonal electric heating and deemed savings for single-head installations, are developed by the Regional Technical Forum and were not a focus of our review.

Fluid's sales estimates and incentives data show that non-incented installations comprised 23 percent of all single-family installations (to displace zonal heating) in 2011. These data are consistent with findings from the in-depth interviews conducted with DHP installers. Overall, the installers estimated that 83 percent of eligible residential DHP customers get rebates from utilities (to displace both zonal heating – 80 percent of their installations - and forced air heating).

Commercial and Manufactured Homes Installations

During the in-depth interviews with 31 DHP contractor firms, we asked the installers to estimate the number of DHP installations going into commercial uses in the past 12 months. Overall, residential DHP installations have outnumbered commercial installations by about four-to-one. On average, each firm installed 54 residential DHPs and 14 commercial DHPs. The highly active firms installed 163 residential DHPs and 33 commercial DHPs. The less active firms installed 37 residential DHPs and 11 commercial DHPs. Overall, the installers estimated that 83 percent of the commercial installations went into smaller commercial businesses of 5,000 square feet or less.

Collectively, the installers estimated that 1.5 percent of their residential installations went into existing manufactured homes. The highest reported percentage of manufactured homes installations was 20 percent, for a company that had installed approximately 60 residential DHP units. Amongst the 30 respondents that installed residential DHPs in the last 12 months, 25 installers did not install any DHPs in existing manufactured homes, four installers reported installing between one and 20 percent and one respondent did not know.

The 10 distributors and manufacturers representatives we interviewed had difficulty reporting actual commercial installation numbers, but their market share estimates were:

- 2 to 3 percent
- 10 percent (2)
- 20 percent
- 25 percent (2)
- 33 percent
- 70 percent

The interviewees perceived that "the majority" of commercial installations are in small businesses (e.g., in strip malls), while some DHPs are installed in school classrooms and large company computer rooms.

The distributors and manufacturers generally estimated the share of DHPs going into manufactured homes to be between zero and five percent.

7 Key Findings and Recommendations

Overall, NEEA's Northwest Ductless Heat Pumps Initiative appears to be well designed and is performing well. In this section we present some of the key findings from the evaluation activities, and recommendations for Initiative continuation and refinements.

Key Findings:

1. **Over 4,800 DHPs were installed by utilities that participated in the Initiative in 2011.** One-quarter of these installations were in rural areas.

2. **General population awareness of DHPs (excluding gas heated homes) is 34 percent and perceived to be growing.** Households are learning about DHPs from a wide variety of sources, including utility information, friends/family/acquaintances and installation contractors.

3. **Key purchase drivers are desire for energy efficiency and needs for additional space conditioning.**

4. **The quality of DHP installations is high.** Few technical failures were noted by Initiative participants, utilities, manufacturers and distributors. Photographs of "good installations" are a key feature of Initiative presentations to installers and utilities.

5. **Initiative participant satisfaction is high.** Eighty-nine percent of surveyed participants have had their overall expectations met, and 96 percent use their new DHPs for primary heating.

6. **Inadequate heating in very cold conditions is the largest customer issue.** Fourteen percent of surveyed participants stated that their DHP had failed to provide adequate heat at temperatures less than 10 to 30 degrees. This issue was not isolated to specific climate zones or DHP models.

7. **A robust network of DHP installers has been developed.** Over 500 HVAC contractor firms are actively participating in the Initiative, and about 800 firms have been oriented to the Initiative. Interviewed Initiative staff were satisfied with the number of trained contractors, and no contractor "gaps" were noted by interviewed market actors. While Initiative staff have considered expanding training to other contractors (e.g., electricians, refrigerant contractors), most DHP manufacturers and distributors recommended utilizing only specialized HVAC installers.

8. **Price inflation by installers is not common or a large concern.** While some purchasers have reported instances of perceived "price gouging" (and this is difficult to eradicate entirely), the interviewed installers reported that they are generally giving specific cost

quotes. Other market actors noted that there is healthy competition among many Initiative contractors, which will keep prices reasonable in the long run.

9. **Installers and utilities are emphasizing the "displacement theory" in their marketing**.

10. **Some utilities have been surprised by Initiative marketing activities, and do not always know whom to contact for Initiative support.** Multiple changes to marketing and utility outreach staff at NEEA and Fluid may be a contributing factor, and it is possible that the utility participants are not informing their marketing staff of new initiatives. No significant negative impacts were mentioned (e.g., contradictory marketing), however this confusion should be addressed to prevent future problems.

11. **BPA's funding assistance is a key driver of many utility programs, and funding level changes and/or other implementation requirements could reduce future utility offerings and DHP installations**. In April 2012 BPA changed its database and utilities reporting requirements, which has created problems for some utilities with limited staff capacity. Utilities with larger staffs or low customer demand (i.e., small utilities) have been less impacted, but medium sized utilities with high demand will be increasingly pressured to reduce their DHP rebates and/or outsourced forms processing assistance if BPA reduces its conservation rate credits to them.

12. **Key manufacturers and distributors are engaged with the Initiative, have assisted past contractor trainings and marketing efforts, and expect to do so in future**. Initiative implementation staff reported that they have gained improved access to key manufacturing firm decision makers to affect strategic marketing initiatives. The interviewed manufacturers greatly appreciate NEEA's assistance in accelerating market growth and including them in Initiative activities.

13. **Manufacturers are continuing to support retail displays, and installation contractors are displaying DHPs in their own showrooms.** Many market actors noted that allowing customers to see and touch DHPs is critical for future market growth.

14. **DHP sales are expected to grow.** Most of the interviewed installers, manufacturers and distributors predict continued DHP market growth. DHP suppliers and installers have capacity to serve this expected growth. Twenty-two percent of the surveyed general population households said they are "very" or "somewhat interested" in installing DHPs.

15. **The primary barriers to continuing market growth are insufficient customer awareness and purchase costs that are too high for many consumers (particularly in the poor economy).**

Recommendations:

1. **Continue broad based, multi-media marketing to further increase public awareness.** Many of the interviewed market actors perceived that the Initiative's marketing efforts had been effective, but that additional marketing is required to continue growing consumer awareness since DHPs market share is still low.

2. **Develop incentives to promote additional word of mouth marketing.** Many market actors and surveyed participants reported that recommendations from friends, family and acquaintances are particularly influential in the decision making process (even if DHP information is initially obtained from other sources). Almost 60 percent of participants had recommended DHPs to others, while 34 percent said they would. The Initiative could take additional steps to formalize and incentivize the referral process, to reinforce a growing "snowball effect" (e.g., via referral data capture on rebate applications, sponsoring DHP in-home events). While social marketing was not noted as main information source, this is a low cost tool that has generated referrals and should be continued.

3. **Coordinate with distributors to push new improved cold weather models into the market as soon as possible.** Some contractors and potential customers still perceive that DHPs are incapable of providing adequate heat in cold weather, and about 14 percent of households with DHPs reported that they do have heating problems in cold weather. This performance issue needs to be addressed to maximize market penetration, and the Initiative might design special promotions and demonstrations around emerging low-temperature models.

4. **Work with banks and credit unions to expand financing options.** Only two institutions currently offer financing for DHPs. First costs are still a barrier to potential purchasers, even with widespread utility rebates.

5. **Clarify staff roles and communications protocols among utilities, Fluid, NEEA and BPA.** There is some market confusion regarding who is doing what in the DHPs market and for the Initiative specifically. Implementers should request that utility contacts provide marketing staff contact information, so Initiative communications can go to them directly also. Clarify and enforce staff roles among Fluid and NEEA Initiative managers, marketing staff, and utility representatives (channel managers).

6. **NEEA should provide additional funding/services for utilities program implementation to fill potential BPA gaps.** Utility marketing efforts and rebates are key drivers of market transformation, and need to be maintained until market share gains additional momentum. The Initiative might allocate additional contingency budget for the PMC or separate contracts for specific marketing, rebates processing or other assistance.

Appendix A: Glossary

Air Conditioning, Heating and Refrigeration Institute (AHRI). A trade association that certifies the performance ratings of heating and cooling products using independent third party testing.

Air Handler. The portion of a heating and cooling system that forces air through a home's ductwork. Ductless systems have no ductwork, the air handler is most commonly called an Indoor Unit. The indoor unit return air is normally drawn through the top and front of the indoor unit, passed across the evaporator coil and is discharged through the bottom which has a motorized flap controlled by a remote control.

Annualized Fuel Utilization Efficiency (AFUE). A measure of a furnace's heating efficiency. Specifically, it is the ratio of annual output energy compared to annual input energy. The higher the AFUE percentage is, the more efficient the furnace. The minimum percentage established by the DOE for furnaces is 78%.

Airflow. Air volume measured in CFM (cubic feet per minute).

British Thermal Unit (BTU). A unit of heat energy. One Btu is the amount of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

British Thermal Units per Hour (BTU/H). A measure of cooling or heating capacity.

Capacity. Refrigeration capacity by system usually measured in BTU/H or Tons for cooling. One Ton is equivalent to 12,000 Btu/H.

Central Air Conditioning System. System in which air is cooled at a central location and distributed to and from rooms by one or more fans and a series of ducts.

Compressor. A component of the refrigeration cycle, which draws low pressure/temperature refrigerant gas from the evaporator (indoor unit) and delivers in high pressure/temperature form to the condenser (outdoor unit).

Condenser Coil. Part of the outdoor portion of a heating or cooling system, that releases or collects heat from the outside air.

Cubic Feet per Minute (CFM). A measurement of air volume.

Damper. When used in ductwork, the damper is a movable plate that regulates airflow. Dampers are used to direct air to the areas that need it most. Typically used in zoning applications.

Ducted Split Systems. A system composed of an outdoor condensing unit connected by refrigerant pipes to a ducted type indoor evaporator unit (Fan Coil or Air Handler).

Ductwork. Hollow metal pipes used to transfer air throughout your house.

Electronic Air Cleaner. An electronic device that filters out large particles and bio-aerosols in indoor air.

Energy Efficiency Ratio (EER). Efficiency rating of air conditioning or heating units in cooling mode. It is calculated by dividing the system capacity output per hour by its power consumption (watts). The higher the EER, the more efficient the system.

Energy Guide Label. A large yellow tag affixed to major appliances and HVAC equipment such as central air conditioners, heat pumps, furnaces, water heaters and boilers that provides energy efficiency and operating cost information. The label is designed to help consumers compare the operating cost of similar models.

