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Northwest Ductless Heat Pump Initiative 2010

Market Progress Evaluation Report #1

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Final Report

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EXECUTIVE SUMMARY

This market progress evaluation report (MPER) describes the progress, accomplishments, and challenges of the Northwest Energy Efficiency Alliance's (NEEA) 2010 Northwest Ductless Heat Pump (DHP) Initiative. The initiative began in 2010, following a pilot phase that launched in October of 2008. Both the pilot and the initiative share the goal of promoting the displacement of electric zonal heat in residential applications with ductless heat pumps. NEEA and implementation contractor, Fluid Market Strategies, worked through 2010 to promote DHP installations through marketing and supporting utility incentive programs, track installations, work with DHP manufacturers and suppliers, train installers, and assure installation quality.

This report is one component of on-going comprehensive research underway on DHP technical performance and market acceptance. Previous MPERS evaluated the DHP pilot progress and market acceptance of DHPs through surveys and interviews with market actors.

Key findings of this report, by market actor, include:

Manufacturers: In 2010, manufacturer contacts reported that they better understood the Initiative theory and goals, and were more engaged in it. In particular, they had incorporated Initiative fundamentals into their training and marketing materials. Manufacturers also reported that, due to the Initiative, the Northwest is a viable market for DHPs and that the Initiative provides an effective model for similar DHP programs in other regions. Both manufacturers and Initiative implementation staff said they planned to branch into new, innovative marketing approaches intended generate interest from more diverse populations of potential DHP consumers.

Installers: About eighty percent of HVAC installers in the region had installed at least one DHP. Participating contractors, which made up about twenty percent of the total regional contractors, had installed about eighty percent of the target market installations. Utility program administrators reported that installation quality remained consistent or improved in 2010. Initiative implementation staff and utility program administrators credited the Master Installer Program with encouraging quality installations and rewarding those installers who have an advanced understanding of Initiative theory and practices.

Utilities: Ninety-one utilities participated in the Initiative in 2010, an increase of five from 2009. Utility contacts reported a sustained consumer demand for DHP technology which results in valuable energy savings for their programs. Utility contacts reported plans to continue running their DHP programs for as long funding allows.

Installations: As of May 2011, the NW Ductless Initiative had installed 10,500 DHP systems. Participating contractors, which make up about twenty percent of the total regional contractors, have installed about eighty percent of the target market installations. Additional surveys conducted with contractors installing un-incented units, indicate that at minimum, 2,603

installations replaced baseboards/zonal heat in single-family homes and 1,842 were installed in supplemental or add-on space in single family homes.

RECOMMENDATIONS

NEEA should continue to offer the initiative and continue building on its successes.

Residential target market: The initiative staff should expand outreach activities to the market of homeowners younger than 60, pursuing activities begun in 2010 such as involving social media, television advertising, and publicizing the very positive consumer response to DHPs. The staff should ensure the target market definition and market size estimate it uses in its operations are consistent with that of the DHP ACE (Alliance Cost-Effectiveness) model and the Northwest Power and Conservation Council's *Sixth Power Plan.* Alternatively, the program and ACE model might use the number of northwest single family electrically heated homes estimated by the U.S. Census.

Expanded northwest markets: Initiative staff should consider ways to support residential DHP installations in markets beyond the target market, regardless of whether incentives are offered for these applications. The initiative might promote short-run ducting with DHPs for new construction applications to address aesthetic barriers. It might initiate conversations or collaborations between manufactured housing manufacturers and DHP manufacturers. It might develop case studies or testimonials showcasing residential-size DHPs in small commercial applications.

Utility support: Initiative staff should strategize with Energy Trust of Oregon staff about possible responses to the research findings that the Portland area has among the lowest saturations of HVAC contractors installing incentivized DHPs and among the lowest rates of customers specifically requesting DHPs (per contractor reports). Initiative staff should continue to collaborate with utilities and support them with best practices.

Contractor support: Initiative staff should continue to grow the Master Installer Network and conduct installer training, especially in areas with lower initiative participation: rural areas, Portland, Spokane, and the other locations in the Spokane grouping. Contractors would welcome additional marketing materials and support, and might benefit from sales training that highlights customer-reported benefits of the DHPs and promotes DHPs to displace existing zonal electric heating systems. Initiative staff should continue the current approach of showcasing successful contractors.

Manufacturer support: Initiative staff should work with manufacturers to expand the locations – such as utility offices – where consumers can observe DHPs and experience their space conditioning, noise levels, and appearance. Initiative staff should continue its successful work with manufacturers to increase manufacturers' marketing supportive of the initiative and technical support of contractors.

Retail support: Initiative staff should continue collaborations to increase the number of big box retailers and retail store locations that sell and install DHPs.

1 INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA) is a non-profit corporation supported by electric utilities, public benefits administrators, state governments, public interest groups, and energy efficiency industry representatives that operate in the states of Idaho, Montana, Oregon, and Washington.[1] These organizations combine efforts to promote energy efficiency in the Northwest.

NEEA hired Research Into Action, Inc. to evaluate its 2010 Northwest Ductless Heat Pump Initiative. This market progress evaluation report (MPER) describes the 2010 initiative progress, accomplishments, and challenges.

The initiative began in 2010, following a pilot phase that began in October of 2008. Research Into Action completed two MPERs on the pilot activities and market progress. Both the pilot and the initiative share the goal of promoting the displacement of electric zonal heat in residential applications with ductless heat pumps. NEEA and implementation contractor, Fluid Market Strategies (Fluid), worked through 2010 to promote DHP installations through marketing and supporting utility incentive programs, track installations, work with DHP manufacturers and suppliers, train installers, and assure installation quality. This research seeks to evaluate the initiative's progress towards market transformation, contractor education, and DHP installations. NEEA's research on the technical performance of ductless heat pumps (DHPs) is ongoing through 2012. Ecotope, Inc. is performing the regional technical evaluation efforts for NEEA, including lab testing, metering, and energy savings calculations.

Historically, the DHP supply chain and likely target market were unaware of DHPs' viability for displacement of existing space conditioning or did not see potential for DHPs in the Northwest. Due to the perception of limited market potential, DHP manufacturers and distributors did little to encourage sales of DHPs in the Northwest. The pilot ran from October 2008 to December 2009 and helped generate a strong consumer demand for DHPs, as well as a supply chain of interested manufacturers, distributors, and contractors. The pilot demonstrated the capability of DHPs to residential consumers and the market potential to HVAC contractors. The pilot also involved regional utilities in incentivizing and promoting DHPs to their customers. By the end of 2009, the pilot had made documented progress toward creating a market for DHPs in the Northwest and a network of trained contractors to support that market. During the pilot, the Bonneville Power Administration (BPA) sponsored the installation of 1,500 installations. Utilities sponsored an additional thousand units. By November of 2009, the pilot had installed its installation goals and as of December 31, 2009 had installed 3,899 DHP units in the region.

[1] See the website at *www.neea.org*.

The 2010 DHP initiative built on the successes of the pilot with more DHP installations and stronger networks between the supply chain and initiative stakeholders. The primary goals of the 2010 initiative are to:

- **Continue to demonstrate the effectiveness of inverter-driven ductless heat pumps in displacing electric heat in the Northwest;**
- **Partner with Northwest utilities and energy efficiency organizations to achieve a 15% market share of DHP by 2014 in single family electrically heated homes**
- **Increase consumer awareness of DHP technology**
- **Maintain and enhance a robust trade ally network**
- **Increase affordability and variety of DHPs available throughout the region**

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

- **Accelerate market adoption of ductless heat pumps by building on the progress and infrastructure of the 2009 pilot.**
- **Promote quality installations throughout the region and communicate findings to market actors and Project partners**
- **Maintain and enhance the upstream market by partnering with manufacturers to implement effective regional marketing platforms**
- **Ensure that ductless systems are well supported by the distribution channel in the Northwest and support technology advancements in the region**
- **Create and maintain a sales data tracking mechanism to monitor ductless heat pump sales and gauge progress regionally**
- **Increase contractor awareness and adoption of ductless heat pump technology and applications in single family homes with electric resistance heat;**
- **Create and maintain robust trade ally network and increase active contractor participation by 20 percent and ensure contractors are trained in the technical nuances of installing DHPs**
- **Verify appropriate ductless heat pump applications and installations according to the expectations and requirements of the Project and manufacturer specifications.**
- **Begin to shift the responsibility of quality installations to the marketplace by providing contractors with near-term feedback on best practices and areas of concern**
- **Coordinate and review quality assurance protocols with utilities**

DHP 2010 INITATIVE THEORY AND LOGIC

Prior to the DHP pilot, the Northwest was viewed by DHP manufacturers as a minor market. The Initiative theory posits that through direct intervention with market actors that initiative will increase DHP sales, transform the market, and build a sustainable market for DHPs.

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

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

2 METHODOLOGY

This report addresses the primary objective of the 2010 DHP Initiative evaluation: to assess market response and progress by collecting data from market actors and participants. Research Into Action reviewed the DHP Alliance Cost-Effectiveness (ACE) model and key initiative assumptions to evaluate the validity of the ACE Model assumptions and initiative logic.

Building on the concepts from the ACE Model and initiative logic, Research Into Action collected data from participants, initiative implementation staff, contractors, and manufacturer/distributors. We called a sample of participants and installation contractors up to six times to reduce the likelihood of convenience sampling bias. Table 1 shows the populations and samples for each group.

Table 1: DHP Initiative Evaluation Primary Data Collection

Group	Estimated Population	Sample Size	Confidence/ Precision
Interviews			
Initiative Implementation Staff (NEEA and Fluid)	3	3	Census
Participating DHP Program Administrators (administrators with one or more installations)	76	19	85/15
Manufacturer Contacts (brands with 35+ units installed – 0.5% or more of installations)	5 brands	5 brands, 15 contacts	NA
Manufacturer Contacts (brands with < 0.5% share)	4 brands	4 brands, 4 contacts	NA
Focus Groups (to Support Survey Development)			
Participating Installation Contractors	NA	3 groups	NA
Participating Consumers	NA	3 groups	NA
Surveys			
HVAC Contractors	2,000+	Strata 1:47	Strata 1:85/10
		Strata 2:47	Strata 2:85/10
		Strata 3:18	Strata 3:80/15
		Strata 4:50	Strata 4:85/10
		Strata 5:6	Strata 5:80/20
		Strata 6:46	Strata 6:85/10
		Total: 214	**Overall: 95/10**
2010 Participating DHP Customers	3,000+	67	Greater than 90/10

Table 2 summarizes the data collection undertaken for the MPER. We tailored the questions for each group to address the research questions and evaluation goals. Table 2 shows the correspondence between the data collection efforts and the research objectives.

Table 2: Correspondence of Research Objectives and Data Collection

Research Objectives	Data Collection Techniques				
	Quantitative Market Surveys	Interviews	Focus Groups	Initiative Documents, etc.	Secondary Sources
Sample	**268 Contractors 100 Consumers**	**3 Initiative Implementation Staff 19 Program Administrators 19 Manufacturers**	**3 Contractor Groups 3 Consumer Groups**	**NA**	**NA**
Progress toward Market Share Goal …Market Penetration of Incented Units …Market Penetration of Unincented Units	✓	*		✓	*
Progress toward Utility/ Energy Agency Partnering Goal		✓		*	
Progress toward Consumer Awareness Goal	✓	*	*	*	
Progress toward Trade Ally Network Goal	✓	*	*	*	
Progress toward Goals for DHP Variety, Availability and Affordability	✓			✓	
Progress toward Market Transformation	✓	*			
Validation of Initiative Logic	✓	✓	✓	✓	
Validation of ACE Model	✓			✓	✓
Informing Adaptive Management	✓	✓		✓	

* Data source contributed to understanding the research objective, but did not constitute the key source.

Research Into Action completed two additional data collection components: a series of focus groups to inform the data collection instruments and follow-up research with DHP contractors regarding DHPs they had installed without initiative incentives. Please see appendices for more details on findings, findings from additional research tasks, and all data collection instruments

3 FINDINGS FROM INTERVIEWS

This chapter presents findings from interviews conducted by Research Into Action with the manufacturers, utility program administrators, and initiative implementation staff. Table 3 shows the sample sizes for each group.

Table 3: Interview Groups and Sample Sizes

Manufacturers and Distributors	Utility Program Administrators	Initiative Implementation Staff
19	19	3

MANUFACTURERS AND DISTRIBUTORS

Research Into Action interviewed 19 manufacturer or distributor contacts. Contacts included a diverse representation of manufacturer contacts, manufacturer's representatives, and distributors. We spoke with 15 contacts representing brands with 0.5% or more of installations through the initiative: Mitsubishi, Fujitsu, Daikin, LG, and Sanyo. We also spoke with four contacts representing brands with just a few program installations. Some contacts represented distributors working with more than one brand of DHP.

On average, manufacturer contacts reported that two-thirds of the outdoor DHP units they manufacture or stock qualified for initiative incentives. Contacts manufactured or stocked an average of 13 qualifying outdoor DHP units and seven DHPs that did not qualify for incentives.[2] Nonqualifying units either were not inverter driven or did not meet the SEER requirements. Contacts reported that their most popular units were high efficiency, qualified for the initiative, easy to install, quiet, and were capable of operating in cold weather conditions.

Initiative Influence

Respondents indicated that the NW Ductless Heat Pump Initiative has influenced their marketing, changed their perception of the regional and national market, and provided lessons that they will apply to the rest of the United States. Only one contact – a distributor – reported that the initiative did not change either the DHP models they carry or the number of individual DHP units that they stock. Contacts reported that initiative outreach, including the initiative

[2] Initially, we sought to understand the number and proportion of DHP systems (consisting of configurations of both indoor and outdoor DHP units) that manufacture contacts manufacture or stock that qualify for initiative incentives. This approach was problematic because of the large number of possible configurations of indoor and outdoor DHP units. Therefore, we asked manufacturer contacts solely about the proportion of *outdoor* DHP units they manufacture or stock that qualified for initiative incentives, in an effort to infer the value of the variable of interest.

website and email blasts from Fluid, generated a high level of contractor and consumer awareness about DHPs and the initiative incentives.

Marketing

Manufacturer contacts reported that DHP marketing is primarily conducted through their contractor networks. Direct marketing approaches varied across respondents; most of the representatives reported they did not conduct direct marketing of DHPs, while two of the brands maintained national awareness campaigns. These two contacts described their national DHP marketing as emphasizing comfort, efficiency, and zonal control. Manufacturers reported that marketing through contractors or distributors is the established method of marketing, while direct to consumer marketing for DHPs is a more recent development. In some cases, manufacturers provide co-op marketing dollars to contractors or distributors based on the sales these contractors or distributors generate.

Initiative Influence on Marketing

In general, respondents indicated that the initiative had expanded their perspective and awareness of potential DHP applications and value, including displacement applications for DHPs. Contacts further reported that this increased awareness has influenced the messages they seek to convey to contractors about the current DHP market, proper DHP installation techniques, and effective marketing approaches, In addition, respondents indicated that their increased awareness had prompted them to increase their marketing focus on the Pacific Northwest. Representative comments included:

> *The initiative has helped us focus our attention on the Northwest, where we have not traditionally had very good results.*
>
> *Everything the initiative is doing is tremendous in terms of raising awareness. It has definitely made us more attuned to the displacement concept as a market. Even five years ago, if you talked to a contractor they saw DHP only as a spot cooling application. Now you cannot go to a contractor that does now know about DHPs and all their applications. It has come a long way in a short period of time.*
>
> *I'd say the project has influenced our viewpoint on the DHP market. It has showed us what the Northwest market can do and what works out there, things which could work in other parts of the country.*

In addition to the traditional marketing approaches and target demographic, the initiative encouraged manufacturers to expand their message to promote DHP energy efficiency and zonal displacement to a more diverse population. Contacts indicated that this broader focus has been successful in appealing to more diverse groups of customers.

A few manufacturers indicated that they had participated in or been approached about co-branding with the initiative, yet they were not enthusiastic about co-branding. Co-branding would allow the initiative and the manufacturers to share marketing dollars to promote the technology and the initiative simultaneously. Even those manufacturers who had already

participated in co-branding reported being cautious about participating again because the approach has "no capacity to target," meaning that the manufacturer did not see a direct return in sales for their brand from their investment. One co-branding approach that manufacturers did consider effective was radio advertising, specifically pairing an initiative advertisement with a manufacturer advertisement on National Public Radio. Manufacturer and distributor contacts indicated plans to keep their marketing approaches the same as current beyond 2010 which includes the increased collaboration with utility programs and distribution networks caused by the initiative.

Sales and Supply Chain

Market Share

While none of the manufacturers or distributors knew the approximate market share of each manufacturer, but about half were willing to speculate. Contacts reported their perception of the existing market shares; they placed Mitsubishi at around one-third of the total market followed by (in rank order) Fujitsu, Daikin, LG and Sanyo. According to the initiative installation database, Mitsubishi accounts for almost half of initiative installations (47%), followed by Fujitsu (27%), Daikin (10%), and Sanyo (7%).

Sales and Availability

Manufacturer and distributor respondents universally agreed that the initiative positively impacted sales. However, none of the manufacturer contacts reported that the increased sales resulted in a larger number of DHPs being manufactured. None of the manufacturers or distributors indicated any serious concerns about DHP availability, although several discussed possible supply limitations subsequent to the March 11, 2011 tsunami in Japan, which disrupted production of critical DHP components.

Retail

Manufacturers are hesitant about working with retailers to sell DHPs in big box stores, although they are aware of retailers' interest in doing so. Working with retail stores would reduce the need for the distributors. Both distributors and manufacturers value their established relationships; however, manufacturers indicated that unless distributors can add significant value to the product customers will almost certainly demand the added convenience of retail. Retail stores can offer financing through store credit cards and the purchase can be coordinated prior to installation, which necessitates a trained installer. DHPs are already sold in retail environments internationally, but contacts explained that the domestic contractor base is new to the technology and without the support from manufacturers and distributors the quality of installations might decrease. Manufacturers expressed concern that lower quality installations would result in less satisfied customers, more warranty claims, and bad publicity. Previous research also revealed concerns among manufacturers and distributors about potential misapplication (installation in

inappropriate applications or incorrect sizing) of DHPs if installed without the existing level of regulation. [3]

Submarkets

We asked manufacturers and distributors which markets, beyond residential retrofits, are potentially suitable for DHPs.

Contacts indicated that new construction is a promising market for DHPs. For example, contacts expressed that DHPs are ideally suited for new construction of small spaces such as condos. Most respondents agreed that the new construction market for DHPs will grow in the coming years. Contacts reported large design and construction firms to be the biggest barrier to new construction applications as these large firms are inflexible and slow to see the benefits of DHP compared to traditional heating systems since DHPs require additional upfront costs. Respondents also considered the physical appearance of the indoor DHP units to be a barrier to their application in new construction. To address this barrier, respondents suggested loosening initiative requirements that disqualify DHP systems with a small amount of ducting. Contacts suggested that these energy-efficient "hybrid" systems with minimal ducting are an effective approach to addressing the aesthetic barrier in new construction and other DHP markets. The contacts noted that while the current slow economy has significantly reduced the size of the new construction market, it has as a positive outcome led to increased demand for smaller houses, which are well suited to DHPs.

Contacts reported no current focus on manufactured housing as a market for DHPs. Although manufactured housing is the ideal size and configuration for DHPs, contacts indicated that there are several barriers – in addition to first costs – to DHP installation in manufactured homes. Existing codes and manufacturing procedures are barriers to this application, as well as the ducting present in nearly all manufactured homes.

Manufacturer and distributor contacts considered multi-family housing to be a promising market although there have been few installations and the potential is relatively unknown. Additional markets that the contacts considered promising were hotel rooms, assisted living communities, and low income housing. However, the contacts noted that such applications for DHPs are not yet widespread.

Training and Education

Manufacturer contacts reported offering an increased number of DHP trainings since the inception of the initiative. Respondents indicated that initiative requirements are now included in their northwest trainings- such as line height or line set covering requirements. One contact indicated that these concepts, which were previously less important, are presented "universally as a quasi-requirement," and added, "the initiative has influenced installation training." In addition,

[3] Northwest Ductless Heat Pump Pilot Project, Market Progress Evaluation Report #2.

some manufacturers reported increasing the technical assistance they provide to support the expanding contractor network.

Manufacturer and distributor contacts indicated that contractor education is the largest barrier to expanding application of DHPs into additional submarkets. According to one contact, "The technology can move forward only as quickly as the contractor understanding." Despite increased training activities, some manufacturer and distributor contacts remained skeptical about their capacity to convince contractors about the technical and market potential of DHPs.

Issues

We asked manufacturers and distributors about some potential program challenges, including meeting demand, the discontinuation of the tax credit, and cold climate performance concerns.

- All contacts except three indicated that they have experienced or anticipate difficulty meeting demand. Barriers to meeting demand include the unreliable oversea supply chain, the tsunami in Japan, and inventory restrictions[4].
- Contacts universally agreed that the federal tax credit had a substantial positive influence on their business. Respondents reported an uptake of tax-credit qualified units that vastly outpaced the uptake of non-qualified units. Manufacturer and distributor contacts indicated mixed experiences since the tax credit ended. Some have seen a decrease in sales while others have not. Contacts indicated that without the tax credit they foresee a potential decrease in sales.
- Universally, contacts reported that DHPs are functional down to zero or negative five degrees; however, cold weather efficiency varies by brand. Some units remain efficient at low temperatures while other units require more energy to function at colder temperatures. With an additional wind baffle, manufacturers report that the units remain highly efficient. The technology is continually improving and not a single contact indicated that cold climate conditions are a serious barrier to DHP sales.

- Contacts reported ongoing consumer education issues around the operation and functionality of DHPs. Manufacturers report continued misunderstanding of the DHP remote control, which has a separate temperature sensor than the DHP unit itself and features buttons that can be confusing to some consumers. Additionally, manufacturer and distributor contacts indicated that consumers are not being sufficiently educated about what to expect when operating the DHP. Instead of operating similar to a traditional heating system, the DHP runs more often and for longer periods of time.

[4] Inventory restrictions apply only to Sanyo, which is allowed to hold a limited amount of inventory while transitioning to new management under Panasonic.

Contacts indicated that increasing contractor training may be helpful in overcoming these shortcomings in consumer education.

Future Projections

Contacts universally expect growth in DHP sales in the near future. All contacts also expressed a belief that DHPs are a viable market in the Northwest now and in the long-term future. Beyond the current applications, contacts expect an expansion of whole house DHP solutions and multi-headed systems. While multi-zonal systems are expected to increase, contacts estimated that the majority of the market (at least 60%) will continue to be one-to-one applications.

UTILITY PROGRAM ADMINISTRATOR INTERVIEWS

Research Into Action interviewed 19 utility program administrators from around the Northwest. We sampled utility program administrators with diverse numbers of DHP installations across urban and rural territories. Contacts represent both small and large utilities.

Program Structure

Utility contacts reported only very minor program changes in initiative structure in 2010. One program had added an in-house financing component, another added minimum insulation requirements, and another has reduced their incentive amount by $250. The majority of program administrators are waiting for the Bonneville Power Administration (BPA) to announce major program changes, anticipated in October of 2011, and plan to keep their programs consistent until that time. Aside from changes dictated by BPA, program administrators reported no plans to change their existing programs.

Quality Assurance Inspections

Overall, the program administrators report doing less quality assurance than they did at the onset of the initiative. None of the program administrators had any concerns about the quality of installations in their territory. Program administrators credit the quality assurance performed by Fluid and the utilities with increasing and maintaining installation quality. Respondents reported high levels of satisfaction with the quality assurance services performed by Fluid. Several program administrators indicated that conducting as many inspections as possible is a "best practice" for maintaining a successful DHP program, as it encourages both quality installations and strong relationships between contractors and utility staff.

Program Interactions

All contacts reported maintaining at least email interaction with NEEA and/or Fluid staff about their program. Installation status updates or approvals were the most common reasons for communication. Aside from daily administration, respondents reported that interactions with NEEA were less common than interactions with Fluid. Interactions with Fluid have reportedly improved in 2010 from pilot experiences. Utility contacts indicated that interactions with Fluid

are faster than in previous years and more comprehensive. The level of interaction varied by program structure; utilities with pre-approval processes or for whose programs Fluid provides application form processing have the most interactions with Fluid.

Manufacturer and Distributor Interactions

Few (3) utility program administrators indicated that they have interacted with DHP manufacturers or distributors. Aside from a two who had offered trainings featuring presentations by the manufacturers or distributors, most had only contacted the manufacturers or distributors for clarification on technical issues or not at all. One utility had extensive interactions with one manufacturer because the manufacturer provided materials which conflicted with utility practices. Overall, contacts did not communicate with manufacturers or distributors often but reported that they could if they wanted to do so.

Incentives

All but two of the program administrators indicated their satisfaction with the current incentive level. The amount was considered both appropriate and sufficient to motivate people to consider a DHP. The remaining two administrators thought the incentive could be smaller and still motivate potential customers, as long as the incentive remains in place for a sufficient period of time. Several of the utility administrators served by expressed a concern that BPA might reduce the incentive amount, which they thought would reduce installation rates. All of the interviewed utilities plan to continue offering the current incentive or the maximum incentive that BPA authorizes. All of the interviewed program administrators indicated that DHPs constitute a viable market in their territory, but none were confident that the market was ready for the incentives to be eliminated. Program administrators see the incentives as a very important sales motivator.

Installations and Goals

None of the interviewed program administrators had numerical goals for DHP installations. Instead, energy savings targets directed the DHP program efforts. All but two of the program administrators reported meeting their energy savings goals in 2010. The DHP is identified as a useful tool for achieving energy savings goals and several utilities indicated that they are relying on the savings to meet their future energy savings goals. All utility program administrators reported that their programs met all established objectives.

Installation Costs

Program administrators reported an average installation cost of four thousand dollars. Within individual territories the lowest average cost was $3,600 and the highest average cost was $5,800. The lowest cost was achieved via a partnership between a local installer and electrician, which reduced the overall installation costs. The highest cost was attributed to the urban local economy, which has higher costs for all goods and services in that area. Utility program administrators indicated that the installation costs have been fairly consistent.

Marketing

Few of the utility program administrators reported having major marketing campaigns. Instead, most administrators relied on their contractor network to market the DHP initiative and technology. In addition to the contractor network, administrators indicated a preference for marketing through traditional channels such as bill stuffers and print media. The most commonly mentioned form of print media was the *Ruralite* magazine, which reaches over 300,000 homes monthly across Alaska, Washington, Oregon, Idaho, Nevada, California, and Montana. The *Ruralite* has been identified by both utility program administrators and DHP consumers as a popular source of DHP awareness and information since the DHP pilot.

Beyond print, some utilities have begun expanding their marketing into website marketing and radio campaigns. Radio campaigns have provided co-branding opportunities for the utilities and manufacturers to pool funds and purchase radio airtime. Utility program administrators had more favorable impressions regarding the co-branding than the interviewed manufacturers, who reported that the approach was not sufficiently targeted towards their individual brands. Utility contacts reported positive customer response to the co-op advertising.

Utilities identified display units installed in their own lobby or offices as a marketing best practice. Display units were also identified as a powerful sales tool when taken to state fairs and home shows. A display unit overcomes the initial lack of familiarity many potential customers have. Being able to see an operational unit also alleviates sound level and appearance concerns. Some utilities reported receiving funds from NEEA or the manufacturers to aid in the purchase of their display units. Manufacturers may also benefit from providing display units as the utilities reported promoting the brand of their demo display unit to their customers.

Utility program administrators indicated they planned to continue their current marketing strategies in the future. Only one utility indicated they had any plans to extend their marketing; expansion plans included potential television spots and more radio advertising to target younger consumers.

Utility Program Successes

Utility contacts reported various forms and levels of program success, from a few installations to a significant refocus of contractor attention towards DHPs. Universally, utility program administrators reported nearly universal positive feedback from their customers. All utilities had also installed a sufficient amount of DHPs to meet their energy savings goals.

Inspections and Contractor Education

In addition to positive customer feedback, utility contacts reported successes with contractor education and inspections. Those utility administrators with active inspection programs reported that the inspections provided an opportunity to enforce quality installations and educate their contractor networks. Fluid inspections were also credited with improved installations and contractor education. Utility contacts indicated that their inspection processes have resulted in high quality installations and well-educated contractor networks, which are a major asset in

promoting the DHP initiative. The inspection process has also given the utilities an opportunity to strengthen their relationships with their contractor networks.

Challenges

Contractor Education

Although most utilities consider the contractor education efforts successful, in some of the smaller areas, which utility contacts described as more rural, contractor awareness and education are still lacking. Contractors without sufficient understanding of the DHP technology or faith in DHP performance do not drive DHP sales. New installers, or those who do few installations, have lower levels of understanding of the DHP initiative. The DHP is also less profitable to some contractors than the traditional ducted systems, which reduces the interest level from some contractors. Utility contacts indicated that education could overcome these barriers.

Cost

Even with the incentive, four thousand dollars is a considerable financial commitment to many potential customers. This is especially true in some of the areas hit hardest by the current economic recession and in rural areas. In these areas it is more difficult for contractors to make an appealing case to their potential customers, especially because the typical DHP customer is elderly or owns a small home and may have a modest budget for home improvements.

Other Markets

We asked the utility program administrators about other potential markets for DHPs in their territory. Some had already expanded into other markets, beyond the residential single-family homes included in the program.

Commercial

Some utilities have already encouraged DHP installations in small commercial facilities, such as in fast food restaurants, in their territories. One utility reported that every Subway restaurant in their town has a DHP. Program administrators believe small commercial installations constitute a potentially large market for DHPs. In addition to fast food chains, administrators see small retail establishments, labs, server facilities, and space additions in office buildings as promising applications for DHPs.

Multi-Family

Only two utilities had installed DHPs in multi-family housing. The other utilities offered conflicting opinions about the viability of DHPs for multi-family housing. Some utilities view DHPs as a perfect fit for small multi-family housing with shared walls. Other contacts do not believe the units can be correctly situated to serve multi-family housing sufficiently. The two contacts that had already installed DHPs in multi-family housing reported that the installations

are functional and well received. Some of the smaller utilities indicated that they do not have much multi-family housing potential. Program administrators see some opportunity for DHPs in multi-family homes and, at the time of our interviews, were waiting to see if multi-family incentives will continue.

Manufactured Homes

Program administrators do not regard manufactured homes as a promising DHP opportunity. Manufactured homes are built with ducts. To convert them to be conditioned with DHPs, the ducts would have to be closed off. Two utility contacts indicated that manufactured homes are better candidates for Performance Tested Comfort Systems (PTCS) than for DHP conversion.

Future Projections

Utility program administrators plan to continue their programs for as long as funding continues, from BPA or, for investor-owned utilities, from their management. Contacts indicated that they will continue quality assurance inspections and contractor education efforts into the coming year. Program administrators intend to continue building contractor knowledge and training. Additionally, they intend to continue current marketing practices and are considering expanding their marketing into more technologically advanced approaches.

INITIATIVE IMPLEMENTATION STAFF INTERVIEWS

Research Into Action completed three interviews with initiative implementation staff from Fluid (2) and NEEA (1). All contacts reported that their role in the 2010 initiative had remained consistent since the previous year. Contacts reported, however, that the 2010 initiative brought about new developments, successes, and challenges.

Initiative Evolution

During the 2010 initiative, interactions between contractors and the Fluid staff transitioned from primarily application paperwork processing to a more "hands-off" relationship, which consisted of inspections and recruiting additional contractors. In 2010, BPA took a more active role in processing paperwork, freeing more Fluid staff time for inspections and targeted training. Fluid also directed their attention to providing more technical support to the utilities. The program focus also extended beyond the original single-family electric resistance homes into some multi-family and manufactured homes. NEEA maintained the same role from 2009 through 2010, although the specific focus of some parts of its involvement shifted.

Working with Installers

Implementation contacts reported that relationships with installers have progressed since 2009. The initiative now has a more advanced marketing structure and can provide well-tested templates to installers instead of customizing marketing to each individual firm. While training and orientation for installers have remained primarily the same, the initiative developed a new

Master Installer program in 2010, which includes a best practices web training, preferential ranking on the DHP website, and a recognition of well performing installers who have demonstrated advanced knowledge of initiative theory and implementation.

Implementation contacts also indicated that firms are sending more contractors per firm to training then for the pilot. Initiative trainings are increasingly coordinated with manufacturers, especially Mitsubishi. The initiative is also conducting more trainings in regions that previously had lower uptake. The implementers planned for more events in 2011 to capitalize on the momentum generated in 2010.

Working with Retail

Implementation contacts envision DHP sales through big box retailers as a step towards market transformation as the technology branches out into new sales channels. Fluid contacts reported that DHPs are, and will continue to be, sold in retail outlets. Mitsubishi has already started working with Home Deport in some areas. Fluid is attempting to make this practice more common and extend it to other manufacturers. Currently, Home Depot only sells Mitsubishi units and contractors who work through Home Depot are limited to that one brand. Fluid contacts indicated that retail stores have the ability to show unfamiliar customers a display DHP unit. Retail stores also provide the customer with the option of using a store credit card to finance the purchase of the DHP unit and installation. These stores, however, do not have the capability to provide estimates, scope a household, size an appropriate unit, or install the units.