Energy Input Rating. The amount of input energy delivered at the burner of furnaces, water heaters and boilers, measured in British thermal units (Btus) per hour.

ENERGY STAR. A joint program of the US Environmental Protection Agency and the US Department of Energy. Energy Star qualified ductless systems are highly efficient products that are cost effective solutions to deliver heat or cool air directly into different zones in many residential or commercial applications.

Environmental Protection Agency (EPA). Federal agency that develops and enforces federal environmental regulations. The EPA oversees the nationwide ENERGY STAR program.

Evaporator Coil. Part of the heating or cooling system located indoors, that cools and dehumidifies the air by converting liquid refrigerant into gas.

FLUE. The passageways in heating equipment and vents through which combustion products pass to the outside atmosphere.

Heat Exchanger. The major part of the furnace that transfers heat into a home.

Heat Pump. Cooling/Heating system that can reverse the direction of refrigerant flow to provide heating or cooling to the indoor space as needed.

HSPF. Measurement of the heating efficiency of heat pumps. The higher the HSPF, the more efficient the heat pump.

Indoor Unit. The evaporator unit, which contains a heat exchanger coil, fan, air filters and remote signal receiver.

Inverter Technology. Compressors with inverter-driven technology reduce power consumption and thus save energy by varying the compressor speed to meet load requirements. The system operates at a more steady revolution, maintaining desired temperature more evenly for better comfort.

Load Calculation. Load calculations consider a variety of factors: location, orientation, construction materials (insulation, brick or siding, etc.), building size, etc. Heating and cooling needs are expressed in BTUs per hour or Btu/h. A "block load" looks at the whole building's requirements as one large room. A "room-by-room" load calculation refines the calculation to determine a room or zone's requirements.

Multi Zone Ductless System. A system that features a single outdoor unit (condenser) connected to multiple indoor units or heads, providing zoning capability through individual remote thermostats that control temperature and air flow for each room or zone.

Outdoor Unit. A condensing unit that contains compressor, condenser coil, propeller fan and circuit board.

Programmable Thermostat. A thermostat with the ability to preset different temperature/time settings for heating and cooling equipment.

Refrigerant. A gas/liquid substance used on refrigeration cycle to provide cooling by absorbing and dispersing heat.

Refrigerant Lines. Two copper lines that connect the outdoor air conditioner or heat pump to the indoor evaporator coil.

Scroll Compressor. A compressor that works in a circular motion, as opposed to up-and-down piston action.

SEER (Seasonal Energy Efficiency Ratio). Efficiency rating of air conditioners and heat pumps over the course of the cooling season. The higher the SEER, the more efficient the system.

Split System. Refers to an air conditioner or heat pump that is combined with indoor components, such as an evaporator coil inside and a condenser coil outside the home.

Thermostat. A device that monitors and controls the temperature inside a home. The remote control is most commonly used as a thermostat on ductless split systems.

Ton. Measurement of system cooling capacity. 1 Ton is equivalent to 12,000 BTU/H.

Upflow. When an air handler or furnace is installed in an upright position and circulates air through the side or bottom and out through the top. Typically used in basement, closet and attic installations.

Variable Speed Motor. A motor that automatically adjusts the flow of warm or cool air for improved comfort.

Ventilator. A system that exchanges stale, re-circulated indoor air with fresh, filtered outside air.

Venting System. A continuous open passageway from the flue collar or draft hood of a gas-burning appliance to the outside atmosphere for the purpose of removing products of combustion.

Zoning. Ductless systems manage environments individually with remote thermostats that control the temperature and airflow for each room or zone. In multi-split ductless systems, households can set different temperatures for different rooms or areas according to individual preference.

Appendix B: Summary of Evaluation Activities

The following table summarizes the main components of the MPERs that have been completed for the Northwest Ductless Heat Pump Initiative.

Evaluation Report Components

Analysis Component	MPER 1 (4Q 2011)	MPER 2 (3Q 2012)
Market Characterization	●	●
Participants Phone Survey	●	●
General Population Phone Survey		●
Contractor/Installer Phone Survey	●	
Contractor/Installer In-Depth Interviews		●
Manufacturer/Distributor In-Depth Interviews	●	●
Utility In-Depth Interviews	●	●
Implementation Staff Interviews	●	●
Process Evaluation	●	●
Review of Cost Effectiveness Modeling	●	●

Table 25: Activities/Outputs Theory and Assumption Table

Link	Why will it happen?	How will we know it happened? – Activity Indicator	
		Indicator	Data Source
A	Engaging market actors for training and developing training activities for market actors (contractors, distributors, manufacturers) will result in the supply chain that is knowledgeable about DHP potential in electric homes and understands how to install and sell the displacement approach.	Number of installations and contractors participating in Initiative	Initiative tracking, MPER
B	Initiative provides product support via QA process and highlighting Best Practice Installation Techniques	Monthly QA reports	QA Database, MPER, Initiative Tracking
C	Marketing activities result in campaigns, PSA's PR, marketing templates for product channel and utility partners	PSAs will be present, market actors will support campaigns and adopt Initiative messaging, templates will be utilized	Marketing tracking, clipping services, MPER, Initiative tracking
D	Engage with utilities to participate in the regional NW Ductless Heat Pump Initiative creating plug and play opportunity for utility partners	Utilities offer DHP incentives and incorporate DHPs into Initiative offerings	Initiative tracking, Utility Participation list, MPER
E	Recruiting and engaging with market actors to explore partnerships and collaboration opportunity resulting in an understanding of the business potential of DHP technology in the NW	New partnerships created and increased DHP uptake	Initiative tracking
F	Develop minimum standard and testing procedure for DHPs sold in NW states	Specification and testing standard	Annual Initiative tracking

Table 26: Outcomes Theory and Assumption Table

Link	Why will it happen?	How will we know it happened? – Market Progress Indicator		
		What will you measure	What is your indicator?	Data Source
1	Trainings and QA efforts geared towards market actors highlight business benefits and potential of 1:1 application/displacement approach as a result Initiative approach is incorporated into supply chain and incorporates 1:1 application.	Supply chains approach to electrically heated homes. Manufacturer/distributor adoption of 1:1 application. Contractors selling 1:1 application.	Change in the supply chain's application of DHPs in residential electrically heated homes.	Initiative tracking & evaluation interviews of market actors
2	Product support highlights benefits of 1:1 application and influences supply chain to adopt Best Practice recommendations while highlighting the market potential for DHP technology	Number of Master Installers, contractors participating, and supply chains adoption of Initiative Best Practices	Change in the supply chain's application of DHPs in residential electrically heated homes.	Initiative tracking & evaluation survey of market actors
3	Quality installations, training and sales materials targeting electric homeowners highlighting DHP benefits will result in increase consumer adoption of DHPs	Consumer uptake	Increased consumer adoption of DHPs in electrically heated homes	Regional sales data, Initiative installation data, evaluation surveys of supply chain & consumers
4	Effective marketing efforts raise awareness of DHP technology resulting in increased adoption of DHPs	Consumer uptake, market actor perception and utility participation	Increased consumer adoption of DHPs in electrically heated homes	Regional sales data, survey of supply chain and DHP database
5	Incentives assist in customers overcoming first cost hurdle and result in increased consumer adoption of DHP technology	Consumer uptake and utility participation	Increased consumer adoption of DHPs in electrically heated homes	Initiative installation data, interviews with utility staff and consumers

6	Engaging with market based financing Initiatives will result in market actors understanding of the DHP potential in the NW market creating a business case for financing Initiatives	Financing Initiatives available for DHPS	Customers throughout NW region have access and utilize financing mechanism	Annual Initiative tracking and interviews with purchasers and market actors
7	Engaging with retailers highlighting DHP potential supporting existing product channel will result in DHPs being offered in retail stores	DHP placement in retail channels, product mix and sales strategy	DHP products available in retail channels	Annual Initiative Tracking, shelf surveys
8	Leveraging evaluation results and NW experience with DHP technology will help creating minimum standard resulting in NW states adoption of product standard for sale within the state	Document standards process through progress towards standard adoption	Progress through an established standard making process	State Standard documentation
9	Supply chain adopts 1:1 approach capitalizing on retrofit potential in electrically heated homes. Supply chain success leads to competition and additional actors adopting 1:1 approach.	Supply chain training and marketing material targeting electric homes and displacement theory, consumer uptake and supply chains attitude about DHP market potential in electric homes.	Change in the supply chain's application of DHPs in residential electrically heated homes.	Initiative tracking, surveys and evaluation of supply chain,
10	Increased consumer adoption drives demand resulting in supply chain adopting 1:1 approach in response to demand	Supply chains response to consumer adoption	Change in the supply chain's application of DHPs in residential electrically heated homes.	Initiative tracking, surveys and evaluation of supply chain
11	Consumers purchasing DHPS increases word of mouth and overall awareness of DHP product	Consumer awareness and uptake	Increased consumer awareness	Regional sales data, annual Initiative tracking and survey of consumers
12	Retailers offering DHPs increases visibility and availability of product and overall consumer awareness	Consumer awareness and uptake	Increased consumer awareness	Regional sales data, annual Initiative tracking and survey of consumers

13	Market actors offering financing options for DHPs addresses customers first cost hurdle increasing adoption	Consumer uptake	Increased in NW DHP residential sales	Regional sales data, Initiative installation data, interviews with market actors and consumers
14	State adopting standard will influence Federal Standards process creating minimum product efficiency ratings for DHPs	Progress towards Federal Standard	Progress through an established standard making process	Annual Initiative Tracking
15	Majority of supply chain adopts 1:1 approach resulting in marketing and selling benefits over existing electric resistance heat to NW customers. Supply chain understands the benefits and customers prefer the comfort of DHPs resulting in DHPs becoming the preferred technology in electric heated homes.	Supply chains response, behaviors and applications of DHPs	Increased NW DHP sales in electric homes	Regional Sales, survey of supply chain.
16	Increased consumer awareness of product potential and superiority over existing electric heat results in DHPs becoming preferred technology in electrically heated homes	Consumer uptake and response to DHP technology	Increased NW DHP sales in electric homes	Survey of consumers, regional sales, total Initiative installations.
17	DHPS as the preferred technology increases overall installations displacing electric resistance heat resulting in increased energy savings	Number of installations and their resulting energy savings	Energy Savings	Regional sales data, Initiative installation data, surveys/interviews with supply chain
18	More efficient product is sold as a result of Federal standard resulting in increased energy savings	Federal standard	Federal standard is adopted	Federal Standard Documentation

Appendix D: Survey Instruments/ Interview Guides

Included below are:

1) DHPs Households Phone Survey
2) DHP Installers In-Depth Interview Guide
3) DHP Manufacturers/Distributors In-Depth Interview Guide
4) DHPs - Utilities In-Depth Interview Guide

DHPs Households Phone Survey

FINAL May 4, 2012

Key Objectives:

- Assess awareness of DHPs
- Identify installation barriers
- Understand DHPs usage and satisfaction
- Understand financing patterns

Target Audience: 100 DHP participants in 2011 from Fluid's database, and 200 general population households with electrically heated homes.