Successes

Implementation contacts described 2010 as a very successful program year. Contacts identified marketing achievements, contractor recruitment and training, and increased regional support among the key initiative successes in 2010. The 2010 initiative also achieved 5,300 new installations. Contacts indicated that over 80 percent of total DHP installs are in single-family zonal homes, the intended target of the initiative.

Marketing

In 2010 the initiative's marketing efforts explored some new avenues, such as television and radio. The initiative was able to capitalize in radio Public Service Announcement rates to get a great deal of radio play at a low cost. Manufacturers had the opportunity to contribute funds to the radio advertising to promote their brand of DHP. The radio ads had an estimated 32,000 plays in some of the largest potential DHP markets. NEEA focused specifically on markets with low DHP uptake or affordable radio advertising slots. The radio outreach was very cost effective and contacts estimated the value of the advertising was over $500,000. The initiative created about 150,000 contractor sales sheets to help contractors market the DHP to their customers.

In previous years, the majority of customers installing DHPs were over age 60. To address this, the initiative employed online marketing to attract a younger market. Contacts judged this successful, as they saw an increase in installations among younger groups. The initiative also tested online banner ads which received about ten million postings and brought an estimated

2,700 visitors to the website. The implementers placed banner ads on weather websites on particularly hot or cold days.

Initiative implementation contacts indicated that 2010 was a key year in advancing their relationship with manufacturers and distributors in terms of marketing. Mitsubishi and Fujitsu committed to adopting some initiative messaging in their marketing materials. The existing marketing materials used by these manufacturers will be adapted to include some displacement and single unit benefits. This will create a marketing tool that can appeal to customers interested in various DHP applications and options. By joining together with the initiative in this marketing effort, manufacturers and distributors are displaying an acceptance of the initiative goals unparalleled in previous years.

Moving forward, contacts indicated that marketing will move into social media, billboards, and television PSA advertising. Along with new modes of advertising, the initiative will continue to work with manufacturers and distributors to create a unified message around DHPs. Contacts indicated that a future goal is to expand the displacement message beyond the Northwest.

Challenges

Implementation contacts reported no new challenges in 2010, yet some of the issues present in the prior years carried forward. Most notable, the challenge of increasing consumer and contractor awareness remains.

For consumers, implementation contacts reported that awareness and first cost are still substantial barriers. The initiative has made substantial progress informing a previously unaware consumer market about the potential of DHPs. Implementation contacts indicated that the initiative goals seek to make the DHP as ubiquitous as the dishwasher or refrigerator in the home. In addition to awareness, the first cost of a DHP is still considered high by many potential customers, with costs averaging around four thousand dollars.

Implementation contacts believe contractor education has made great strides and the Master Installer Program has been especially successful. Despite these successes, contacts indicated that contractor education in rural areas or areas with few installations is still lacking. Implementation contractors indicated that some contractors are still learning how to sell this relatively new technology. The implementation team has made steps towards overcoming this education gap with contractor sales sheets, increased webinar training, and increased coordination of the entire supply chain. Contacts also credited inspections conducted by Fluid with educating contractors and increasing the quality of installations.

Future Plans

Implementation contacts indicated that several accomplishments in 2010 could be expanded in future efforts- specifically relationships with manufacturers and distribution networks. In 2010 these relationships evolved as the manufacturers and initiative implementers developed agreement around advertising messages. In 2011 the initiative will continue to work with manufacturers to create cohesive messaging and a unified front for DHP sales in displacement applications.

The initiative also began working with Energy Star in 2010 to shape the messaging the brand will use around DHPs. Initiative staff helped define the Energy Star marketing and installation guidelines. This relationship allows the initiative to apply the knowledge gained over the past years towards a larger audience through Energy Star. In 2011 the initiative will continue to build on this established relationship.

4 FINDINGS FROM SURVEYS

CONTRACTOR SURVEY

Methodology

We completed surveys with 214 northwest residential HVAC contractors. Working from Dunn and Bradstreet[5], augmented with data from program records, we divided the population into six groups (strata) to capture a representative distribution of urban and rural, large and small, and participating or non-participating contractors. Our survey instrument screened HVAC contractors to exclude those not working in the residential sector, to confirm or revise the strata classification of each, and to establish awareness of DHPs; we completed surveys only with contractors aware of DHPs. Our survey disposition enabled us to estimate the market size of each strata and the proportion of the market strata aware of DHPs.

We weighted the data to represent the population of contractors aware of DHPs; Appendix B provides additional information on the surveyed firms and the weighting. The contractor statistics in this report describe weighted findings; the respondent sample sizes (the "n's" given in tables and figures) describe the actual, unweighted number of survey respondents.

We report any statistically significant differences among the strata; we found no statistically significant differences between the oriented participating contractors and oriented non-participating contractors.

Total HVAC Contractor Market

Table 4 provides our estimates of the proportions of the total northwest residential HVAC contractor market aware of DHPs and the initiative and experience installing incentivized and unincentivized DHPs, by submarket. Note that the column "installed DHPs" includes contractors – only 3% of the total – who have installed DHPs only in commercial applications. For details on the total amount of DHP installations in the region, with an emphasis on unincented installations, see *DHP Installations* later in this chapter.

Please note, a contractor may have installed DHPs and be unaware of the initiative, or may be aware of the initiative yet not have installed any DHPs; however, all contractors who installed incentivized DHPs are also members of the set of contractors that have installed DHPs and the set that is aware of the initiative. Finally, the reader should understand that contractors installing initiative DHPs may also have installed nonincented DHPs, a topic discussed further in the section *Incented and Unincented DHPs by DHP-Installing Contractors.*

[5] Dunn and Bradstreet provides information about over 150 million businesses and corporations worldwide for use in business to business marketing and supply chain manage.

Table 4: Total HVAC Contractor Market Awareness of, and Experience Installing, DHPs

HVAC Contractor Market	Percent of Regional HVAC Contractors			
	Aware of DHPs	Installed DHPs	Aware of Initiative	Installed Incentivized DHPs
Total HVAC Contractor Market	92%	79%	61%	20%
Oriented, Participating Contractors	100%	100%	100%	100%
Oriented, Non-participating Contractors	100%	94%	100%	0%
Large Urban Contractors (non-oriented, non-participating)	90%	78%	49%	0%
Small Urban Contractors (non-oriented, non-participating)	88%	68%	37%	0%
Large Rural Contractors (non-oriented, non-participating)	100%	83%	50%	0%
Small Rural Contractors (non-oriented, non-participating)	86%	57%	43%	0%

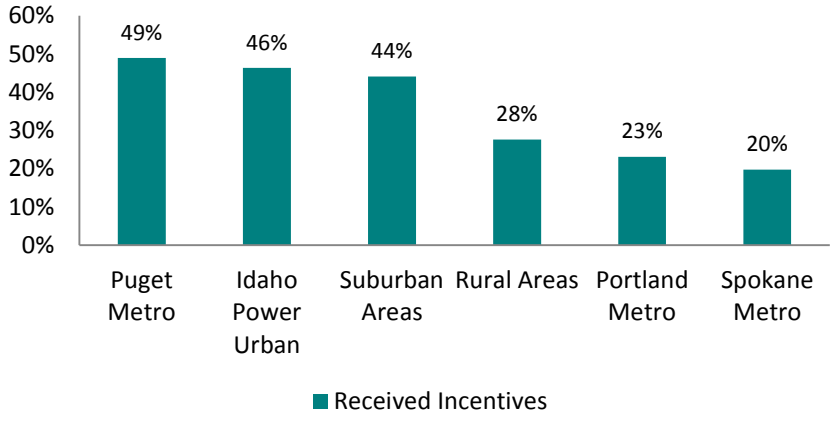
HVAC Contractors Aware of DHPs

The remainder of analysis in this chapter presents findings from the survey of contractors aware of DHPs. The text clearly states whether the frame of reference is all contractors aware of DHPs, all contractors that installed DHPs, all contractors aware of the initiative, or all contractors installing incentivized DHPs through the initiative.

Initiative Participation and Awareness among Contractors Aware of DHPs

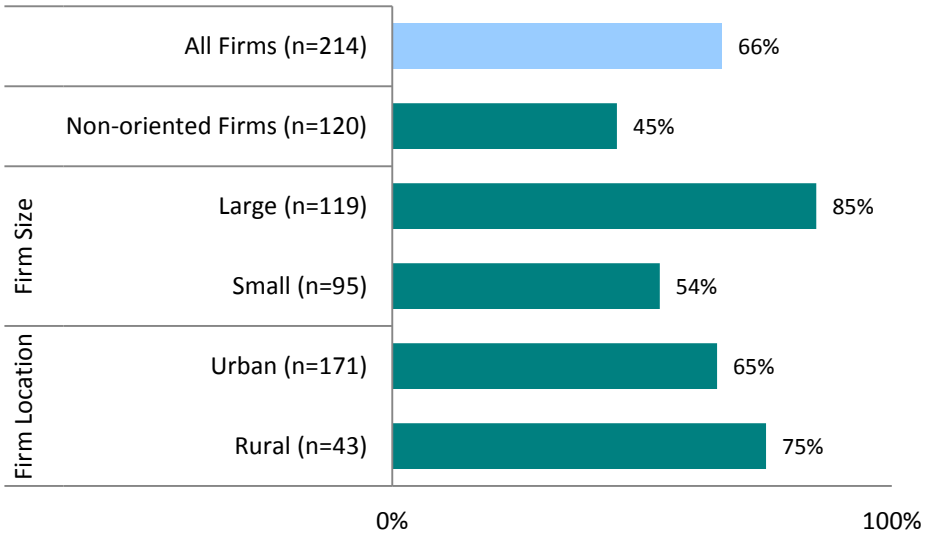
Of DHP-aware contractors, slightly less than a quarter (21%) (20% of the total HVAC contractor market) reported having received an incentive through the initiative. A large proportion (67%) of large rural firms did not know if their company had received an incentive through the initiative. Among those aware of the initiative, only 20 percent of firms in the Spokane grouping (see Appendix B for definition) reported receiving incentives, compared to almost half of the firms in the Puget metro, Idaho area, and rural areas.

Figure 1: Initiative Participation among Initiative-Aware Contractors (n=152)



Overall, two-thirds (66%) of DHP-aware contractors (61% if total HVAC contractor market) reported awareness of the initiative (Figure 2). About half of all non-participating contactors reported initiative awareness. Non-oriented small rural and small urban firms reported the lowest levels of initiative awareness (between 39% and 50% unaware). Smaller firms reported less awareness when compared to large firms. Half of surveyed small firms reported no awareness, compared to 30 percent of large firms. Contractors in the Spokane area reported the lowest levels of awareness (52%). This difference is statistically significant when compared against the Clark/Eugene area, Idaho, and rural areas. Both the Spokane area (64%) and the Seattle area (58%) had more contractors who had not attended an orientation than the overall average (44%).

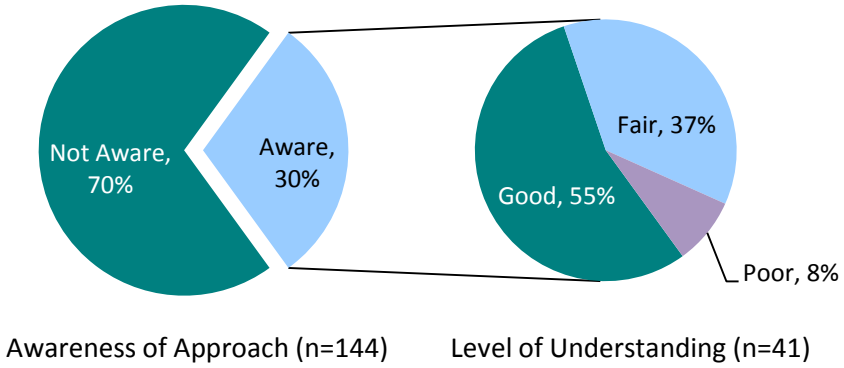
Figure 2: Awareness of NEEA's Initiative among DHP-Aware Contractors



The NW Ductless Heat Pump Initiative is based on a theory of displacement instead of replacement, meaning the DHPs are intended to displace the existing primary electric heating system in the home to reduce energy use. Seventy percent of contractors who reported being aware of the initiative said that they had not heard of the displacement versus replacement approach (Figure 3).[6] Of those who had heard of it, slightly more than half (55%) indicated that they had a "good understanding" of the approach. An additional third (37%) indicated they had a "fair understanding".

[6] Contractors indicating familiarity with the program responded to the question: "Have you heard of the NW Ductless Heat Pump Program's 'displacement not replacement' approach to DHP installations?"

Figure 3: Awareness and Understanding of Initiative's "Displacement versus Replacement" Approach among Initiative-Aware Contractors



Among those initiative-aware contractors, 62 percent of contractors reported visiting the initiative website, including a large majority (89%) of all oriented contractors. Most contractors who had visited the website (70%) rated it in the top two boxes on a five-point satisfaction scale. Significantly more of the participating contractors found it useful than did the oriented but not participating contractors.

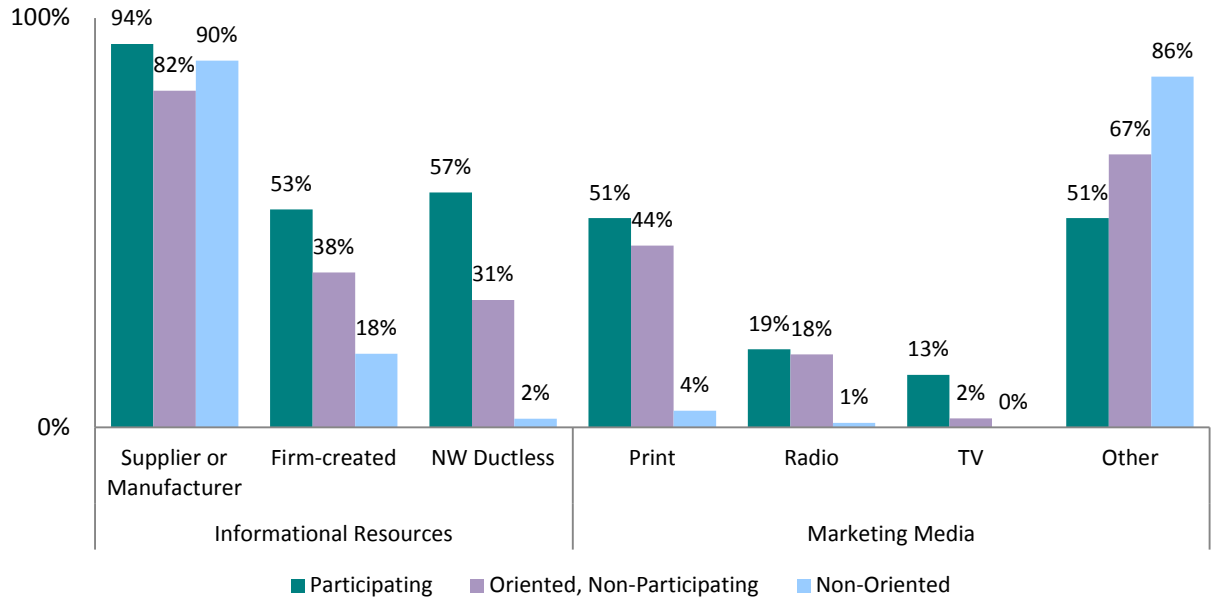
Less than half (45%) of the initiative-aware respondents had contacted an initiative representative. Participating contractors reported the most contact with initiative staff. Large urban contractors were the only group aside from the oriented and/or participating contractors to report any contact with initiative staff. Respondents in Portland, Spokane, and rural areas reported the lowest levels of contact with initiative staff. Surveyed contractors universally rated the initiative staff as responsive with a majority (92%) rated them a "4" or "5" on a five point scale.

Half of contractors familiar with the initiative (51%) expressed a preference for keeping the current incentive amount for whatever duration the utilities can support rather a larger incentive for a shorter time or smaller incentive for a longer period of time. A majority (57%) of non-oriented small rural contractors expressed a preference for a smaller incentive over a longer period of time.

DHP Marketing by Contractors Installing DHPs

Contractors who had installed DHPs reported using a variety of materials to introduce customers to the technology (Figure 4). Nearly all (89%) reported distributing materials from the manufacturer or distributor. Participating and oriented non-participating contractors reported distributing NW Ductless or personally created materials more often than all other groups. A majority of participating contractors reported distributing both initiative materials and materials created by their firm. Oriented non-participating and participating contractors reported the highest rates of print and radio marketing.