PROGRAMMING NOTE:

SAMPTYPE = F if a participant from Fluid database

SAMPTYPE = GP if from general population

Hello, my name is _____ calling from Quantum Market Research on behalf of the Northwest Energy Efficiency Alliance, or NEEA.

For SAMPTYPE F: Today I am calling you to help us conduct an evaluation of the Northwest Ductless Heat Pump Initiative. I want to learn about your household's impressions of heat pumps and your actual experiences to help us improve our Initiative.

For SAMPTYPE GP: Today I am calling you to conduct an evaluation of a program about energy savings and home heating. I want to briefly learn about your household's heating system and use your experiences and preferences to help improve our program.

IF CUSTOMER NAME in Fluid Sample: Could I speak to _____?

ELSE: Could I speak to the person most familiar with your home's heating and cooling equipment?

(Repeat Intros to new person, if necessary)

This will only take a few minutes. Is this a good time? In my questions, I will refer to the ductless heat pump as a DHP to save time.

[IF NECESSARY:] Thank you for your help. This study will help NEEA to make its Initiatives as successful as possible for homeowners like you. Our survey will only take a few minutes. Of course all of your answers and comments are kept confidential.

Is now a good time?

Yes	[CONTINUE]
No	[SET UP CALLBACK]
DK/refused	[TERMINATE]

SCREENS for GP Sample:

SCREEN1: First, is your home a single family home, or it physically attached to other units?

1)	Yes, single family home	[CONTINUE]
2)	No, attached to other units	[TERMINATE]
88)	Refused [TERMINATE]	
99)	Don't know [TERMINATE]	

SCREEN2: What is your home's primary heat source? Is it:

1)	Electricity	[CONTINUE]
2)	Kerosene	[CONTINUE]
3)	Wood/Wood Pellet	[CONTINUE]
4)	Propane Gas	[CONTINUE]
5)	Natural gas from a utility	[TERMINATE]
6)	Something else?	[TERMINATE]
88)	Refused	[TERMINATE]
99)	Don't know [TERMINATE]	
100)		

SCREEN for Fluid Sample:

SCREEN3: Our records indicate that you installed a ductless heat pump, or DHP, in your home in 2011; is this correct?

IF NOT SURE: A DHP is a type of home heating and cooling system. It's unique in a couple of ways. First, it divides your house into zones for heating and cooling, and secondly it does not require the use of air ducts, like more common heating and cooling systems. DHPs have an outdoor compressor unit and one or more indoor air-handling units, called "heads", linked by a refrigerant line. Indoor heads are typically mounted high on an indoor wall or ceiling. Each indoor head serves a different heating and cooling zone that can be controlled independently.

DHPs are often used to supplement electric baseboard, wall or ceiling units, woodstoves and other space heaters.

1) Yes - unaided [CONTINUE]
2) Yes – aided [CONTINUE]
3) No [TERMINATE]
89) Refused [TERMINATE]
100) Don't know [TERMINATE]

SCREEN for ALL:

SCREEN5: Do you own your home, or do you rent it?

1) Own [CONTINUE]
2) Rent [TERMINATE]
88) Refused [TERMINATE]
99) Don't know [TERMINATE]

Terminate: Thank you for your time. Based on your response we do not need you to complete this survey at this time. Thank you for your time and consideration. Good-bye.

Awareness Battery

Q 1. (If SAMPTYPE = GP) Before this call, had you ever seen or heard about ductless heat pumps, or DHPs?

[IF NOT SURE] A Ductless Heat Pump, or DHP, is a type of heating and cooling system used in homes. It's unique in a couple of ways. First, it divides your house into zones for heating and cooling, and secondly it does not require the use of air ducts, like more common heating and cooling systems. DHPs have an outdoor compressor unit and one or more indoor air-handling units, called "heads", linked by a refrigerant line. Indoor heads are typically mounted high on an indoor wall or ceiling. Each indoor head serves a different heating and cooling zone that can be controlled independently. DHPs are often used to supplement electric baseboard, wall or ceiling units, woodstoves and other space heaters. They use 25% to 50% less energy than electric resistance and forced air systems.

1) Yes – unaided
2) Yes - aided
3) No (Go to **Q 10**)
4) Don't know (Go to **Q 10**)

Q 2. How did you first hear about DHPs? [DO NOT READ; CHOOSE ONE, THE FIRST PLACE THEY HEARD OF IT]

1) Friend or acquaintance had one
2) Utility print advertising, bill stuffer
3) Utility website
4) Newspaper ad
5) Newspaper story
6) Television ad
7) Social media
8) Materials from contractor/installer
9) Internet research
10) Internet advertising
11) There is one in my home – someone else installed it (TERMINATE)
12) Other:

Q 3. Did you hear about it anywhere else? Or learn more about it from another source?

1) Friend or acquaintance had one
2) Utility print advertising, bill stuffer
3) Utility website
4) Newspaper ad
5) Newspaper story
6) Television ad
7) Social media
8) Materials from contractor/installer
9) Internet research
10) Internet advertising
11) There is one in my home – someone else installed it (TERMINATE)
12) Other:

If SAMPTYPE = F, Go To Q 21

Q 4. Do you currently have a Ductless Heat Pump, or DHP, in your home?

1) Yes
2) No (Go To **Q 7**)
3) Don't know (Go To **Q 7**)

Q 5. In what year did you install the DHP?

Record GP INSTALL YEAR

1) Don't know – someone else installed it (**TERMINATE)**
2) Don't know

Q 6. Did you receive a rebate for your DHP from your utility company?

1) Yes
2) No
3) Don't know

Go To Q 21

Q 7. Have you ever considered installing a DHP in your home?

1) Yes
2) No (Go To **Q 10**)
3) Don't know (Go To **Q 10**)

Q 8. And why didn't you - what was the primary reason you chose not to install a DHP?

1) Existing equipment works fine
2) Can't find a local installer
3) Doesn't work in my climate
4) Aesthetics/they are ugly
5) They cost too much
6) Maintenance hassles
7) Don't believe savings claims
8) Other, specify
9) Don't know

Q 9. Were there other reasons you chose not to install a DHP?

1) Existing equipment works fine
2) Can't find a local installer
3) Doesn't work in my climate
4) Aesthetics/they are ugly
5) They cost too much
6) Maintenance hassles
7) Don't believe savings claims
8) Other, specify
9) Don't know

Q 10. Were you aware that most utilities in the Northwest offer their customers cash rebates for purchasing and installing a DHP?

1) Yes
2) No (go to **Q 12**)

3) Don't know (go to **Q 12**)

Q 11. (If Q 10 = YES) Were you aware that they can go up to $1,500 for a single family home?

1) Yes
2) No
3) Don't know

Q 12. Were you aware that there are banks in the Northwest that offer specialized financing for homeowners that want to install a DHP?

1) Yes
2) No
3) Don't know

Q 13. Now I'd like to tell you a little more about DHPs.

- **The average cost of an installed DHP for one indoor heating/cooling zone is between $3,000 and $5,000, and rebates of $1,500 are often available. A zone is a distinct area of your home where the heating/cooling can be controlled independently, so you don't always have to heat or cool your whole house.**
- **DHPs are easy to maintain. Most homeowners can do the maintenance themselves, without having to hire anyone.**
- **DHPs use 25% to 50% less energy than other electric heating systems.**

(IF NEEDED: Maintenance only requires cleaning the filters and coils occasionally.)

How interested would you be in installing a DHP system in your home? Would you say you are:

1) Very interested
2) Somewhat interested
3) Not too interested
4) Not at all interested
5) Don't know

Let me remind you we're not selling anything. We just want to ask your opinions about a couple of financing options. Option A would be a rebate and bank loan. As I mentioned, sometimes banks have special financing programs for homeowners who want to install DHP's. Typically, this financing is available at about 8% interest. For Option A, you would receive a rebate and bank financing at 8%.

Q 14. (If Q 13 = 1 or 2) If bank financing like this were available in your area, how likely would you be to use it to finance your DHP purchase and installation?

1) Very likely

2) Somewhat likely
3) Not too likely
4) Not at all likely
5) Don't know

Q 15. (If Q 13 = 3 or 4) Even though you aren't interested, we still want your opinions about this option. If bank financing like this were available in your area, would this increase your interest in getting a DHP?

1) Yes
2) No
3) Don't know

As I said, we're not selling anything. We're just gathering opinions about financing options. In Option B, a person could take out a loan to buy the DHP, with a low interest rate, typically less than 2%. He or she would purchase the DHP equipment with no down payment, but get no rebate. The utility company applies the energy savings towards the loan payback, so energy bills remain constant until the loan is paid off, and then the bills go down.

Q 16. (If Q 13 = 1 or 2) If utility financing like this were available in your area, how likely would you be to use it to finance your DHP purchase and installation?

1) Very likely
2) Somewhat likely
3) Not too likely
4) Not at all likely
5) Don't know

Q 17. (If Q 13 = 3 or 4) Even though you aren't interested, we still want your opinions about this option. If utility financing like this were available in your area, would this increase your interest in getting a DHP?

1) Yes
2) No
3) Don't know

Q 18. Is there anything in particular about DHPs that you would like to know more about?

1) Yes (RECORD DETAILS)
2) No
3) Don't know

Q 19. Where would you go if you wanted more information about DHPs?

1) Utility
2) Contractor/installer
3) NEEA
4) Manufacturer
5) Friends/family I trust
6) Other, specify
7) Don't know

Q 20. Lastly, what heat source(s) do you have installed in your home? [DO NOT READ LIST UNLESS NECESSARY; CHECK ALL THAT APPLY—PROBE "ANYTHING ELSE?"; DO ASK C)

	A. Type of heat	B. Fuel	C. What is your primary heat source?
Forced Air Furnace			
Baseboards			
Wall Heaters			
Electric radiant heat			
Wood heat			
DHP			
Space Heaters			
Other			

Go To Demographics Battery

Q 21. Could you also please tell me what sources of information, including the one(s) you mentioned earlier, were especially important in your decision to install the DHP - your top two?

1) Friend or acquaintance had one
2) Utility print advertising, bill stuffer
3) Utility website
4) Newspaper ad
5) Newspaper story
6) Television ad

7) Social media
8) Materials from contractor/installer
9) Internet research
10) Internet advertising
11) Other:

Q 22. Since you purchased the DHP, have you purchased any other heating or cooling equipment (If needed: space heaters, window ACs)? This would include any additional indoor DHP room units or "heads".

1) Yes
2) No
3) Don't Know

Q 23. (If Q 22 = YES) What did you purchase? [check all that apply]

1) Heating, specify type:_____
2) Cooling, specify type:_____
3) Heating and Cooling (e.g., more DHP units), specify type:_____

Motivations Battery

Now I would like to ask you some questions about your reasons for purchasing a DHP.

Q 24. What initially interested you in the DHP? [DO NOT READ, PROBE TO CODE, CHECK ALL THAT APPLY]

1) Needed space conditioning, had no ducts
2) Needed additional or supplemental space conditioning
3) Existing heating was not working well enough
4) Existing heating was broken
5) Wanted to add cooling
6) Wanted to be more energy efficient
7) Other, please specify:_____

Q 25. Did you seek out a contractor who could install a DHP or was the DHP a suggestion from a contractor you were already working with?

1) Was customer's idea
2) Was contractor suggestion
3) Other:

Q 26. What heat source(s) did you have before you installed the DHP? [DO NOT READ LIST UNLESS NECESSARY; CHECK ALL THAT APPLY—PROBE "ANYTHING ELSE?"; DO ASK C-E)

	A. Type of	B. Fuel	C. Do you	D. Before the DHP,	E. What is your

	heat equipment		still use it?	what was your primary heat?	primary heat now?
Forced Air Furnace					
Baseboards					
Wall Heaters					
Electric radiant heat					
Wood heat					
DHP					
Space Heaters					
Other					

Q 27. [IF THEY USED WOOD] About how much wood did you typically use in a season?
__ cords OR __ pounds of pellets

Q 28. Did you have any cooling equipment before you purchased the DHP? What kind? [CHECK ALL THAT APPLY]

1) None
2) Window/Room AC
3) Full house AC
4) Portable AC
5) Evaporative/Swamp cooler
6) Other:_____

Q 29. [If had cooling] Do you still use this other cooling equipment?

1) Yes
2) No
3) Don't Know

Q 30. Please rate how important each of the following factors was in your decision to purchase a DHP, were 1 is not at all important, and 5 is very important:

How important was…	1	2	3	4	5
A. The comfort potential offered by the DHP					
B. The cost of the DHP, including any incentives					
C. The potentially cheaper operating costs of the DHP compared to your previous heating/cooling system					
D. The cooling capability of the DHP					

Q 31. Were there any other aspects of the DHP that were appealing to you?

1) Yes, please specify: _____
2) No

Q 32. How did you gather information about the DHP before you made your purchase? [CHECK ALL THAT APPLY]

1) Internet/online
2) Contractor provided materials
3) Spoke to the contractor
4) Spoke to someone who already had a DHP installed
5) Did not look for any information
6) Utility provided information
7) Other, please specify: _____

Q 33. Was there anything you were concerned about when you were considering a DHP? [DO NOT READ; CHECK ALL THAT APPLY]

1) No concerns
2) Appearance
3) Capability/functionality
4) Cost
5) Reliability
6) Noise
7) Maintenance needs

8) Equipment warranty
9) Manufacturer customer service/support
10) Other, please specify:_____

Q 34. [IF Q 33 = YES] How did you overcome those concerns?

Q 35. Did you use a loan from any of the following sources to pay for your DHP? [READ, ALLOW MULTIPLES]

1) Local bank or credit union
2) Utility company
3) Installation contractor
4) Other, specify
5) No
6) Don't know

DHP Experience Battery

Next, I'd like to ask about your experiences using your DHP.

Q 36. Is your system a multi-head system, which has multiple indoor units, or a single-head system with only one indoor unit?

1) Multi-head
2) Single-head
3) Don't know

Q 37. I'm going to read a list of types of rooms in your house. For each, please tell me if you have your DHP installed in the room. (READ AND CHECK ALL THAT APPLY)

1) Kitchen
2) Dining room
3) Family or living room
4) Bathroom or bathrooms
5) Bedroom or bedrooms
6) Office or studies
7) Entertainment or rec room
8) Garage
9) Detached living unit (e.g., "accessory " or "grandparents unit")
10) Basement
11) Don't know

Q 38. Who was the manufacturer of your DHP?

1) RECORD
2) Don't know

Q 39. Since it was installed, have you used the DHP for:

1) Heating
2) Cooling
3) Both

Q 40. Has the DHP ever been unable to meet your heating or cooling needs?

1) Yes, heating
2) Yes, cooling
3) Yes, both
4) No

Elaboration:_____ **(Post Code if possible)**

Q 41. Have you or someone you have hired ever cleaned the filter in your DHP?

1) Yes
2) No
3) Don't know

Q 42. (If Q 41 = YES) How often do you clean it? Is it:

1) Every other year
2) Every year
3) More than once a year
4) Don't know

Q 43. (If Q 41 = NO) I'll read a list of reasons for why you may not have had a chance to clean your filter. Can you tell me which ones apply to you?

1) It's too new, haven't had to yet
2) Not sure how
3) Too difficult
4) Just haven't gotten around to it
5) Forgot to
6) Need to find someone to do it
7) Don't know

Q 44. Have you programmed your DHP to automatically adjust the temperature it is set to during different periods of the day or week, or do you typically adjust the temperature on the unit manually?

1) Manual
2) Automatic
3) Mixed
4) Don't know

Satisfaction Battery

Q 45. Please rate your satisfaction with the following aspects on a 5-point scale, where 1 means "very dissatisfied" and 5 means "very satisfied":

How satisfied are you with the….	1	2	3	4	5
A. Sound level of the indoor unit					
B. Electricity bill since installing the DHP					
C. Comfort of the new heat					
D. Comfort for the new cooling					
E. Maintenance the DHP requires					

Q 46. Overall, has the DHP met your expectations?

1) Yes
2) No, how so?_____

Q 47. Have you, or would you, recommend the DHP to a friend, colleague or family member?

1) Yes, have
2) Yes, would
3) No
4) Don't know

Q 48. [IF RESPONDENT SAYS THEY WOULD RECOMMEND THE DHP OR ALREADY HAVE] What are some of the reasons you (would) recommend(ed) the DHP? (DO NOT READ, ACCEPT MULTIPLES)

1) Lower energy bills

2) Improved heating comfort
3) Improved cooling comfort
4) Equipment cost is reasonable
5) Appearance is good/acceptable
6) Good for the environment
7) Operates reliably
8) Requires little maintenance
9) Other, please specify:_____

Q 49. Thinking back over your whole experience with the DHP and the buying process - is there anything you would change?

Demographics Battery

The following questions are for classification purposes only. All your answers will be kept confidential.

Q 50. How important is it for you to have an energy-efficient home? Would you say it is: (READ LIST)?

1) NOT AT ALL IMPORTANT (1)
2) A LITTLE IMPORTANT (2)
3) SOMEWHAT IMPORTANT (3)
4) VERY IMPORTANT (4)
5) Don't know

Q 51. (IF Q 50 not Don't Know) Why do you say that?

RECORD AND TRY TO POST-CODE

Q 52. What year was your home built?

ENTER YEAR: _____

If not sure, would you say:

1) 2006 or later
2) 2000 - 2005
3) 1990 - 1999
4) 1980 - 1989
5) 1970 – 1979
6) 1960 - 1969
7) earlier than 1960
88) Refused

99) Don't know

Q 53. How old are you?

RECORD [RESPOND AGE]

8888) Refused
9999) Don't know

Q 54. (IF Q 53 = REFUSED) Could you please tell me which of the following categories best describes your age? (READ LIST)

1) Between 18 and 24
2) Between 25 and 34
3) Between 35 and 44
4) Between 45 and 54
5) Between 55 and 64
6) 65 and older
88) Refused
99) Don't know

Q 55. Which of the following best describes your educational background?

1) Less than high school,
2) High school or GED
3) Some college
4) Technical College (2 year degree)
5) 4 Year college
6) Graduate degree
88) Refused
99) Don't know

Q 56. Which of the following best represents your approximate annual household income from all sources in 2011, before taxes?

1) < 40K
2) Between 40K and 60K
3) Between 61K and 80K
4) Between 81K and 120K
5) Over 120K
88) Refused
99) Don't know

Q 57. Do you consider yourself Hispanic or Latino?

1) Yes
2) No
88) Refused
99) Don't know

Q 58. Would you describe yourself as: (READ ALL, ACCEPT MULTIPLES)

1) White
2) Black or African American
3) American Indian or Alaska Native
4) Asian
5) Native Hawaiian or Other Pacific Islander
6) Other, Specify
88) Refused
99) Don't know

Q 59. For your political affiliation, are you a Democrat, a Republican, an Independent or something else?

1) Democrat
2) Republican
3) Independent
4) Libertarian
5) Tea Party
6) Other, Specify
88) Refused
99) Don't know

Q 60. (IF Q 59 = Democrat or Republican) Would you consider your support of the [Democratic/ Republican] party to be strong or weak?

1) Strong
2) Weak
3) Neither
88) Refused
99) Don't know

Q 61. (IF Q 59 = Independent) Would you say you lean toward Democrat, Republican or neither?

4) Democrat
5) Republican
6) Neither
88) Refused
99) Don't know

Q 62. For verification purposes only, may I have your name.

1) Name: _____
88) Refused
99) Don't know

Q 63. [Interviewer: Record Gender.]

1) Male
2) Female
99) Don't know

Those are all the questions I have for you today. Thank you very much for your time and good information.