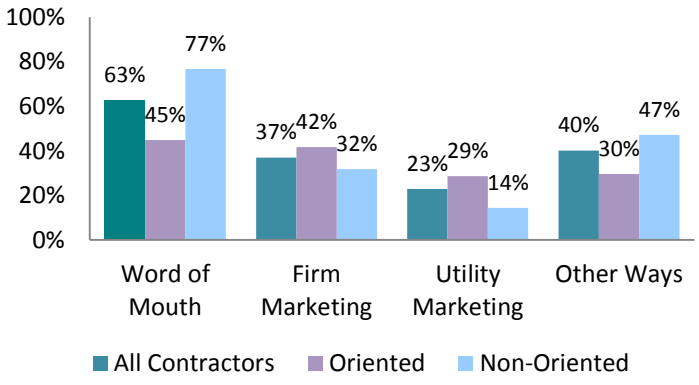
Figure 4: Informational Resources and Marketing Media Used by DHP-Installing Contractors (n=188)



A large majority of non-oriented contractors reported "other marketing" which consisted primarily of online/website advertising (32%), various types of print ad (19%) and word of mouth (11%). Overall, radio marketing was more common in rural areas, while print marketing was most commonly used in the Puget Metro and Idaho Power areas.

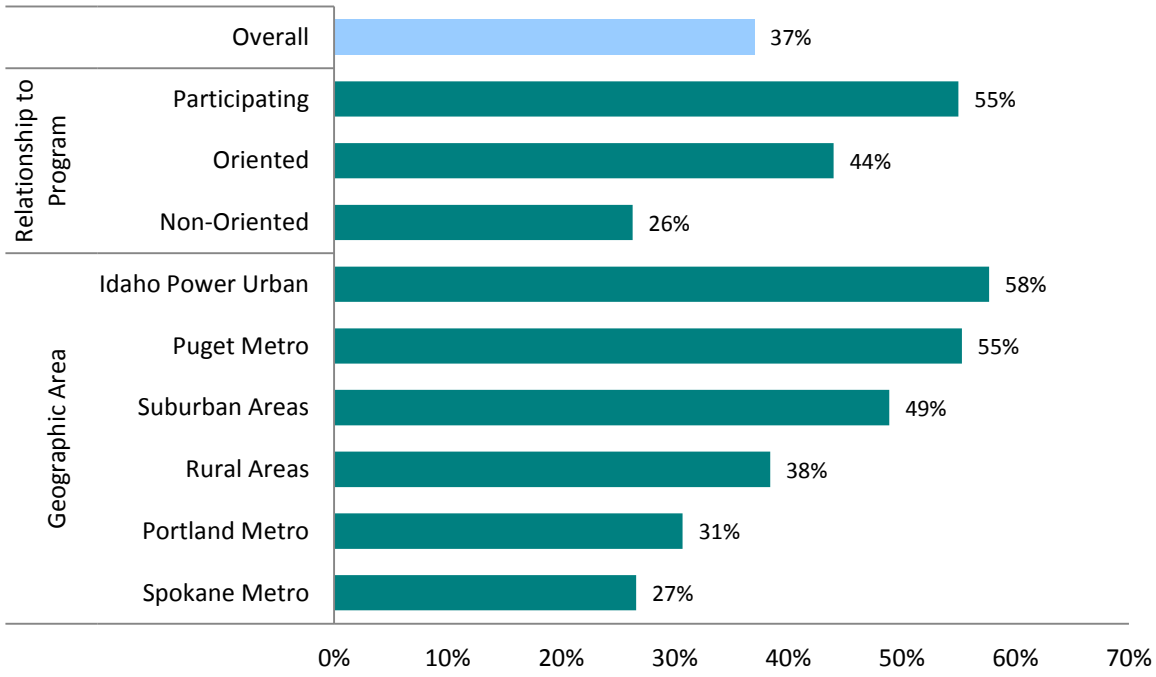
Participating and non-participating oriented contractors reported the highest percentage of sales to customers who contacted them in response to utility marketing. These contractors reported lower than average rates of customers contacting them due to word of mouth (less than 50% compared to 63% on average).

Figure 5: Customer Source of DHP Awareness as Reported by DHP-Installing Contractors (n=188)



Participating and non-participating oriented contractors reported the highest rates of customers asking specifically for DHPs (55% and 44% respectively, compared to 37% overall). The Portland Metro and Spokane areas reported the lowest rates of customers asking specifically for DHPs.

Figure 6: Customers Specifically Requesting DHPs as Reported by DHP-Installing Contractors (n=188)



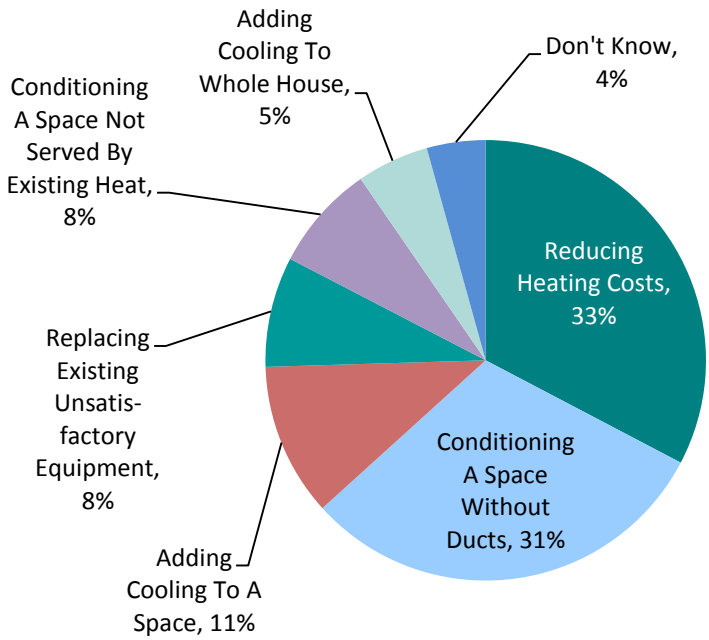
Just under half of all DHP-installing contractors (46%) reported having strategies to encourage customer referrals. Participating and oriented non-participating contractors reported having referral strategies more often than any other groups. These strategies included providing incentives, suggesting their customers refer others, and following up with prior customers. Among non-oriented firms, large urban contractor firms reported using incentives to encourage referrals more often than small rural or urban contractors. About half of initiative-aware contractors indicated that additional resources could help them increase the number of DHPs they sell. None of the large rural contractors indicated a need for additional resources. Additional resources contractors suggested might be useful included additional technical support from distributors, additional marketing materials, and additional support from manufacturers.

Customers' Purchasing Motivations per DHP-Installing Contractors

Contractors who have installed residential DHPs identified what they believe to be the reasons customers consider DHPs. These contractors most frequently identified the motivators of reducing heating costs (33%) and conditioning and space with ducts (31%). Less common

reasons included adding cooling to a space (11%), replacing existing unsatisfactory equipment (8%) and conditioning a space not conditioned by existing equipment (8%).

Figure 7: Customers' DHP Purchasing Motivations as Reported by DHP-Installing Contractors (n=188)



Incented and Unincented DHP Installations by DHP-Installing Contractors

Installations Prior to the Initiative

Prior to the program (both its pilot and initiative phases), DHP-aware contractors had installed an average of 12 DHPs in homes. Participating and oriented non-participating contractors reported installing significantly more DHPs prior to the program than the other non-participating contractors.

Relatively few DHP-aware contractors reported installing short run or concealed duct DHP systems in the past two years, and these systems comprised a small portion (under 6%) of DHP system installations. No rural contractors, small or large, reported installing these types of systems. Contractors in the Spokane area were even less likely to report having performed these types of installations than the contractors in other areas.

Initiative Installations

As of May 2011, the NW Ductless Initiative installed 10,500 DHP systems.[7] The 20% of regional contractors that participated in the initiative installed about 80% of the estimated target market installations, which include unincented installations. Through contractor reports, we estimated the total number of residential-size DHPs installed in the region since the initiative began (through summer 2011) to be around 22,950 (Table 5).

Table 5: DHP Installations as of May 2011 (DHP-Installing Contractors)

Installation Category	Amount
Total Number of Residential-Size DHPs Installed in Region Since Pilot Began (the subsequent categories constitute various subsets of this group)	22,950
Total Installed through NW Ductless Heat Pump Initiative (per program database)	10,500
Total Installed without Incentives (sum of residential and commercial)	12,450
Total Installed in Commercial Applications	4,265
Total Unincented units Installed in Residences	8,185
Total Unincented Installed in Existing Homes	7,544
Total Installed One-to-One Systems in Homes (irrespective of construction status as existing or new)	4,754
Total Units NOT in Existing Homes OR NOT One-to-One Systems	5,169
Total Units IN Existing Homes AND One-to-One Systems	3,016

Unincented Installations

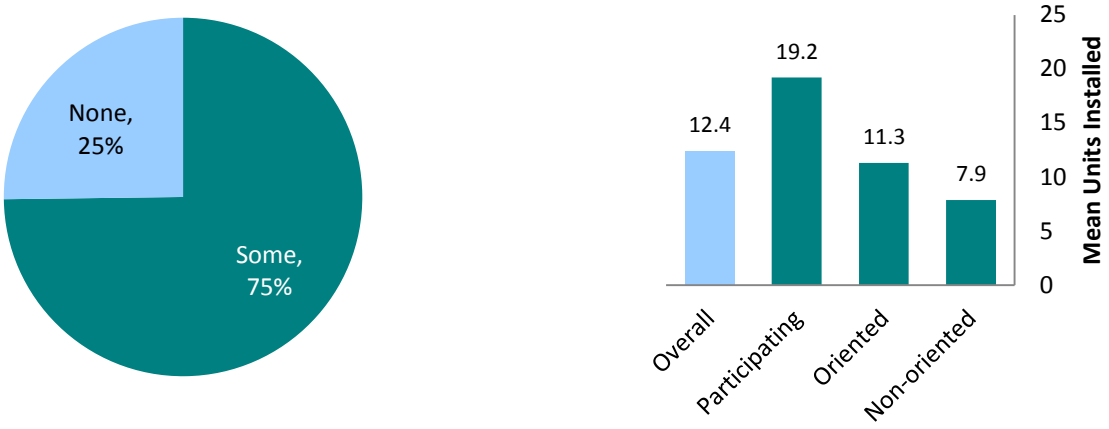
All DHP-installing contractors reported their unincented DHPs comprised mostly (67%) single head systems. Large and small rural contractors reported higher proportions of single head systems than any other group. On average, ten percent of unincented units went into newly constructed homes. Slightly more than a quarter (27%) of unincented installations conditioned space that was previously unconditioned.

Three quarters of initiative-aware contractors reported having installed at least one DHP without a program incentive (Figure 8). While this population average generally held in each of the subgroups we examined, in contrast only 35% of contractors in heating zone three that were aware of the program had installed at least one unincented unit.

Participating contractors reported installing more unincented units than non-participating contractors, with a mean of 19.2 compared to the overall mean of 12.4. Contractors in urban areas reported significantly more unincented installations (13.4) compared to rural contractors (7.6).

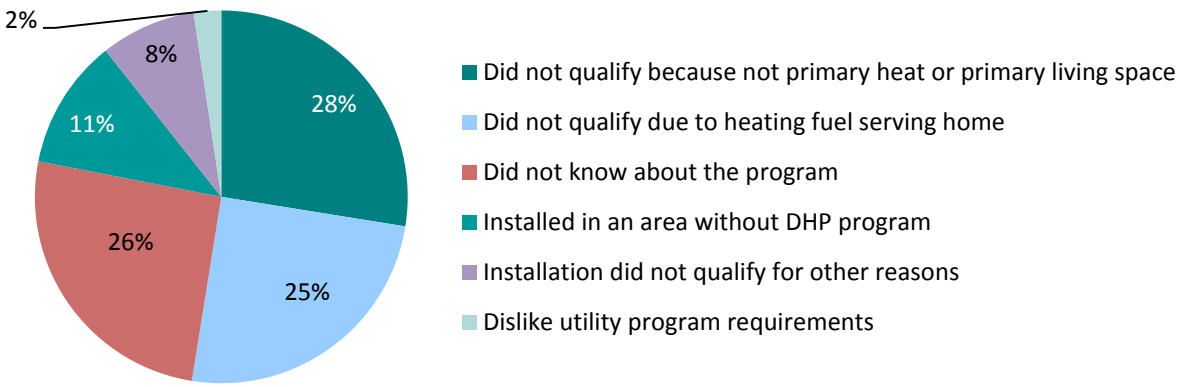
[7] As of September 13, 2011, the initiative database included 12,047 incentivized installations.

Figure 8: Prevalence and Average Number of Unincented Installations among DHP-Installing Contractors (n=152)



DHP-installing contractors provided a variety of explanations for why units are installed without incentives. Participating contractors most frequently (47%) reported that applications did not qualify (not primary living space or primary heat). Contractors in the Idaho area also cited disqualification as the most common reason (79%) for unincented installations. Overall, participating and oriented non-participating contractors reported secondary heating fuel as a reason for unincented installations more than the other non-participating contractors. Non-participating contractors cited not being aware of the initiative as the largest reason for unincented installs (26%) followed by secondary heating disqualification (25%) (Figure 9).

Figure 9: Reasons for Unincented Installations among DHP-Installing Contractors (n=149)

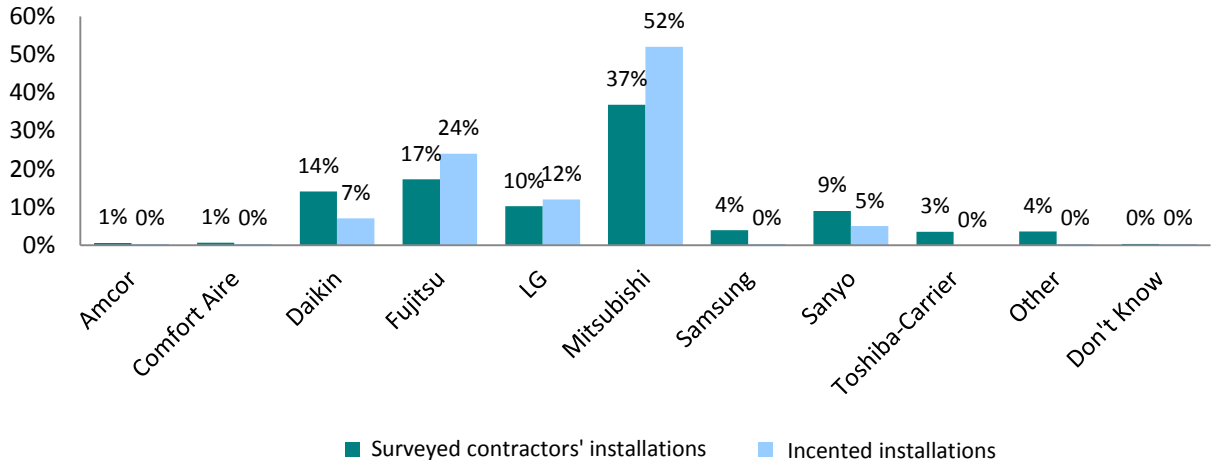


Brands Installed

Forty percent of DHP-installing contractors offered more than one brand to their customers. Installers reported stocking Mitsubishi (37%) and Fujitsu (17%) units most often. These

proportions reflected the incentivized installations for the same January to May 2010 timeframe (Figure 10).

Figure 10: Comparison of Brands Installed by DHP-Installing Contractors with Brands of Incented DHPs)



*Other brands: Amana, Bryant, EMI, Geo Comfort, Goodman, Gree, Gustave Larson, Knight, York, and Turbo Air.

The most popular brands have remained consistent since the beginning of the NW Ductless Initiative in 2008[8]. The brands of unincented installations varied by region.

Perspectives of Non-Installing Contractors

Advantages and Disadvantages of DHPs

We asked contractors who had not sold any DHPs to residential customers about what advantages DHPs offer and if the technology has any disadvantages. Contractors most frequently selected lower installation costs (28%) and lack of ducts (12%) as the strongest strengths from a list. Non-installing contractors also offered some other advantages such as the zonal controls, quiet operation, and suitability to small houses.

The most common identified disadvantages included costs, cold weather performance, availability, and appearance.

Plans

Of contractors who reported no DHP installations, more than half (16 of 26) indicated planning to recommend DHPs to their residential customers in the future. Of those who commented on

[8] NW Ductless Heat Pump Pilot Project Market Progress Report. Research Into Action.

their future sales projections, about two-thirds of contractors anticipated selling more DHPs than in 2010.

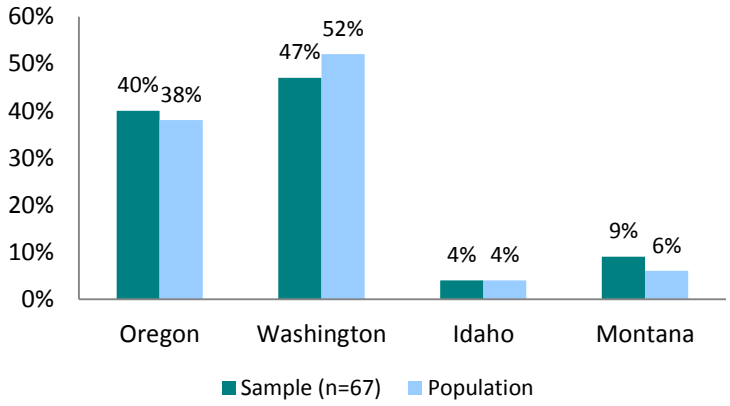
PARTICIPANT SURVEY

The evaluation team completed surveys with 67 participants who had installed DHPs through the initiative. We completed the surveys between May 25 and June 5, 2011. The surveys lasted between 15 and 20 minutes. The team placed up to five calls to each potential respondent and called potential respondents in evenings and on weekends to prevent convenience bias.

The research team selected potential respondents randomly from a list of residential customers who had installed a DHP between January and May of 2010. This selection ensured that participants represented the 2010 initiative year and had experienced both a heating and cooling season. The sample also represented participants in all three cooling and heating zones[9]. We sampled for a 90/10 confidence and precision. We used the Pearson χ^2 test to identify statistically significant differences across the cooling and heating zones. We found only no significant differences among groups.

The sample included participants in all four states (Figure 11) in proportions roughly equal to the population.

Figure 11: Participant Sample and Residential Population

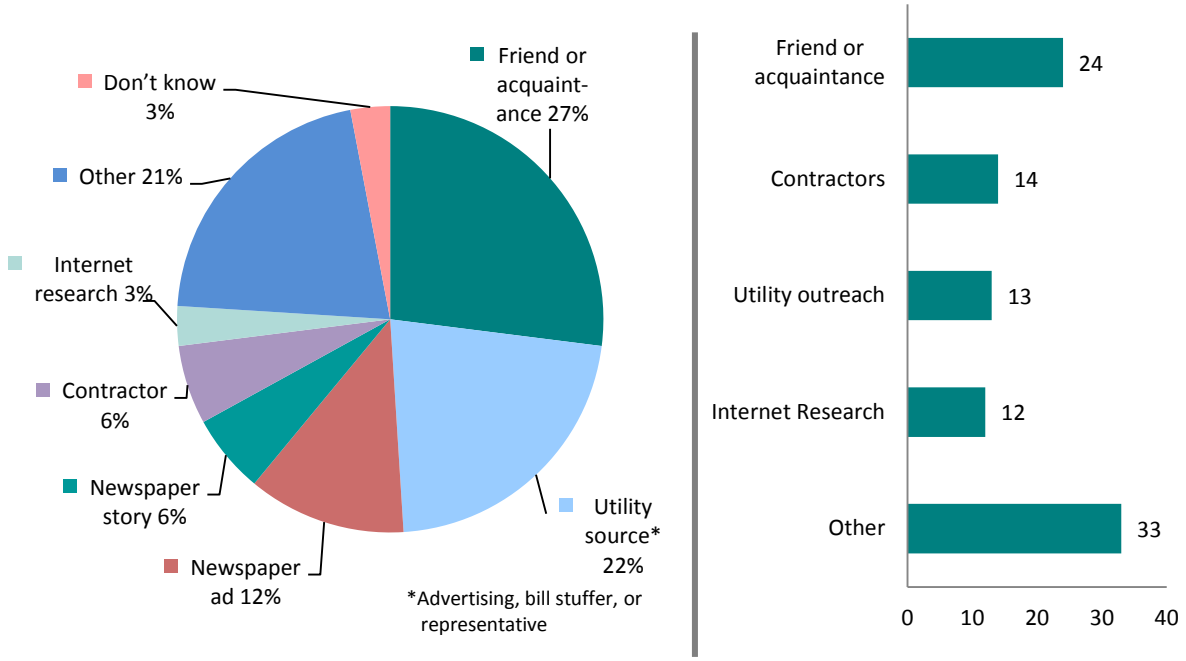


Source of DHP Awareness

Participants reported their initial source of awareness about ductless heat pumps. The majority of respondents indicated that they heard about DHPs from someone they knew or via utility outreach, consistent with contractor perceptions (Figure 12).

[9] See Appendix A for explanation of heating and cooling zones.

Figure 12: Source of Initial DHP Awareness among Participants (Left; n=___) and Most Influential Source of Awareness (Right; n=67)



The "other" responses included other publications (3), travel (2), and seeing a DHP in person at stores (2). Twenty-eight respondents also indicated additional sources of awareness about the DHP. When asked to prioritize the most influential source of information the majority indicated that their friends or acquaintances were the most influential (24), followed by contractors (14), with utility outreach ranked third (13).

Initial Interest

We asked participants what initially interested them in a DHP. Respondents indicated that reducing their heating bills (29) and needing to supplement or replace their existing heating (18) prompted them to investigate DHPs. Respondents were allowed to give multiple answers.

Table 6: Reasons Participants Considered DHPs

Initial Reason For Interest	Frequency
Wanted to reduce heating bill	29 (43%)
Needed additional or supplemental heating	18 (27%)
Needed space conditioning but did not have/want ducts	16 (24%)
Wanted to add cooling where none was installed before	14 (21%)
Needed additional or supplemental cooling	12 (18%)
Rebates or incentives	5 (1%)
Alternative to wood	4 (<1%)

Initial Reason For Interest	Frequency
Existing heat was broken	4 (<1%)
Converting a space or adding new space to home	2 (<1%)
DHP capability to heat AND cool	2 (<1%)
Quiet	2 (<1%)
Don't know	3 (<1%)
Total	**NA**

All of the participants reported looking for information about DHPs to support their purchase decision. The most common sources of information were speaking to contractors (34), the internet (20), and printed materials from contractors (17). Additionally, 16 respondents sought information from another individual who already had a DHP installed. Fourteen respondents reported that their utility was a source of information, either through their websites, speaking to a representative, or publications.

Although several (34) participants reported that their contractor was a source of information before purchase, 86 percent (60) of all participants reported that they sought out a contractor who could install the DHP rather than being approached by a contractor who suggested a DHP.

Participant Satisfaction

In 2010 participants reported high levels of satisfaction with the DHP technology and purchasing process. All except one respondent also reported that they had (61%) or would (37%) recommend the DHP to a friend or colleague. The most popular reasons participants would recommend the DHP were financial benefits (29), increased comfort (12), efficiency (12), and the combination of heating and air conditioning (7).

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5 FINDINGS FROM ACE MODEL REVIEW

As part of the MPER research, we conducted a validation of the DHP ACE model, assisted by the firm of Proctor Engineering Group. Appendix D provides the memorandum deliverable of the research findings.

Here, we summarize the key findings.

Target Market Definition, Size, and Energy Savings: The ACE model defines the DHP Initiative target market as *existing single family (SF) homes with electric zonal heat*, yet the initiative manager defines the target market as *all* existing electrically heated SF homes. This difference between the two target market definitions has implications for the ACE Model, as follows.

The model assumes a high total market share for DHPs at the end of the forecasting period. If the market size of all existing electrically heated SF homes is considerably larger than that of existing zonal electrically heated SF homes, it may not be reasonable to assume that DHPs will attain the same ultimate penetration of the larger market as it might attain of the smaller market. In addition, if the market size of all electric heat homes is considerable greater than that of zonal electric heat homes, then the size of the complementary non-target market (non-incented residential-size units) is smaller than it is with a target market of zonal heat.

The ACE model assumes an energy savings value consistent with findings to date on savings for homes with electric zonal heat. Engineering principles suggest there may be less energy saved at homes with electric heat controlled through a central thermostat, such as forced air furnaces. Thus, it would not be appropriate for the model to apply the zonal heat savings estimate to other applications.

Net Energy Savings: NEEA defines net energy savings as non-incented *residential (3 tons or less)*[10] DHP units, regardless of their application within or outside of the target market. For example, commercial applications of residential units count toward estimates of net energy savings. The ACE model currently accommodates a single parameter for net energy savings, yet the energy savings will differ according to market application.

As suggested in Table 6 and detailed in Appendix E, *Additional Unincented Installations Research,* the initiative net market effects are potentially large if the savings of all unincented installations of residential-size DHP units are included.

[10] Fluid, NEEA's DHP implementation contractor, suggested that residential-sized units are as large as 5 tons, while commercial units are as small as 3 tons. Yet Ecotope, NEEA's DHP impact evaluation contractor, strongly recommends that residential units be defined as 3 tons or less, as larger units use a different technology (VRF) that NEEA has not investigated.

6 CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the findings and presents the conclusions and recommendations we draw from the 2010 evaluation of the Northwest Ductless Heat Pump Initiative.

SUMMARY OF FINDINGS

Our findings relating to the initiative's goals and objectives follow:

***Goal:* Partner with Northwest utilities and energy efficiency organizations to achieve a 15% market share of DHP by 2014 in single family electrically heated homes**

Findings: In 2010, the DHP Initiative continued to expand awareness and uptake of ductless heat pumps. The initiative strengthened partnerships with utilities and energy efficiency organizations to maintain initiative installations and advance marketing to expand into new demographics. Initiative outreach is increasingly targeting younger potential customers and those reached by alternative marketing such as social media.

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

Findings: More than half of the contractors in the region are aware of the initiative, and more than 70 percent of those contractors are aware of the initiative's objective to displace existing electric zonal heating equipment. Manufacturers reported increased cooperation with and appreciation for the initiative and displacement applications. DHP-installing contractors are satisfied with the technology. Cold weather efficiency performance varies by brand, yet even lower-efficiency brands still provide sufficient space conditioning. Manufacturers suggest an additional wind baffle can help increase the cold-weather efficiency of some units.

***Goal:* Increase contractor awareness and adoption of ductless heat pump technology and applications in single family homes with electric resistance heat**

Findings: Over 90% of northwest residential HVAC contractors are aware of ductless heat pumps, nearly 80% have installed them (one quarter of these have installed DHPs through the initiative, installing about half of the regional residential DHPs installations since 2009 and 80% of all target market applications). Surveyed contractors (contractors aware of DHPs) reported actively pursuing the initiative target market of single family homes with electric resistance heat. Contractors plan to continue promotion of DHPs. Utility, manufacturer, and contractor contacts described less understanding of the technology and the goal of electric-heat displacement among contractors in rural areas and contractors who do few installations.

***Goal:* Maintain and enhance a robust trade ally network**

Findings: In 2010 the initiative formed a Master Installer Network. This network created a system of recognition for installers with an advanced knowledge of the initiative structure and

generated additional market leads for these installers. As a result, the trade ally network has become stronger and more effective at providing installations that meet all initiative requirements. Contractors indicate a desire for additional manufacturer support and initiative marketing materials.

***Goal:* Increase affordability and variety of DHPs available throughout the region**

Findings: According to respondents and program data, the price of DHPs has decreased slightly in the 2010 initiative year. Some regions have developed sales partnerships between contractors and electricians which result in lower overall costs. Affordability remains an issue in regions where depressed local economies limit homeowners' investments in their homes, but very few contractors described DHP price as limiting sales. Contractors reported installing at least nine brands of DHPs.

***Goal:* Begin to shift the responsibility of quality installations to the marketplace by providing contractors with near-term feedback on best practices and areas of concern**

Findings: The 2010 Initiative has provided best practices for installations and inspections to utility program administrators, delivered through initiative-created webinars and trainings. Manufacturers' contacts reported including the installation best-practices content in their DHP contractor training; in the words of one contact, "The initiative has influenced installation training." Some manufacturers have increased the technical assistance they provide to support the expanding contractor network. Both contractors and utility contacts reported that installation quality has increased or remained high in 2010.

MARKET PROGRESS INDICATORS

Table 7 assesses and describes the initiative's market progress with respect to stated goals and logic model outcomes.

Table 7: 2010 DHP Initiative Market Progress Indicators

Program Goal or Logic Model Outcome	2010 Status	Findings
Utilities signed up; utilities embrace DHPs; utilities are actively promoting DHPs	Goal met	Five utilities joined initiative post pilot (total is 91). All surveyed utilities promote DHPs as part of their residential portfolio; some aggressively promote DHPs; all describe ongoing commitment to DHP program
Manufacturers and distributors provide cooperative marketing, including unified messaging	Progress	Manufacturers and distributors demonstrated new commitment to initiative marketing strategy and messaging by creating new materials featuring the displacement concept and promoting one-to one (singe head) applications

Program Goal or Logic Model Outcome	2010 Status	Findings
15% market share	Progress	3% market share. Initiative installations (~10,000) plus contractor-estimated installations in single-family electrically heated homes (2,600), divided by NWPCC estimate of population (402,000)
Over 250,000 systems installed	Progress	10% of goal. ~23,000 residential DHP systems installed (all applications) in region from start of pilot to May 2011
DHPs constitute largest share of residential energy efficiency portfolio savings	Progress	DHP installations continue to increase; utilities satisfied with their contribution to portfolio savings; contacts unable to comment on DHP's share of portfolio savings
Market actors report diminished importance of market barriers: Price point; cold-weather performance; aesthetics	Progress	Among noninstalling contractors, 30% reported price as a barrier and just a few respondents reported cold-weather performance or aesthetics as barriers. Among installing contractors, price perceived as a barrier in communities with depressed economies and little home remodeling.
HVAC contractors see DHPs as viable solution for their customers; contractors consider DHPs a viable solution for customers; have experience installing	Progress	About 80% of contractors have installed DHPs. About 30% of non-installing contractors have recommended DHPs to customers. Installations have occurred in single-family homes for primary living space and for secondary space, newly constructed homes, and multifamily and manufactured homes. Installing contractors report DHP buyers ask specifically for DHPs about one-third of time and two-thirds of time the contractor suggests; participants report opposite proportions
25% of AC installations are DHPs	Progress	DHPs comprise about 10% of cooling equipment installations, based on contractor estimates of both DHP and AC (CAC and RAC) sales
DHPs in big box retailers	Progress	DHPs sold by some Home Depot stores; initiative program and implementation staff and manufacturer contacts anticipate more retailers will offer DHPs.
Builders view DHPs as a viable alternatives in new homes; remodel contractors offer DHPs on appropriate projects (e.g., bonus rooms)	Progress	Manufacturers and distributors report new home applications, especially in some "higher end" new homes; installers estimate new-home installations comprise about 10% and secondary and add-on-space applications comprise about 20% of total residential installations
Some contractors specialize in DHPs	Progress	Some contractors reported DHPs are their primary business; some created custom sales approaches to promote DHPs, such as partnerships with electricians

CONCLUSIONS

The Northwest Ductless Heat Pump Initiative is making good progress in the attainment of its goals, objectives, and desired outcomes. Through efforts with the DHP supply chain and advertising interventions, NEEA increasing the market acceptance and adoption of residential ductless heat pumps within the initiative-targeted market, in the broader northwest market for residential-sized units, and outside of the region. Manufacturers serving the national market and organizations such as Energy Star are taking notice of the initiative structure and goals.

The initiative has been very successful in stimulating consumer demand for DHPs and accounts for almost half of estimated regional installations and 80% of installations in its target market. Traditional marketing has been very successful at reaching a certain

demographic of potential DHP customers, but uptake among younger and more diverse potential customers remains slow. NEEA and the regional utilities are advancing and diversifying DHP advertizing, including accessing social media and television and developing testimonials, which capitalize on enthusiasm for word of mouth advertising (reported as the primary source of DHP awareness by over one quarter of participants). Consumer satisfaction with DHPs – their performance, effectiveness, and operating costs – is very high, consistent with findings from the pilot evaluations.

The initiative has made substantial progress towards increasing contractor knowledge around the initiative theory of displacement not replacement; however, certain areas and contractor types still evidence a lack of understanding. More than half of contractors in the region are aware of the initiative and more than 70 percent of those are aware of the initiative's objective to displace existing electric zonal heating equipment. In 2010, the initiative started the Master Installers Network, which rewards those contractors who display advanced understanding of the initiative theory. While many contractors are aware of the initiative, and the Master Installers Network is gaining popularity, interview respondents indicate that contractors in rural areas or those areas with slow DHP sales still do not fully understand the initiative theory or how to translate the initiative goals into sales.

While DHP manufacturers' and distributors' objectives are not fully in line with those of the initiative, the initiative has made substantial progress building cooperative relationships with manufacturers and distributors. Manufacturers and distributors are happy to have new and expanded markets for DHPs, yet they are driven by the profit motive and have no particular interest in displacing electrical load in the target market. Manufacturers and distributors have, however, begun to embrace the initiative displacement theory and have agreed to more cooperative marketing outreach, because the initiative sales have generated an understanding of new market potential. The cooperative marketing activities provide evidence that manufacturers and distributors are displaying an acceptance of the initiative goals unparalleled in prior years.

RECOMMENDATIONS

NEEA should continue to offer the initiative and continue building on its successes.

Residential target market: The initiative staff should expand outreach activities to the market of homeowners under the age of 60, pursuing activities begun in 2010 such as involving social media, television advertising, and publicizing the very positive consumer response to DHPs. The staff should ensure the target market definition and market size estimate it uses in its operations are consistent with that of the DHP ACE model and the Northwest Power and Conservation Council's *Sixth Power Plan.* Alternatively, the program and ACE model might use the number of northwest single family electrically heated homes estimated by the U.S. Census.