DHP Installers In-Depth Interview Guide

FINAL February 8, 2012

Objectives:

- Understand marketing and business practices
- Identify barriers to increased participation
- Understand customer installation trends and barriers
- Assess effectiveness of Initiative processes
- Identify desired Initiative assistance

Target Audience: 5 companies that have completed a high number of installations, 15 participating but less active DHP installers that have not been trained as Master Installers, and 10 companies that were oriented to the Initiative but completed no installations.

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm in Portland, Oregon. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) and the Northwest Ductless Heat Pump Initiative. Please know that this is not a sales call.

NEEA has asked us to help them better understand how well their Initiative is working for HVAC firms like yours, and we'd like to ask you some questions about your experiences with the Initiative and ductless heat pumps (DHPs). Anything you tell us will be kept confidential.

Is now a good time to talk about the Initiative, or can we schedule a time to talk for about 20 minutes?

[IF NECESSARY:] Your feedback will help NEEA to make its Initiative as successful as possible for contractors like you. Our interview will take about 30 minutes and all your answers will be kept confidential.

Business Scope and Practices

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

1. In what county or counties does your company install residential HVAC equipment?

2. **Which of the following best describes your employment status? Are you:**

1) A company owner or key manager
2) An employee of a private company
3) A contractor to a private company
4) Other (Specify)

3. How many staff at your company have received manufacturers training on ductless heat pumps, or have attended a contractor orientation session for NEEA's DHP Initiative?
4. What year did you begin stocking DHPs?
5. Which DHP brands does your firm offer?
6. About what percent of your business revenues come from DHP sales?
7. About how many DHPs have you installed in commercial businesses in the last 12 months?
    a. Of these, what percent went into small commercial businesses less than 5,000 square feet, versus larger businesses?
8. And about how many residential DHPs have you installed in the last 12 months?
9. (IF RESIDENTIAL INSTALLS > 0) What are the key reasons residential customers install DHPs? (PROBE: adding cooling, heating spaces without ducts or new spaces, to lower heating costs, etc.)
10. (IF RESIDENTIAL INSTALLS = 0) Have you recommended DHPs to any of your residential customers?
    a. If not, why?
11. (IF RESIDENTIAL INSTALLS = 0) What are the main reasons you have not installed any residential DHPs? (PROBE to see if installer focused on other types of equipment, not enough staff, not comfortable selling DHPs, cold climate, customer objections – cost, appearance, performance)
12. (IF RESIDENTIAL INSTALLS > 0) What percent of your residential projects are one-to-one systems, versus multi-headed systems? [IF NEEDED: *ONE TO ONE SYSTEMS HAVE ONE OUTDOOR COMPRESSOR UNIT AND ONE INDOOR AIR HANDLER UNIT. MULTIPLE HEADED SYSTEMS HAVE MULTIPLE INDOOR UNITS.*]
13. (IF RESIDENTIAL INSTALLS > 0) And what percent of your residential projects are one ton or less, versus larger projects?
14. What percent of your installations are in:
    a. existing non-manufactured homes
    b. new custom homes
    c. new spec-built homes
    d. existing manufactured homes
    e. multifamily units?
15. About what proportion of your installations are in newly heated areas of homes, such as garages, bonus rooms or in-law units?
16. For your installations in primary living spaces, are you usually replacing existing heating equipment, or adding DHPs to become the primary heat source?

17. What percentage of your installations have the following existing heating types at time of installation:
    a. Baseboards/zonal electric heat
    b. Gas heat
    c. Electric forced air furnace
    d. Wood
    e. Oil
    f. Pellet
    g. Other (please specify)

18. Most of the electric utilities in this region offer incentives for qualifying residential ductless heat pumps through the Northwest Ductless Heat Pump Initiative. About what percent of your residential DHPs sales get rebates from utilities?
19. (IF PERCENT < 100) Why do some residential customers not get incentives? (PROBE to see if local utility doesn't provide, if customer awareness lacking, if disqualified due to home heating fuel used, or ineligible application).
20. What percent of your customers use financing to pay for their installations?
    a. (IF PERCENT > 0) Is this financing through you, a local bank, or other sources?

21. What are your average residential installation costs?

22. In the next 24 months, do you expect your DHPs sales to increase, decrease, or remain about level?
    a. Why do you say that?

23. In your opinion, how important are local utility incentives <u>in</u> driving DHP sales in your service area, where 1 is not at all important, and 5 is extremely important?

24. Based on your current staffing, about how many residential DHP systems <u>could</u> your company install in a year, if there was significant demand in your area?

25. And how many DHPs do you think your company will actually install in 2012?
    a. And in the next five years?

Marketing Practices and Customer Barriers

Now lets discuss your marketing activities.

26. How do you market DHPs? For instance, do you distribute product literature (ask who developed), have info on a website, or use social media or newspaper/radio/TV advertising?
    a. If not marketing, why?

27. How comfortable is your staff explaining DHP technology and benefits to prospective residential buyers? Would you say extremely comfortable, very comfortable, somewhat comfortable, not very comfortable, or very uncomfortable?

28. When you promote DHPs, do you emphasize *displacing*, and not *replacing*, existing heating equipment?

29. What are the most common customer barriers to installing DHPs?

30. Are there any particular customer segments that are <u>most</u> resistant to DHPs?

31. Do you mostly promote single-head or multi-head systems, or both? Why? (PROBE to see how sales staff are paid, e.g., % of cost, flat fee, by size of unit, straight salary)

32. When you give price quotes, do you typically give a fairly specific estimate, or do you quote a price range?

    a. (IF RANGES) Why do you quote a price range?

33. (IF BASED IN OREGON or WASHINGTON) Are you aware that Umpqua Bank offers specialized loan terms for residential DHP customers?
    a. If YES: Do you mention this to prospective buyers?

34. Did you know that some utilities also offer on-bill financing for DHP projects?
    a. If YES: Do you mention this to prospective buyers?
    b. If NO and they are curious: Direct them to: goingductless.com which lists these utilities

35. Do you display DHPs at your business location?
    a. If NO: Would you be interested in teaming with a local hardware store to promote DHPs? For instance, a store might provide a display and/or meeting space, and you could present the technology.

36. Do you have any recommendations for NEEA or the utilities regarding how best to market DHPs to homeowners?

Training

Now let's discuss the DHPs training that is offered through the Initiative.

37. Are you aware of the Master Installer training that is available to DHP contractors?

38. Have you attended this training, or do you plan to attend?

39. (IF HAVE ATTENDED) Do you need any additional information about how to properly perform DHP installations?

40. (IF NO) Why don't you plan to attend this training?

Satisfaction and Initiative Feedback

We're almost done. I just have a few more questions about the Initiative and your satisfaction with it.

41. (IF INSTALLS > 0) How many of your residential installations have been inspected by the Initiative?
    a. (IF > 0) Have you had any problems related to these inspections? If YES: Get details.

42. Do you recommend any changes to the inspections process?

43. Overall, how satisfied are you with the technical information provided to installers through the Initiative? Would you say you are:

    1) Extremely satisfied
    2) Very satisfied
    3) Somewhat satisfied
    4) Not very satisfied
    5) Not at all satisfied

44. What changes, if any, would you recommend to improve communications with DHP contractors?

45. Is there any specific marketing or technical assistance you would like to get from NEEA or the utilities that participate in the Initiative?

Those are all the questions I have for you. Thank you very much for your time and good information.

DHP Manufacturers/Distributors In-Depth Interview Guide

FINAL May 4, 2012

Objectives:

- Understand marketing and business practices
- Assess interactions with Initiative staff
- Identify expected market trends
- Identify desired assistance

Target Audience: 8 manufacturers and 7 distributors that are highly active with the Initiative, and 5 distributors that are aware of the Initiative but less active.

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm based in Portland, Oregon. We're calling on behalf of the Northwest Energy Efficiency Alliance (NEEA) and the Northwest Ductless Heat Pump Initiative. Please know that this is not a sales call.

NEEA has asked us to speak with ductless heat pump (DHP) manufacturers and distributors to learn more about the DHPs market, so NEEA can potentially adjust and improve its Initiative to be successful for both customers and suppliers. Anything you tell us will be kept confidential.

Is now a good time to talk about the Initiative, or can we schedule a time to talk for about 30 minutes?

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

Interviewee Role

1. First, please describe your role at your company.
    a) How long have you been involved with DHPs?

DHPs Marketing

2. How does your company currently market DHPs for the residential market? [PROBE: presentations, internet/website, TV, radio, newspaper, social media, trade magazines]

3. Who is your target market?

4. And what are your key marketing messages? (PROBE for: energy savings, comfort, monetary savings, rebates, etc.)

5. In the past year, have you changed your marketing in any way?

    a) IF YES: What changes have you made? [Probe for messaging, channels and amounts]

b) Why did you make these changes?

6. Have there been any times when the messaging or marketing efforts of the NW Ductless Heat Pump Initiative and/or the utilities has conflicted with the marketing or messaging efforts of your company?

    a) If YES: What have you done to resolve the issue?

7. Has NEEA's Initiative influenced your marketing efforts in any way? [Probe to see if more marketing focused in NW due to rebates, if focusing more on specific home types (e.g., forced air), new messages, etc.)

8. What types of marketing support have you received from NEEA's Initiative? (PROBE on: ad templates, sales fact sheets, signage, website or publication content, co-op ad funding, other)

    a) Are there any types of support you would like going forward? If YES: Please explain.

9. For the Pacific Northwest, does your company's DHP marketing primarily promote multi-headed DHP units for whole house solutions, or one-to-one configurations to displace zonal electric heat? Why is that?

10. [MANUFACTURERS AND MANUFACTURER REPS ONLY]: What is your company's position on working with retailers to sell DHPs? For instance, would it help retailers to display functional DHPs so that customers can see them?

    a) [IF CURRENTLY WORKING WITH RETAIL] What about this approach has been successful/unsuccessful so far? [PROBE: Why/Why not?]

    b) [IF CONSIDERING] What are the potential advantages/disadvantages of working with retailers to sell DHPs?

    c) [IF NOT CONSIDERING] Why don't you want to work with retailers on DHPs?

    * [B and C, IF NEEDED]: Do you think that potential for misapplication and improper installation of DHPs could be addressed by implementing a retail sales model similar to what is used for water heaters, whereby sales include the cost of installation through a network of professional installers? Why/Why not?]