Expanded northwest markets: Initiative staff should consider ways to support residential DHP installations in markets beyond the target market, regardless of whether incentives are offered for these applications. The initiative might promote short-run ducting with DHPs for new construction applications to address aesthetic barriers. It might initiate conversations or

collaborations between manufactured housing manufacturers and DHP manufacturers. It might develop case studies or testimonials showcasing residential-size DHPs in small commercial applications.

Utility support: Initiative staff should strategize with Energy Trust of Oregon staff about possible responses to the research findings that the Portland area has among the lowest saturations of HVAC contractors installing incentivized DHPs and among the lowest rates of customers specifically requesting DHPs (per contractor reports). Initiative staff should continue to collaborate with utilities and support them with best practices.

Contractor support: Initiative staff should continue to grow the Master Installer Network and conduct installer training, especially in areas with lower initiative participation: rural areas, Portland, Spokane, and the other locations in the Spokane grouping. Contractors would welcome additional marketing materials and support, and might benefit from sales training that highlights customer-reported benefits of the DHPs and promotes DHPs to displace existing zonal electric heating systems. Initiative staff should continue the current approach of showcasing successful contractors.

Manufacturer support: Initiative staff should work with manufacturers to expand the locations – such as utility offices – where consumers can observe DHPs and experience their space conditioning, noise levels, and appearance. Initiative staff should continue its successful work with manufacturers to increase manufacturers' marketing supportive of the initiative and technical support of contractors.

Retail support: Initiative staff should continue collaborations to increase the number of big box retailers and retail store locations that sell and install DHPs.

APPENDICES

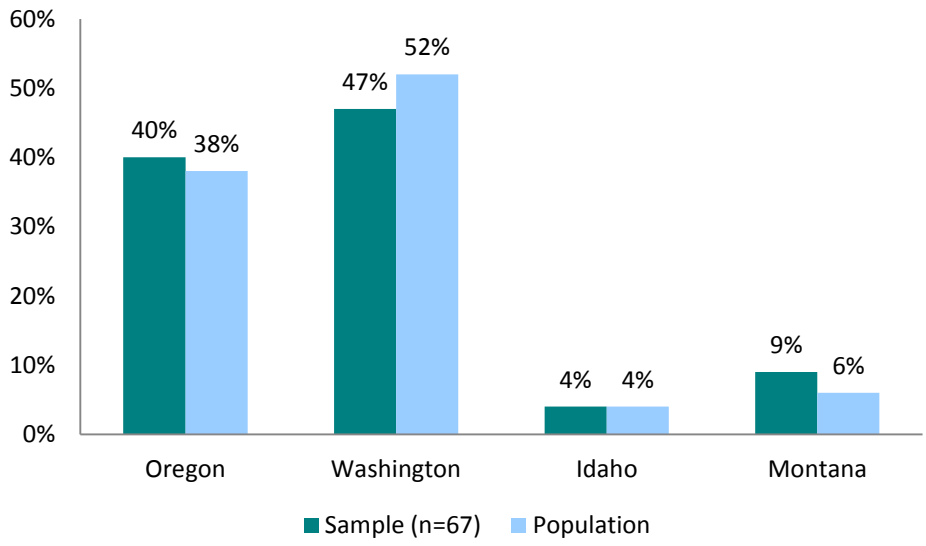
A APPENDIX A: PARTICIPANT FINDINGS

The evaluation team completed surveys with 67 participants who had installed DHPs through the initiative. We completed the surveys between May 25 and June 5, 2011. The surveys lasted between 15 and 20 minutes. The team placed up to five calls to each potential respondent and called potential respondents in evenings and on weekends to prevent convenience bias.

The research team selected potential respondents randomly from a list of residential customers who had installed a DHP between January and May of 2010. This selection ensured that participants represented the 2010 initiative year and had experienced both a heating and cooling season. The sample also represented participants in all three cooling and heating zones. We sampled for a 90/10 confidence and precision. We used the Pearson χ^2 test to identify statistically significant differences across the cooling and heating zones. We found only no significant differences among groups.

The sample included participants in all four states (Figure 13) in proportions roughly equal to the population.

Figure 13: Sampled Contractor State Versus Population



Cooling and Heating Zones

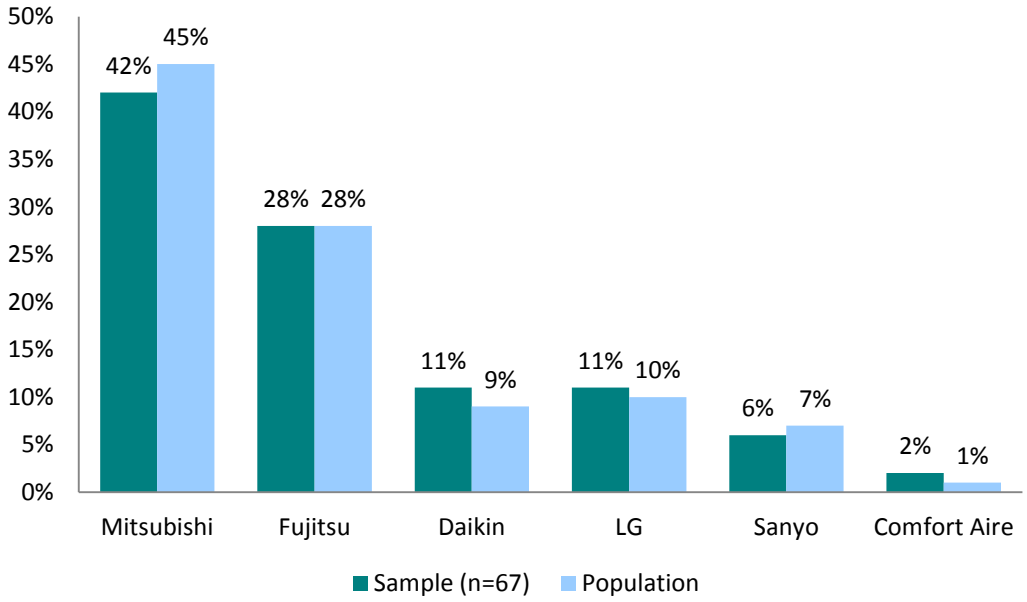
We consider the heating and cooling zones of the Northwest in relevant analysis. These zones are defined as:

- Heating Zone 1: less than 6,000 heating degree days
- Heating Zone 2: 6,001 to 7,499 heating degree days
- Heating Zone 3: Greater than 7,500 heating degree days
- Cooling Zone 1: Less than 300 cooling degree days
- Cooling Zone 2: 300 to 600 cooling degree days
- Cooling Zone 3: Greater than 600 cooling degree days

BRAND

Respondents had installed a DHP from one of six manufacturers. The most popular manufacturers were Mitsubishi and Fujitsu, which reflects the overall install trends.

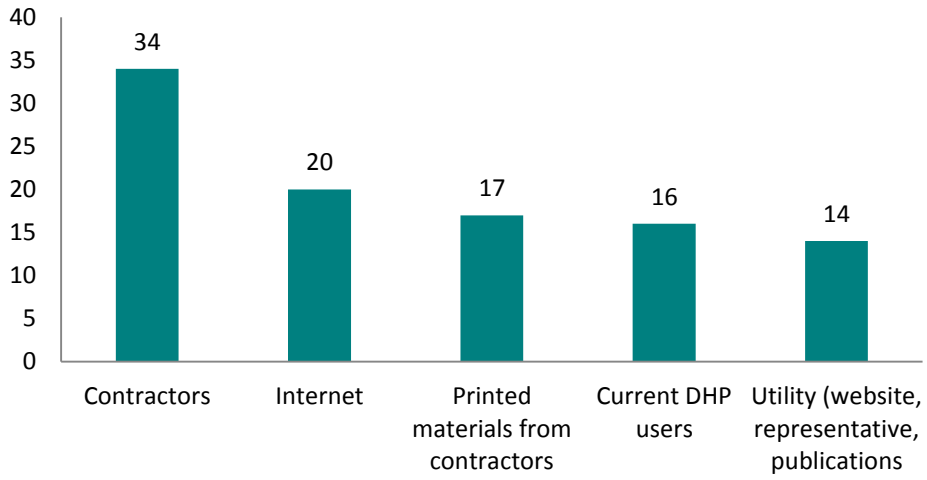
Figure 14: Brands of DHP Installed by DHP-Aware Contractors Compared to Overall Contractor Population



Sources of DHP Information

Participants reported varied sources for information about DHPs. The most commonly reported source was contact with contractors.

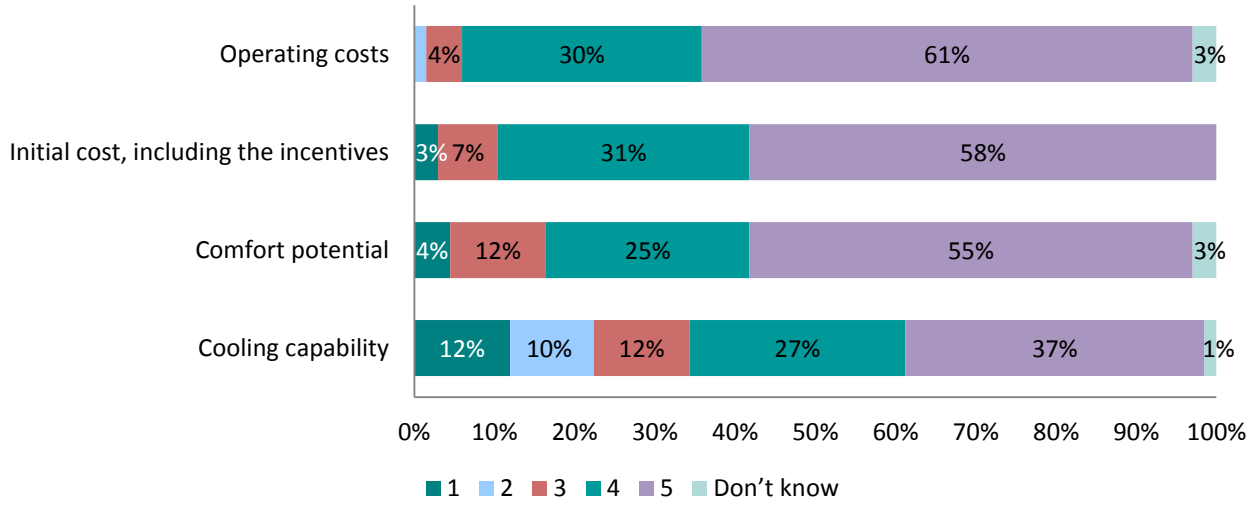
Figure 15: Sources of DHP Information Used by Participants (n=67)



PURCHASING PRIORITIES

The survey team asked respondents how important a few key factors were in their decision to purchase a DHP. Participants rated each factor on a one-to-five scale with one being "not at all important" and five being "very important".

Figure 16: What Initially Interested Participants in DHPs (n=67)



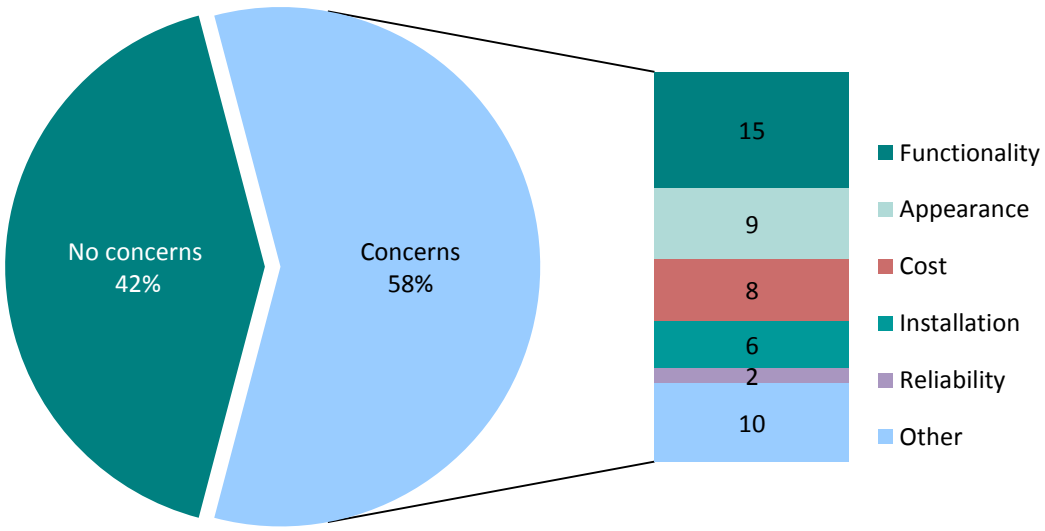
Participants gave the highest importance to potentially cheaper operating costs and the overall cost of the DHP purchase. Respondents offered some spontaneous comments about other

important motivations. The most common among these was the quiet operation (12 mentions), lack of ducts (11 mentions), and ease of install (4 mentions).

PRE-PURCHASE CONCERNS

We asked respondents about any concerns they had before purchasing their DHP. Slightly less than half (42%) of respondents said they had no concerns before purchasing the DHP. Of those who did have concerns, the capability and functionality of the DHP was the most common concern (15) followed by appearance (9) and cost (8). In additional comments six respondents indicated that they were concerned about the installation processes either being damaging to their home or resulting in an unsightly installation. When asked how they overcame any initial concerns respondents indicated that they spoke to their contractor (17 mentions) or did additional research online or by speaking to others who owned DHPs (7).

Figure 17: Concerns Before Purchasing a DHP (n=67)



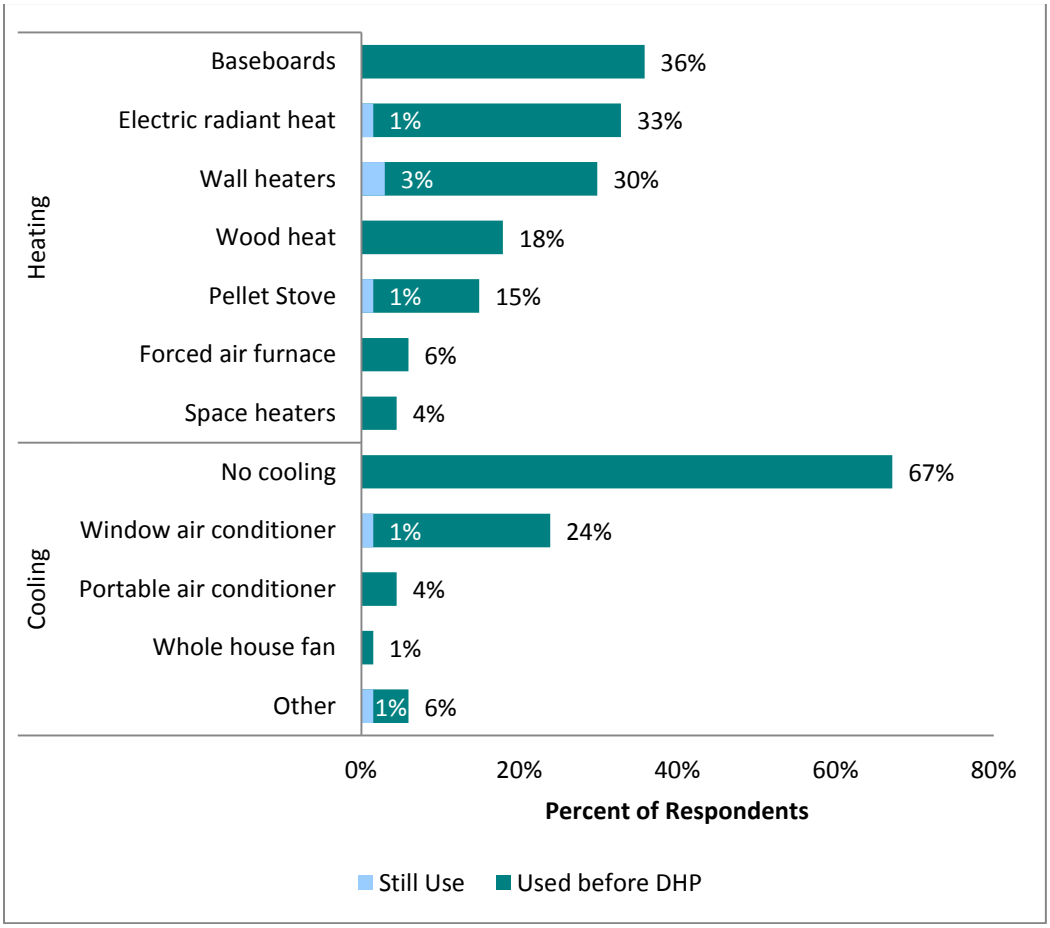
INSTALLATION EXPERIENCE

More than half (57%) of respondents indicated that the contractors did not leave any materials for them beyond the DHP manual. Respondents who did receive additional information (31%) reported receiving items such as brochures, information on cleaning the filters, rebate information, tax credit information, and contractor contact information. The initiative has created a one-page quick reference guide intended to accompany the DHP. No respondents reported having received this guide.

HEATING BEFORE AND AFTER DHP

Participants commonly had space conditioning systems without ducts before they installed their DHP. As noted above, respondents primarily purchased DHPs to reduce the heating bills from their existing equipment or to supplement unsatisfactory existing equipment. Baseboards and electric radiant heat were the most common pre-DHP heating systems among respondents.

Figure 18: Prior and Current Space Conditioning



Participants who used wood before installing the DHP used between a half chord of wood and five chords.

Table 8: Wood Usage

Amount of Wood	Frequency
Less than a chord	2 (17%)
One to two chords	5 (41%)
Three to four chords	3 (25%)

Amount of Wood	Frequency
Five to six chords	2 (17%)
Total	**12 (100%)**

Ten of 12 wood using respondents indicated that they use less wood since installing the DHP, two used the same amount of wood.

COOLING BEFORE AND AFTER DHP

Less than half of the respondents had cooling installed before installing their DHP. Of these, most had window air conditioning units.

Table 9: Respondent Cooling Before DHP

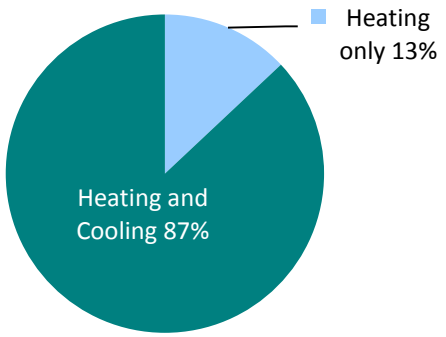
Type of Cooling	Frequency
Window air conditioner	16 (24%)
Portable air conditioner	3 (5%)
Whole house fan	1 (1%)

Only two respondents indicated continuing to use their prior cooling after installing the DHP. Forty-seven respondents did not have any cooling before they installed the DHP. Nearly a quarter (21%) of respondents listed adding new cooling to their homes as a motivation for purchasing the DHP.

DHP USAGE

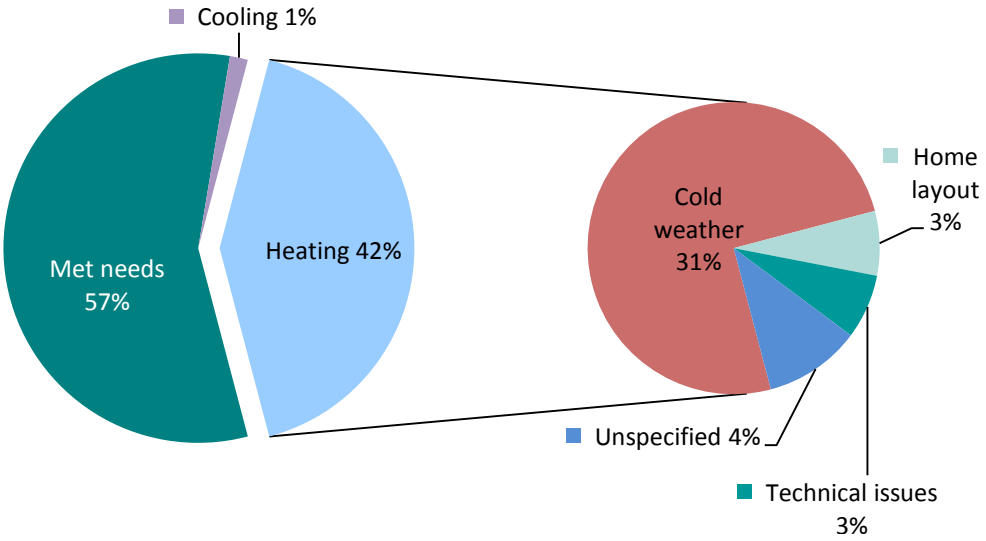
Since installing the DHP, all of respondents had used it for heating and 87% had used it for both heating and cooling.

Figure 19: Respondent Cooling Before DHP



Slightly more than a quarter (28%) of the respondents indicated that the DHP had been unable to meet their heating expectations at least once. Only one percent of respondents indicated that the DHP had ever been unable to meet their cooling expectations. Of the 28 respondents who indicated that the heating did not meet their expectations, 19 reported that the DHP did not function optimally in extremely cold weather. The remaining respondents explained that their house layout prevented the DHP from covering all areas optimally (2) or they had experienced technical difficulties, which they had since resolved (2)[11].

Figure 20: Respondent Cooling Before DHP

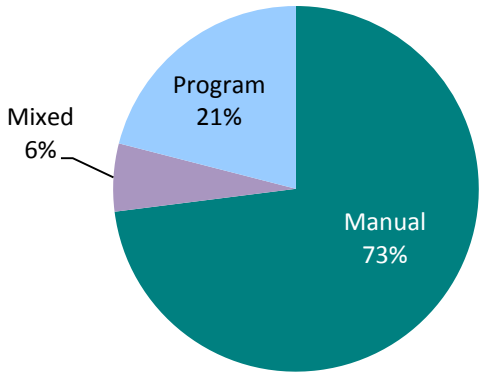


The majority (85%) of respondents reported that they had cleaned their DHP filter since installing the unit.

Nearly three quarters (73%) of the respondents indicated that they control the DHP manually, instead of running it on a program.

[11] The remaining six respondents who were not completely satisfied with the heat did not specify why or gave reasons unrelated to the DHP, such as power outages.

Figure 21: Respondent Cooling Before DHP



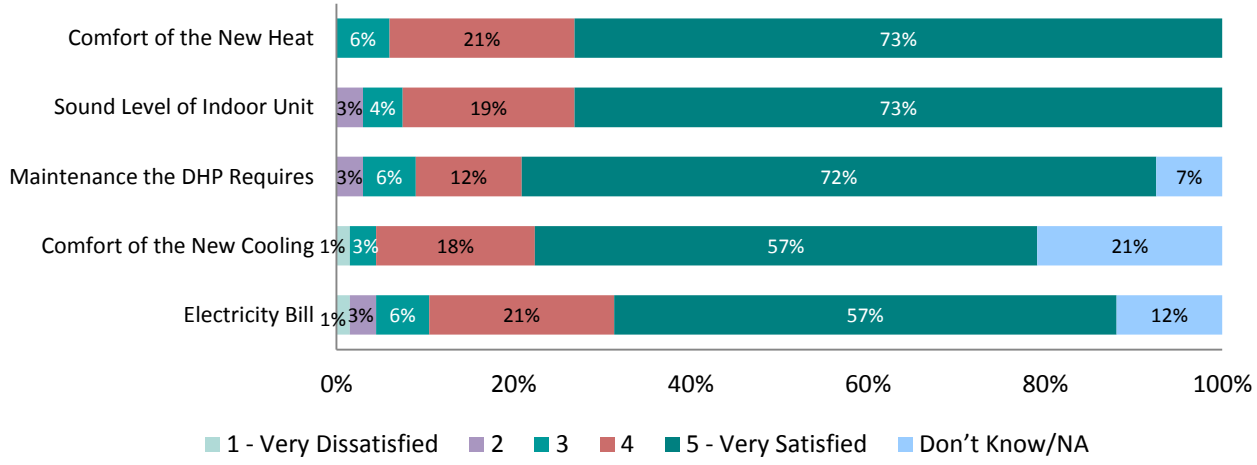
OTHER HEATING EQUIPMENT

Ninety percent of respondents had not purchased any other heating or cooling equipment since installing the DHP. The seven who had purchased equipment purchased another heat pump (1), a fireplace insert (1), a ceiling fan (1), wall heaters and a wood stove (1), and unrelated equipment (3).

PARTICIPANT SATISFACTION WITH DHP

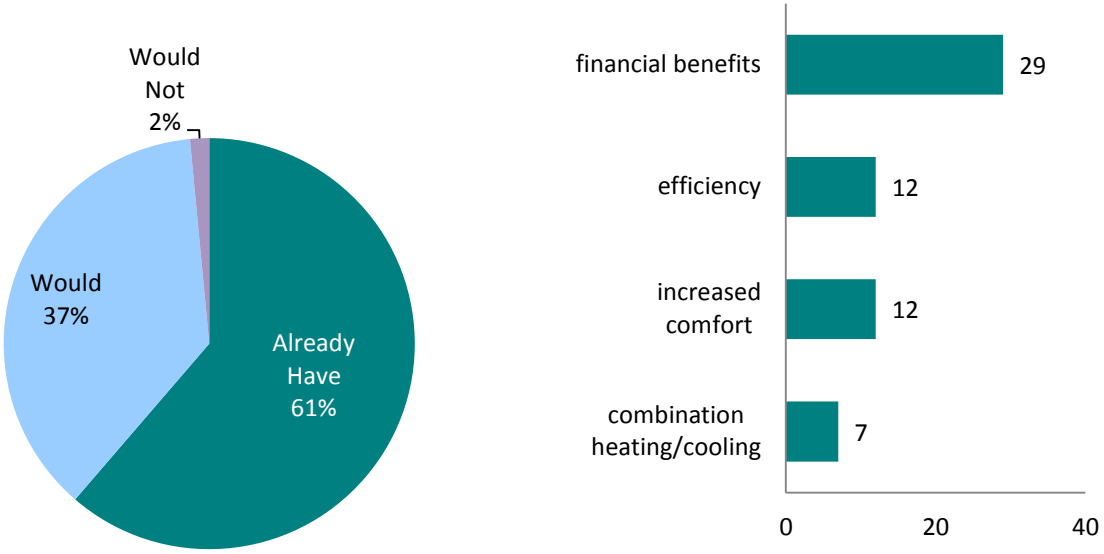
We asked participants to rate their satisfaction with their DHP. Overall, respondents reported high levels of satisfaction with the DHP. Participants reported the highest satisfaction with the comfort of the DHP heat and the sound of the indoor unit.

Figure 22: Participant Consumer Satisfaction



All except one respondent indicated that their overall experience with the DHP has met their expectations. The one respondent whose expectations were not met reported that their DHP was having mechanical issues. All except one respondent also reported that they had (61%) or would (37%) recommend the DHP to a friend or colleague. The most popular reasons participants would recommend the DHP were financial benefits (29), increased comfort (12), efficiency (12), and the combination of heating and air conditioning (7).

Figure 23: Participants Reasons for and Willingness to Recommend DHPs



B APPENDIX B: CONTRACTOR SAMPLE DETAILS

SURVEYED CONTRACTORS' FIRM CHARACTERISTICS

We completed interviews with DHP-aware contractors within each of the six strata designed to ensure fair representation of rural and urban, large and small, and participating or nonparticipating contractors. We placed up to six calls to each contractor, striving for, but not always attaining, sample sizes providing 90/10 confidence/precision for the stratum. Twenty percent of the surveyed contractors represented rural firms, according to the U.S. Census classification[12].

Our analysis also identifies any statistically significant differences among areas with especially high or low initiative uptake, specifically: the Puget Sound metropolitan area, the Portland metro area, Spokane and similar urban areas, the urban areas within Idaho Power's territory, rural areas (per NEEA's designation), and all other areas (which for distinction we term "suburban," yet includes smaller urban areas in the region). While not contiguous geographically, each grouping reflects a similar DHP market in terms of utility program characteristics and rate of DHP uptake.

Surveyed contractors (the sample of contractors aware of DHPs) represented all four Northwest states.

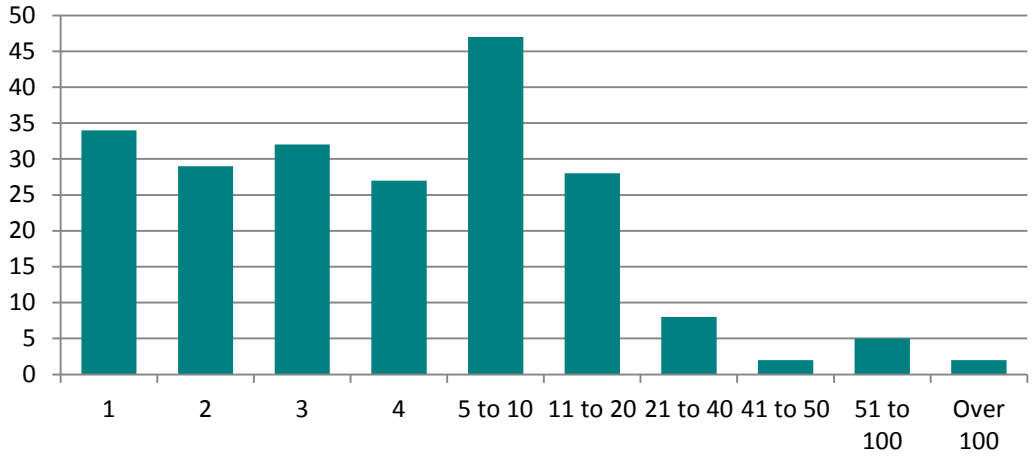
Table 10: Surveyed Contractor Respondent States

Group	Count	Percent
Oregon	56	26%
Washington	51	24%
Idaho	23	11%
Montana	29	14%
Washington and Oregon	35	16%
Oregon and Idaho	10	5%
Washington and Idaho	5	2%
Oregon and Montana	1	<1%
Oregon, Washington, Idaho and Montana	1	<1%
Washington, Idaho, and Montana	1	<1%
Total	**214**	**100%**

[12] The Census Bureau classifies as "urban" all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). It delineates UA and UC boundaries to encompass densely settled territory. It classifies all other areas as "rural" http://www.census.gov/geo/www/ua/ua_2k.html

Firm sizes varied from one installer to 150 (Figure 24). The majority of surveyed firms (79 percent) consisted of one to ten employees. Sixteen percent of surveyed firms had only one employee.

Figure 24: DHP-Aware Surveyed Contractor Firm Sizes



Nearly all (95%) of the firms had been in business longer than two years. Urban areas have more new contractor firms than rural areas. Over half (55%) of contacting firms has sent at least one employee to the DHP initiative orientation. The majority of companies (86%) had sent at least one employee to manufacturer training for the DHP. Additionally, almost half of installers (48%) reported planning to send at least one staff person to manufacturer training in the next year.

All surveyed contractors (firms aware of DHPs) sold residential HVAC equipment. Firms also reported selling commercial HVAC equipment (85%) and performing home remodels (85%). Significantly more rural firms reported selling commercial HVAC equipment. Small rural contractors and contractors in heating zone three were the most likely to engage in home remodels.

CONTRACTOR SURVEY WEIGHTING

We weighted the contractor survey sample to reflect the overall population of contractors in the Northwest. The weights ranged from 4.9 to 16.2. The largest weight was applied to the small, urban contractors group, which had the lowest response rate compared to the population.

We weighted the contractor survey sample to reflect the overall population of contractors in the Northwest (Table 11).

Table 11: Contractor Groups, Counts, and Weights

Group	Count	Percent	Weight	Weighted Count	Weighted Percent
Group 1: Participating Contractors	47	22%	8.8	414	21%

Group	Count	Percent	Weight	Weighted Count	Weighted Percent
Group 2: Oriented Non-participating Contractors	47	22%	7.2	338	17%
Group 3: Small, Rural Non-participating Contractors	18	8%	6.7	121	6%
Group 4: Small, Urban Non-participating Contractors	50	23%	16.2	810	42%
Group 5: Large, Rural Non-participating Contractors	6	3%	4.9	29	2%
Group 6: Large, Urban Non-participating Contractors	46	22%	5.1	235	12%
Total	**214**	**100%**	**--**	**1947**	**100%**

GROUPINGS BY MARKET AREA

Our analysis identifies statistically significant differences among contractors by location of interest to the DHP initiative manager, specifically: the Puget Sound metropolitan area, the Portland metro area, Spokane and similar urban areas, the urban areas within Idaho Power's territory, rural areas (per NEEA's designation), and all other areas (which for distinction we term "suburban," yet includes smaller urban areas in the region). While not contiguous geographically, each grouping reflects a similar DHP market in terms of utility program characteristics and rate of DHP uptake. Included in the "Spokane and similar urban areas" category are installers in Spokane, Yakima, Benton, Columbia, Grant, Lewis, and Whitman counties.

C APPENDIX C: FOCUS GROUP FINDINGS

Research Into Action conducted six focus groups in three locations: Eugene (March 8), Bellevue (March 10), and Idaho Falls (March 15). In each location, we held one focus group with customers who had installed DHPs (participants) and another with DHP installers. The Eugene groups drew ten participants and six contractors. In Bellevue, the groups consisted of six participants and six contractors. The Idaho Falls groups had nine participants and two contractors.