DHP Sales

11. How many DHP models do you have in stock? And how many of these models qualify for 2012 NW Ductless Heat Pump Initiative incentives?

12. What models do you have that *don't* qualify? Why don't these models qualify?

13. What are your most popular DHP models? Why are these sales highest?

14. Has the market share of any of the DHP brands you stock changed in the past year? How so? [PROBE FOR NUMERICAL ESTIMATES, by functionality (e.g., heating/cooling v. cooling only]

15. What impact has NEEA's Initiative had on your sales of residential DHPs? Has the Initiative impacted the number of DHP units that you…

    a) [MANUFACTURERS ONLY] Manufacturer/distribute? [PROBE TO GET NUMERICAL ESTIMATES]

    b) [MANUFACTURER REPS ONLY] Distribute? [PROBE TO GET NUMERICAL ESTIMATES]

    c) [DISTRIBUTORS ONLY] The variety of DHP brands/models you carry?

    d) [DISTRIBUTORS ONLY] How many DHP units you keep in stock? [PROBE TO GET NUMERICAL ESTIMATES]

16. What challenges, if any, have you experienced in meeting demand?

17. In the past year, has the impact of the Initiative on residential DHP sales increased, decreased, or stayed the same? Why is that?

18. How has the expiration of federal tax credits influenced your DHP business?

Interactions with Installers

19. Do you also rely on contractors to market residential DHPs?

    a) If YES: How do you work with contractors, to ensure that they use appropriate messaging?

20. What technical training do you provide to installers?

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

22. Do you see any evidence that utility rebates result in higher prices charged to consumers for DHPs?

    a) If YES: Why do you say that?

23. (Distributors only): Would you sell DHPs to non-HVAC technicians, such as electricians with a refrigerant license?
    a) If NO: Why not?
    b) Do you think a strategy like this could improve market adoption? Why do you say that?

Commercial Sales and Other Home Types

24. About how many DHPs have you sold to commercial businesses in the last 12 months?

a) What percent of your total DHPs sales does this represent?

b) Of these commercial sales, what percent went into small businesses less than 5,000 square feet, versus larger businesses?

- Has this percentage increased or decreased in the past 12 months?

25. In your residential sales, do you sell DHPs that are used in manufactured homes?
    a) If YES: How common is this – could you estimate a percentage of your residential sales?

26. Do you sell DHPs that are used in new homes?
    a) If YES: How common is this – could you estimate a percentage?

27. And about what percentage go into attached multifamily housing units?

28. Are there any barriers preventing DHPs from being used in manufactured, new or multifamily homes?
    a) If YES: please describe these barriers.

29. Have any of your DHPs been returned due to technical failures?
    a) If YES: Get details on percentage and typical models, reasons

Interactions with Initiative

30. What involvement have you had with the NW Ductless Heat Pump Initiative in the past year? (Probe on interactions with Northwest utilities, Initiative staff and installers.]

31. Did you have any Initiative-related challenges in 2011? [Probe on rebates eligibility, NEEA/Fluid delivery, installer activities, and equipment issues.]

32. How has the Initiative influenced your view of the DHP market in the Northwest? How about the overall US market?

33. Do you plan to assist the Initiative in any way in 2012? (Probe on technology training, marketing, funding, etc.)?

Future Expectations

Let's conclude by talking about the current and future states of the DHP market.

34. What technological trends are you seeing with DHPs?

a) Are there any new developments with DHPs in cold climate applications?

35. Do you think the price of DHP installations will change in the next 2 years? If so, how?

36. What are your expectations for the future regarding your company's DHP sales volume and/or market share in the Northwest?

    a) How much does this depend on the availability of utility incentives, which are typically about $1,500 per system?

    b) Do you think that your company will be able to keep up with market-demand for DHPs?

37. Are there any new or growing market segments for DHPs? [New construction, remodels, manufactured housing, etc.]

38. Are any specific applications for DHPs becoming more popular? [Ex: cooling, converting spaces]

39. Do residential DHPs constitute a strong market for you? How do they compare with other products that you manufacture/carry (for distributors)?

40. What are the primary market barriers to increased residential DHP sales? (Probe on out of pocket cost, economy status, customer awareness, focus on commercial market, etc.)

41. [IF NEEDED] In the Pacific Northwest, what proportion of your DHP sales do you expect will be multi-headed DHP units for whole house solutions – (one or more outdoor units with multiple indoor heads) vs. "one-to-one" configurations (to displace zonal electric heat)?

42. Lastly, do you have any other thoughts or comments about DHPs in general, the market, or NEEA's Initiative?

Those are all the questions I have for you. Thank you very much for your time and good information.

DHPs - Utilities In-Depth Interview Guide

FINAL February 21, 2012

Objectives:

- Understand utility program offerings and promotions, and expected changes
- Identify utility program delivery challenges
- Understand satisfaction with NEEA's Initiative and if needs are adequately met
- Determine how NEEA can improve its assistance to utilities

Target Audience: 20 utilities that participate in the Initiative, including a mix of very active and less active utilities (defined by number of rebates paid out).

Hi, this is _____ with Evergreen Economics, an energy program evaluation firm in Portland, Oregon. My company is evaluating the Northwest Ductless Heat Pump Initiative for the Northwest Energy Efficiency Alliance (NEEA). Right now we're interviewing a group of utility contacts to better understand how well the Initiative is operating, and to gather feedback regarding how the Initiative might be improved.

Is now a good time to talk about the Initiative, or can we schedule a time to talk for 20 to 30 minutes?

(IF NEEDED: Please know that your answers will be kept confidential and will be grouped with other respondents for reporting in aggregate form only. Neither your name nor utility will be mentioned in any reports or documents.)

First I'm going to ask you some questions about your own utility's DHPs program. Then I'll ask you some questions about NEEA's Northwest DHPs Initiative.

1) To start off, why is your utility participating in NEEA's DHPs Initiative?

2) Which methods do you use to promote your DHPs program? Probe for:

   Direct mailings
   Newspaper ads
   TV/Radio
   Social media
   Internet
   Other

3) Do you have a DHP display unit?
   a) If so, how did you get it? Where is it located? Is it functional, or just a display? Permanently installed?

4) What types of customer homes are you targeting?

5) Have your promotion efforts or budget increased or decreased in the past year? Why, and how so?

6) What marketing media and/or messages have been most effective in persuading customers to buy DHPs?

7) Do you use the displacement theory when educating customers about DHPs? (I.e. are they promoting single zone installations, or multi-head/zone installations?)

8) In the next 12 months, will your promotion efforts change in any way? If so, how?

For next Q's, distinguish between: existing SFR – zonal heating, existing SFR – forced air furnace, other existing homes

9) What rebate amount(s) are you offering in 2012?

10) What percent of your residential portfolio is DHPs rebates?

11) In the next two years, do you think your rebate amount(s) will increase, decrease, or remain the same? Why do you say that? (Get details on specific changes. PROBE to see if impacts from lapsing AARA funding, federal tax credits).

12) Does your utility have an expected time frame when DHP rebates may no longer be offered?

13) Do you offer customer financing for DHPs?
    a) If NO: Why not?
    b) If YES: Get details
    c) If YES: What percent of your DHPs customers use this financing if they are eligible?

14) What services, if any, does your utility provide to DHPs installers? (Free or subsidized training, marketing assistance, other? Get details.)

15) Have any of these services changed in the last year? How so/Why not?

16) Which aspects of your program (e.g., rebates, marketing, technical training, contractor referrals, financing) have had the most impacts on driving customer participation?

17) Would you say that you achieved your installation goals in 2011 goals? Why or why not? (Probe on program challenges, successes)

18) What are the biggest challenges for DHPs in your service territory?
    a) Is cold climate an obstacle for installations? If so, how?

19) Are your goals for 2012 different? If so, why?

20) How is the inspections process going?
    a) Are you doing mostly random inspections, or are you also doing discretionary inspections to check on specific installers?
    b) Are you having any pervasive problems with any specific installers, or with any installation issue?

21) Do you need any additional assistance from NEEA or Fluid to improve the inspections process in your area?

Now I'd like to ask you some questions regarding NEEA's Northwest DHPs Initiative.

22) Do you or other utility staff have any difficulties staying informed about NEEA's current or planned Initiative activities? (PROBE to see if any confusion with BPA's activities)
    a) If YES: Are you or other staff usually able to attend NEEA's webinars covering Initiative updates?
    b) If YES to main Q: Do you have suggestions for improving communications between the utilities and NEEA and/or Fluid?

23) How would you describe your relationship with your primary contact from the Fluid team? (Find out who this is)

24) How do you use the Initiative's database, and how well is this working for you? For instance, do you use it to run reports to support your own program or reporting to BPA?

25) Have you visited the Initiative website in the past 3 months?
    If YES, ask:
    a) How many times?

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

If NO: Why not?

26) How satisfied have you been with the technical resources that are available through the Initiative?

27) And how satisfied have you been with the Initiative's marketing support?

28) What features of NEEA's Initiative do you like best and have worked well for you?

29) How could NEEA's Initiative better support your endeavors? (PROBE to see if any specific marketing to customers or installers needed, other activities).

Those are all the questions I have right now. Thank you very much for your time and good information!

Appendix E: DHP Initiative 2011 Installation Maps

Following are maps showing the total number of DHP installations by zip code.

Figure 8: Idaho DHP Installations Map

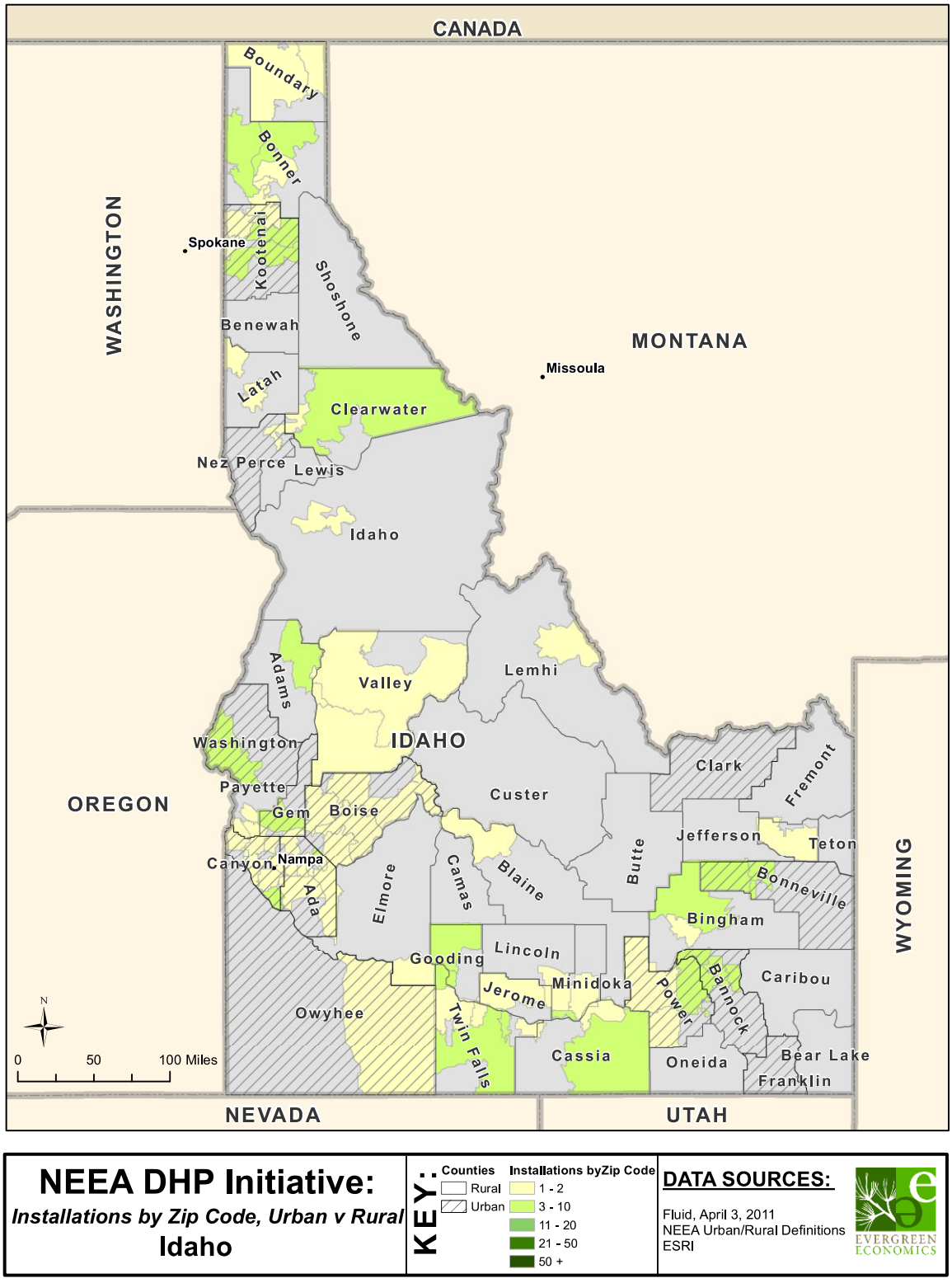
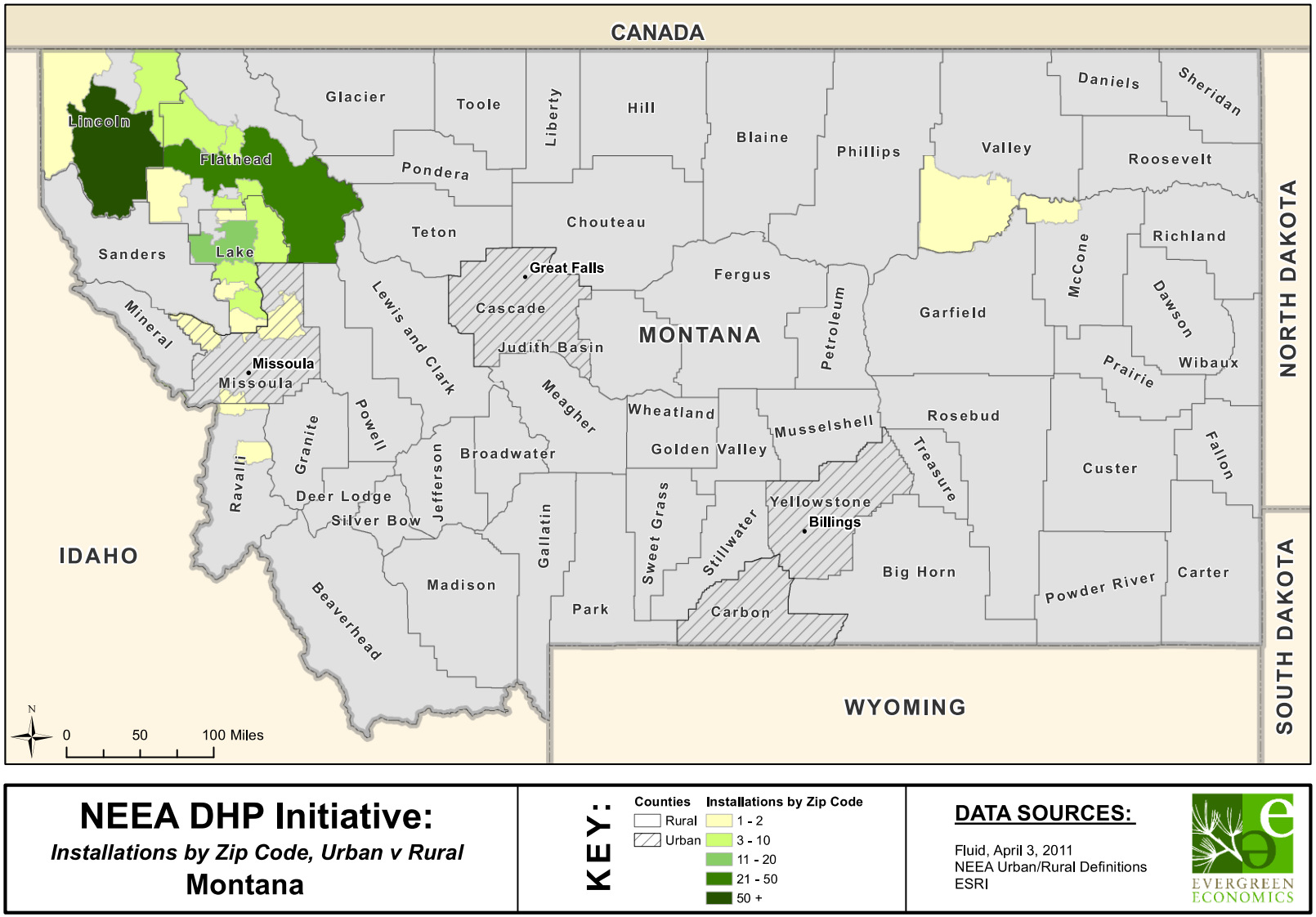


Figure 9: Montana DHP Installations Map



NEEA DHP Initiative:

Installations by Zip Code, Urban v Rural

Montana

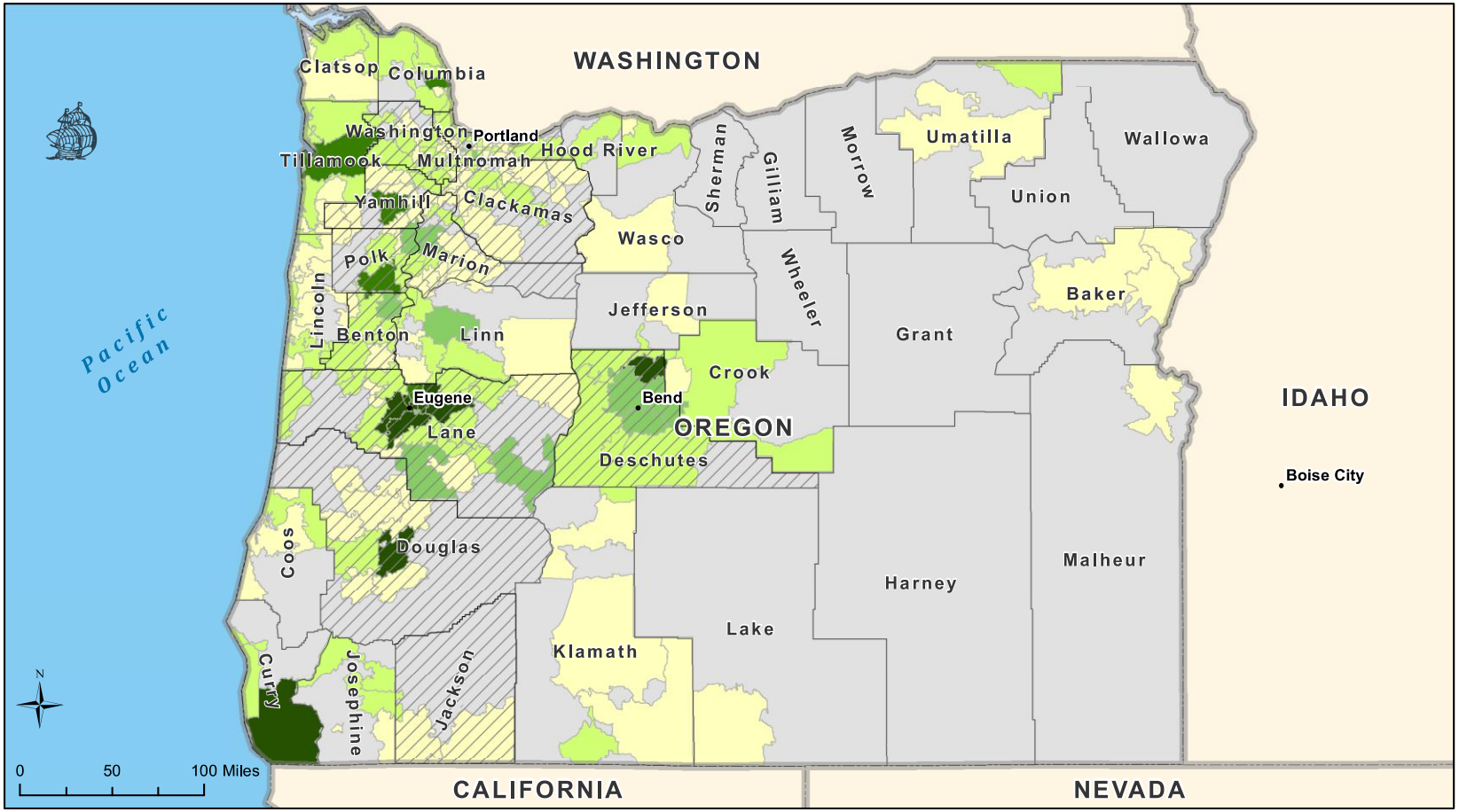
KEY:

Counties	Installations by Zip Code
Rural	1 - 2
Urban	3 - 10
	11 - 20
	21 - 50
	50 +

DATA SOURCES:

Fluid, April 3, 2011
NEEA Urban/Rural Definitions
ESRI

Figure 10: Oregon DHP Installations Map



NEEA DHP Initiative:

Installations by Zip Code, Urban v Rural

Oregon

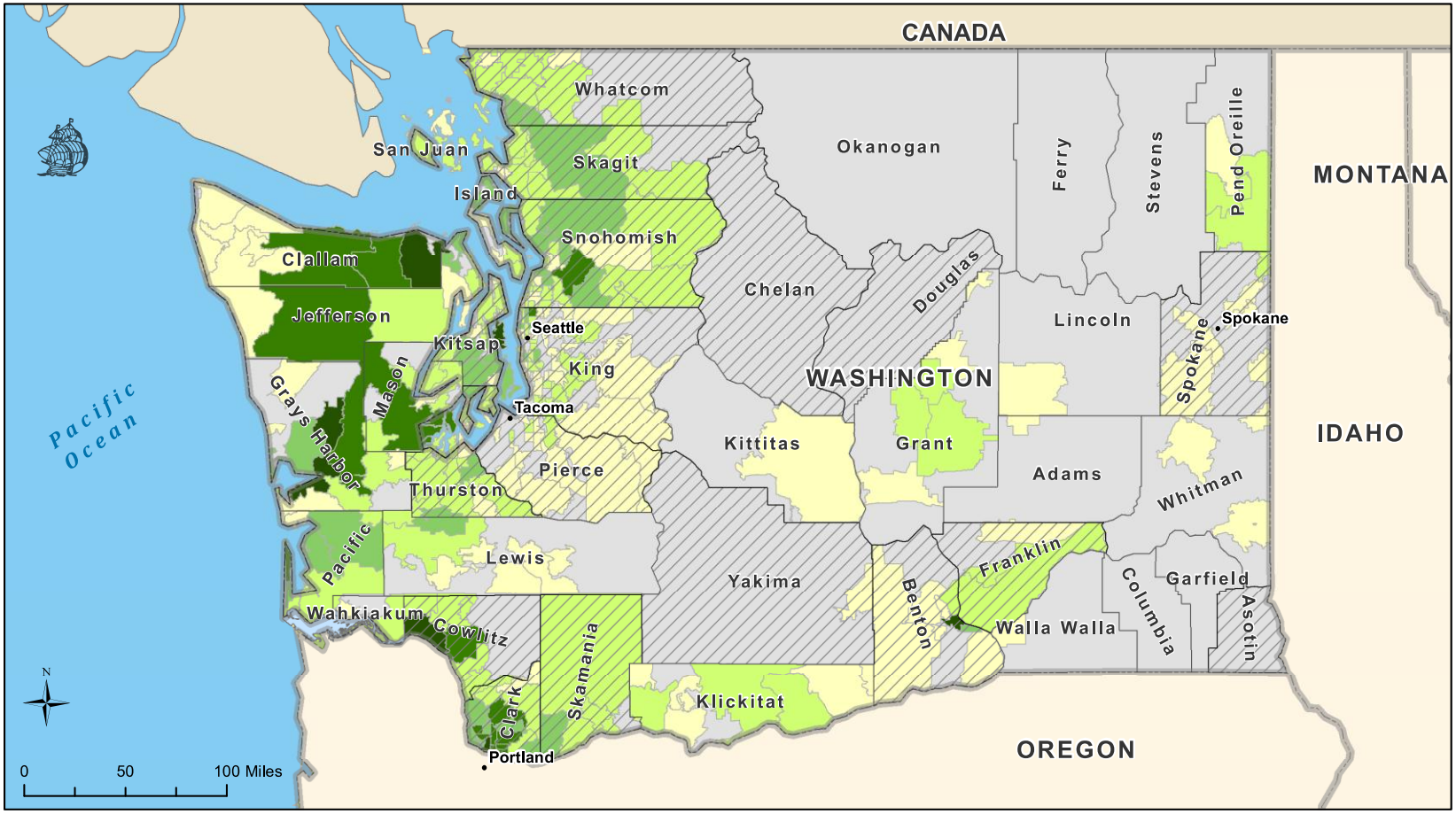
KEY:

Counties	Installations by Zip Code
Rural	1 - 2
Urban	3 - 10
	11 - 20
	21 - 50
	50 +

DATA SOURCES:

Fluid, April 3, 2011
NEEA Urban/Rural Definitions
ESRI

Figure 11: Washington DHP Installations Map



NEEA DHP Initiative:

Installations by Zip Code, Urban v Rural

Washington

KEY:

Counties	Installations by Zip Code
Rural	1 - 2
Urban	3 - 10
	11 - 20
	21 - 50
	50 +

DATA SOURCES:

Fluid, April 3, 2011
NEEA Urban/Rural Definitions
ESRI

Appendix F: Urban/Rural Markets Definitions

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

Appendix G: Supplemental Phone Survey Tables

Table 27. General Population Awareness of DHPs

Cooling Zone, Urban/ Rural	Yes, Aided	Yes, Unaided	No/ Don't Know	Total
CZ1				
Rural (n=35)	0%	29%	71%	100%
Urban (n=35)	3%	34%	63%	100%
CZ2				
Rural (n=35)	3%	29%	69%	100%
Urban (n=34)	6%	29%	65%	100%
CZ3				
Rural (n=30)	3%	27%	70%	100%
Urban (n=30)	0%	30%	70%	100%
Overall (n=199)	3%	31%	66%	100%

Q1. Before this call, had you ever seen or heard about ductless heat pumps, or DHPs?

Table 28. Sources of Initiative Participant Awareness of DHPs

Source	Participant Responses (Percentage) (n=101)
Utility Sources	52%
Friend/ Relative / Acquaintance	47%
Materials from Contractors/Installers	30%
Newspaper	19%
Internet	19%
TV/ Radio	6%
Other	16%
Don't Know	1%

Q2. How did you first hear about DHPs? Q3. Did you hear about it anywhere else? Or learn about it from another source?

Table 29. General Population's Current Heat Sources

Heat Source	General Population Responses (Percentage) (n=199)
Wood Heat	31%
Forced Air Furnace	30%
Heat Pump	11%
Baseboards	8%
Wall Heater	4%
Space Heater	4%
Electric Radiant Heat	3%
Propane	2%
Other	6%
Don't Know	2%

Q20c. What is your primary heat source?

Table 30. Participant DHP Temperature Control Practices

Temperature Adjustment	Initiative Participant Responses (Percentage) (n=101)
Manual	74%
Automatic	14%
Both manual and automatic	11%
Don't Know	1%

Q44. Have you programmed your DHP to automatically adjust the temperature it is set to during different periods of the day or week, or do you typically adjust the temperature on the unit manually?

Table 31. Participant DHP Recommendations Practices

Response	Initiative Participant Responses (Percentage) (n=101)
Yes- have	59%
Yes- would	34%
No	4%
Don't know	2%

Q47. Have you, or would you, recommend the DHP to a friend, colleague or family member?

Table 32: Importance of Having an Energy Efficiency Home – Initiative Participants and General Population

Importance of having an energy efficient home	Very important	Somewhat important	A little important	Not at all important	Refused	Total
Participants (n=101)	75%	21%	4%	0%	0%	100%
General Population (n=199)	64%	26%	3%	4%	3%	100%
Overall (n=300)	68%	24%	3%	3%	2%	100%

Q 50. How important is it for you to have an energy-efficient home? Would you say it is: NOT AT ALL IMPORTANT. A LITTLE IMPORTANT. SOMEWHAT IMPORTANT. VERY IMPORTANT (4) Don't know

Table 33: Education Level of Survey Respondents

Education Level	Percentage of Participants (n=101)	Percentage of General Population (n=199)
High school or GED	25%	25%
Some college	24%	23%
Technical College (2 year degree)	17%	17%
Graduate degree	17%	13%
4 Year college	12%	14%
Less than high school	1%	4%
Refused	2%	4%

Q 55. Which of the following best describes your educational background?

Table 34: Income Level of Survey Respondents

Income Level	Percentage of Participants (n=101)	Percentage of General Population (n=199)
Between 40K and 60K	23%	22%
< 40K	20%	23%
Between 61K and 80K	17%	13%
Between 81K and 120K	18%	8%
Over 120K	4%	8%
Refused/ don't know	18%	23%

Q 56. Which of the following best represents your approximate annual household income from all sources in 2011, before taxes?

Table 35: Political Affiliation of Survey Respondents

Political Affiliation	Percentage of Participants (n=101)	Percentage of General Population (n=199)
Republican	25%	32%
Democrat	17%	16%
Refused	19%	18%
Other	38%	32%

Q 59. For your political affiliation, are you a Democrat, a Republican, an Independent or something else?

Appendix H: Fluid 2011 Installer Trainings

Contractor Orientations					
Date	# Attendees	# Contractor Companies	Manufacturer	Distributor	Host/Location
1/12/11	5	4			Webinar
2/16/11	29	26			Webinar
3/16/11	24	21			Webinar
4/13/11	24	21			Webinar
4/27/11	23	20	Mitsubishi		Idaho Falls, ID
4/28/11	13	11	Mitsubishi		Jackson, WY
5/11/11	33	20			Webinar
6/8/11	16	13			Webinar
7/13/11	14	13			Webinar
8/10/11	20	17			Webinar
9/14/11	25	22			Webinar
10/12/11	16	13			Webinar
10/14/11	9	9			Webinar-Custom Contractor Orientation
11/9/11	24	23			Webinar
12/14/11	19	18			Webinar

Best Practices Installation Webinars		
Date	# Attendees	# Contractor Companies
1/19/11	22	16
2/23/11	17	15
2/24/11	4	3
4/8/11	13	10
5/19/11	32	23
6/30/11	21	9
8/25/11	16	13
9/22/11	10	10
11/3/11	8	6
12/15/11	14	12

Source: Fluid, June 2012