Research Into Action conducted the focus groups to inform the data collection instruments for future quantitative data collection efforts. The participant groups gathered information about how participants became aware of DHPs and what factors motivated them to buy a unit. Contractor groups explored how they find customers and promote the DHP to those customers, and sales of DHPs without incentives. The focus groups exposed many issues which we will investigate in the upcoming during data collection to gather more quantifiable findings in support of sound conclusions and recommendations.

The following is a summary of findings and implications for future research from the participant and contractor focus groups.

PARTICIPANTS

Awareness

Participants had varied sources of awareness about DHPs. In Eugene, participants reported being exposed to DHP promotional media from their utility and local contractors, along with news stories featuring the DHP. Participants also said they learned about DHPs in person at home shows, fairs, and in the homes of friends and acquaintances. Eugene has unparalleled utility support for the DHP. Participants in Eugene may represent a uniquely informed population. Participants in Bellevue also indicated the importance of utility promotion. In Idaho Falls, participants corroborated the value of utility advertising and endorsement.

In all three locations, respondents valued word-of-mouth referrals from friends and acquaintances especially highly. Respondents reported that no one source brought them from a state of unfamiliarity with the DHP directly to the purchase decision. This level of detail was not present in previous research.

These findings will help frame questions for the larger data collection phase. Questions should obtain all of the sources of awareness customers were exposed to and ask for which were the most compelling. For instance, based on the focus group members' comments, participants may *become aware* of the technology through a bill stuffer, but will not be *compelled to buy one* until they have a face-to-face interaction with someone who has a DHP in their home or business, or a convincing contractor. Instead of asking *how* they become aware of the DHP, the questions will

focus on *who* gave them the confidence to make a purchase. In most cases, the contractors are acting as the "face" of the DHP, which makes their ability to educate the consumer and present a compelling argument for installation especially important.

Motivation

The focus group guide asked participants what motivated them to consider a DHP. Participants in all groups identified the same factors as the most important. These factors are: cost, comfort, and the desire to replace a problematic existing heating system. Participants saw the DHP as a cost-effective “answer” to a wide range of problems. Questions in the upcoming interview instruments will be open-ended with a list of pre-codes informed by the focus group findings. This will allow the distillation of a wide range of motivations into easy-to-understand frequencies.

Cost

The cost of the DHP is the one element that participants could be relatively sure of before purchasing the unit itself. While the comfort, noise level, and operating cost of the DHP often required leaps of faith on the part of the participants, bids from contractors established the upfront costs. Due to the tax credits and incentives, the DHP represented an appealing alternative to installing expensive duct work. Participants also indicated that they had considered other options, but the DHP was the only one that appeared to be a sufficiently appealing financial investment. Most participants said the heating system they had before they installed the DHP was ineffective and expensive, which made the DHP's cost-benefit equation even more favorable. We will confer with the NEEA evaluation manager to determine what, if any, further exploration of cost factors we should include in the survey.

Replacement

Focus group participants revealed that replacing or supplementing existing equipment was an important motivator in their purchase decision. We found that participants had a surprisingly sophisticated awareness that the DHP was a supplemental, rather than a primary or sole, source of heating and cooling. In the next wave of research, we will ask additional questions about how much participants continue to use their existing heating system and they had expected do so when they bought the DHP. We also will ask participants they are using the DHP, how they anticipated using it, and they made an unanticipated adaptations due to the DHP.

Cooling

Previous research gave limited attention to cooling. However, participants in the focus groups, especially in Idaho Falls, placed a greater importance on cooling than expected. Contractors in Bellevue reported a growing niche market of using DHPs to provide cooling in bedrooms or other isolated spaces. Contractors also indicated that cooling is a major selling point in all three locations. The upcoming survey will gather more information about cooling, specifically if

cooling was important in the purchase decision or if it became an unexpected benefit. We also will ask if participants have recommended the DHP to other family members and friends, based on the cooling capability.

Concerns

Participants expressed few concerns about the DHP. Concerns included the appearance of the indoor unit, noise, and coverage. Overall, participants had a clear understanding of what the DHP was promised to do and how it would benefit them. Since their expectations were reasonable, they reviewed the DHP favorably. Future research will determine if participants had any concerns before buying the DHP that had not been resolved after they used it. Additionally, we will ask if participants had any issues with the DHP they wish they had known about they bought one. This information will help inform future consumer education efforts and marketing. We also will ask participants how they informed their expectations for the DHP, and if they felt their expectations were reasonable.

CONTRACTORS

Initial Contact

All contractors in the three locations reported that DHP customers were coming to them, so most of them did not actively promote the DHP through advertising and outreach. Some of the larger contractors reported doing advertising outreach, but many did not see this as necessary. Most customers who bought a DHP called the contractors already knowing that the DHP might be solution to their problems. Contractors indicated that by the time a customer contacted them, the customer already had heard something appealing about the DHP. The rate of customers who were unaware of the DHP but who became interested after the contractor explained the benefits has not changed since the pilot started. Additionally, the small market for DHPs in heating converted or added spaces has not been influenced by the program. This niche existed before the program and continues at the same pace as before. Outreach and Marketing

Contractors reported that utility outreach has been the single most vital source of their DHP business. Home shows and smaller marketing efforts also bring in customers, but the utility voice lends credibility to an unfamiliar technology. Contractors are demonstrating increasingly sophisticated techniques to sell the DHP. Some reported overcoming the DHP's appearance obstacle by showing potential customers marketing materials developed by the manufacturer or utility that show DHPs installed in homes; some contractors also show potential customers pictures of units they have installed. All of the contractors knew at least one contractor who uses a mobile demonstration unit. Data collection instruments will ask contractors about the most effective new strategies and tools to sell the DHP. Questions will focus on progress, innovation, and lessons learned. We also will ask contractors how they encourage referrals from their existing customers and what follow-up they do after an installation.

Incentives

Contractors reported that the incentives are driving the market, and without them, the sales would slow significantly. However, they do think the amount of the incentive in some locations could be reduced and instead spread over a longer period of time to sustain demand. In the coming interviews we will ask contractors about their perceptions of the appropriateness of the existing incentives and the ideal incentive structure to achieve the maximum amount of sustained DHP sales.

Unincented Units

Contractors agreed that in all cases where a home qualifies for a DHP, they take full advantage of the incentives and tax credits. They installed unincented units in non-qualifying applications, such as houses with gas service, add-ons, and homeowners who want more than one unit or only want to for cool a particular space. In Idaho Falls, contractors also reported spillover of installations into areas without an incentive program. Contractors explained that this was due to word-of-mouth advertising and customers' conviction that the product would best meet their needs, even without the benefit of incentives. Contractors also said that the unincented units, other than those in non-qualifying territories, were not saving electricity because they were being used to replace existing non-electrical equipment or to condition spaces that previously had not been conditioned. However, one contractor explained that people are “not going to be uncomfortable” and the DHP may be replacing undocumented inefficient conditioning such as a space heaters or window ACs.

In Eugene, contractors reported 5-10 percent of their installations were unincented and 5-15% of their customers were transitioning away from wood heat.

In Bellevue, contractors reported 20 percent of their installations were unincented and almost none of their customers were transitioning away from wood heat.

In Idaho Falls, contractors reported that more than 50 percent of their installations were unincented and they had many customers who use wood as at least a supplemental heat source.

We also asked contractors who could not attend the focus groups how many unincented units they had installed. The consensus gathered from those contractors was around 5-15 percent across all three locations.

Contrary to information in the program database, contractors reported that many brands of DHP are being installed. The brands that do not qualify for the program incentives are lesser known and usually not of optimal quality and efficiency. These undocumented installations represent a challenge to the installers because they lead to customer dissatisfaction and negative word-of-mouth. In the next research phase, we will inquire about this overflow of DHP sales into non-incented areas, such as neighboring utility territories.

Market Expansion

We will ask contractors how they are expanding their markets for DHP and any new applications they have discovered for the DHP. We will ask them to quantify the percent of the units they have installed that are used in the common applications identified in the focus groups: supplemental heating/cooling of a primary living space, primary heating/cooling of a specific space, and converting a space into conditioned space.

Advice to Other Contractors

Since most of the contractors in the focus groups are successful installers, we asked them what advice they could offer to contractors in areas with less established DHP resources. Contractors suggested that any contractor looking to install DHPs take the time to thoroughly understand the units themselves by studying the manuals and manufacturer materials, and by attending manufacturer training. Additionally, contractors suggested that the best way to learn about installing DHPs is to watch someone who knows how and get hands-on experience. Contractors also suggested choosing equipment only from the major manufacturers (Mitsubishi and Fujitsu specifically) to avoid issues with equipment quality and support.

D APPENDIX D: DHP ACE MODEL VALIDATION MEMO

DUCTLESS HEAT PUMP (DHP) PROGRAM

This memo presents the results of efforts undertaken in early 2011 by Research Into Action, Inc. and Proctor Engineering Group to validate assumptions used in the Alliance Cost Effectiveness (ACE) model for the Ductless Heat Pump (DHP) Program.

While we have not had direct feedback from NEEA on this memorandum, we continue to have interactions with the NEEA evaluation and DHP program staff that have bearing on this work. At the time this review was undertaken – February 2011 – we understood the target market to be *existing single family (SF) homes with electric zonal heat*. Subsequent to the first draft, we have learned that the target market is *all* existing electrically heated SF homes. This was not the understanding we had formed from our work on the DHP Pilot Project evaluation, nor is this definition consistent with the first ACE model assumption. Fortunately, our findings given in the table below address the size of the existing electrically heated SH home market.

Also subsequent to this February review, we learned that NEEA defines net energy savings as non-incented *residential (3 tons or less)* DHP units, regardless of their application within or outside of the target market. For example, commercial applications of residential units count toward estimates of net energy savings.

We submit this revised memo to bring to NEEA's attention several implications for the ACE model and for the program's cost-effectiveness of a program target market of all electrically heated homes rather than those with zonal heat. We do not discuss these implications in our table of findings, as we conducted our review prior to learning this additional information.

1) The model assumes an energy savings value (assumption #4) that is consistent with findings to date on savings for homes with electric zonal heat. Engineering principles suggest there may be less energy saved at homes with electric heat controlled through a central thermostat, such as forced air furnaces. Thus, it would not be appropriate for the model to apply the zonal heat savings estimate to other applications.

2) The model assumes a high total market share for DHPs at the end of the forecasting period (assumption #7). If the market size of all existing electrically heated SF homes is considerably larger than that of existing zonal electrically heated SF homes, it may not be reasonable to assume that DHPs will attain the same ultimate penetration of the larger market as it might attain of the smaller market. In addition, if the market size of all electric heat homes is considerable greater than that of zonal electric heat homes, then the size of the complementary non-target market (non-incented residential-size units) is smaller than it is with a target market of zonal heat.

Table 12: Ductless Heat Pump (DHP) Program - 2010

	Input Assumption	Finding	Recommendation	Sources
1	Total market: Defined as "existing single family w electric baseboard heat" (a.k.a. zonal heat) Size = 401,718 units	401,718 units is an NWPCC calculation. Census data gives the NW population of single-family dwellings with electric heat as 1,533,656. We did not find a data source for proportion of electrically heated homes using baseboard heat	Current program description and definition of net impacts as non-incented units (including non-qualifying units) suggests total electric heat population is the relevant market. If program to address only baseboard heat, then NEEA might research proportion of electric heat population with baseboard heat and measure non-incented units within this segment	US Census Bureau, American Community Survey 2005-2009 Summary Tables, generated using American Fact Finder: *http://factfinder.census.gov*; (February 25, 2011)
2	Tracked Units (incented installations): Cumulative (Q4 2008- approx. Q3 2010): 8,804 2010 Annual: 5,000	NEEA updates quarterly with number of incented installations from the DHP program tracking system	No action needed	Interview with NEEA planning analyst
3	Tracked Units (non-incented installations): TBD	MPER research underway in 2011 will generate an estimate	Revise when estimate available. Value will need to be re-estimated every few years	NA

	Input Assumption	Finding	Recommendation	Sources
4	Savings Rate (incented): 3,500 kWh	Consistent with NEEA's DHP Pilot Project research (monitoring and bench testing) conducted by Ecotope, with BPA's monitoring study conducted by Ecotope, and with an independent derivation of expected savings based on key parameters included in the Ecotope work. The latter research estimates 3,838 kWh for regions with 4,000-5,499 heating degree days (HDD); 4,540 kWh for 5,500-7,000 HDD; and 4,796 kWh for >7,000 HDD	No action needed	Ecotope, Inc. 2010. *Ductless Heat Pumps – Evaluation & Keys to Successful Installations.* The Energy & Environmental Building Alliance, Excellence in building Conference & Expo, October 14, 2010 Ecotope, Inc. 2010. *Residential Ductless Mini-Split Heat Pump Retrofit Monitoring: 2008-2010 Analysis.* Bonneville Power Administration, September 27, 2010. Proctor Engineering Group, 2010, unpublished. This research used: *2005 Residential Energy Consumption Survey: Energy Consumption and Expenditures Tables, Table SH8. Average Consumption for Space Heating by Main Space Heating Fuel Used, 2005*
5	Savings Rate (non-incented): TBD	MPER research underway in 2011 will provide qualitative information on the types of homes in which non-incented DHPs are installed	Once data on types of homes with non-incented DHPs are available, develop research plan to estimate savings or assumptions to support the derivation of a multiplier to be applied to the incented savings rate as a proxy for the non-incented savings rate	NA
6	Naturally Occurring Baseline (pre-intervention, 2007): 1% of total installations	Accurate representation of best available market research	No action needed	Source cited in ACE documentation

	Input Assumption	Finding	Recommendation	Sources
7	Market Share Forecast (with program intervention) 2010: 2%; 2014: 15%; 2020: 62%	Insufficient data currently available to validate	No action needed. However, if total market (assumption #1) definition changes to be all single family with electric heat, these assumptions should be revised	NA
8	Naturally Occurring Baseline Market Share Forecast: 2014: 6%	Insufficient data currently available to validate	No action needed	NA
9	Total Benefits ($/installation): $6,567	This is the sum of assumptions #10, #11, and #12. Given our recommendation to revise assumption #11, the corresponding total benefits would be: $6,468	Revise assumption to $6,468	Calculation from revised assumptions #10, #11, and #12
10	Energy Benefits: $5,426	Consistent with an independent derivation of energy benefits from 3,500 kWh annual savings. Research found $5,583 lifetime energy savings based on 2008 retail prices per kWh, weighted by state	No action needed	Proctor Engineering Group, 2010, unpublished. This research used: *Electric Power Monthly Table 5.6.B. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, State*
11	Line Loss: $931	Independent research estimates value of avoided losses at $454. Approach: applied utility-reported kWh losses as a percent of retail sales to expected DHP savings. Model uses average kW reduction during heating and a $23/kW loss value assigned by NWPCC	Revise assumption to $454	Proctor Engineering Group, 2010, unpublished. This research used: *EIA State Electricity Profiles Table 10. Supply and Disposition of Electricity, 1990 Through 2008*
12	Act Credit: $636	This value is 10% of the sum of assumptions #10 and # 11. Given our recommendation to revise assumption #11, the corresponding Act credit would be: $588	Revise assumption to $588	Calculation from revised assumption #11

	Input Assumption	Finding	Recommendation	Sources
13	Non-Electric Benefits: $426	Accurate representation of best available market research	No action needed	Source cited in ACE documentation
14	Net Total Resource Cost (2006 $s): $3,953	We verified calculations embodied in the ACE model Excel sheet. Accurate representation of best available data. Calculations make us of observed average cost of the 1-to-1 DHP units in the program tracking system, updated quarterly	No action needed	Interview with NEEA planning analyst
15	First Cost (2006 $s): $3,967/installation	We verified calculations embodied in the ACE model Excel sheet. Accurate representation of best available data. Calculations make us of observed average cost of the 1-to-1 DHP units in the program tracking system, updated quarterly	No action needed. However, we recommend the input assumption name be changed, as “first cost” is standard term to describe the cost to the consumer, and term is used here to describe total cost (end user’s plus programmatic costs) in first period of the program	Interview with NEEA planning analyst
16	Declining Cost Assumption: Declines by $100 in yr. 2; by $200 in yr. 3; by 3% or more in yr. 4	NEEA updates annually, comparing with annual average costs of the 1-to-1 units in the DHP program tracking system. This is the best possible dataset and approach. Forecast is reasonable based on historic evidence	No action needed	Interview with NEEA planning analyst
17	NEEA Costs (2010): $1.5 million	This value is the sum of assumptions #18, #19, and #20. Given our recommendation to revise those assumptions, the corresponding NEEA costs are $1,671,734	Revise assumption to $1,672,000	Calculation from revised assumptions #18, #19, and #20
18	Contracts & Implementation: 2010: $1,000,000	$1,141,763 reported by program manager for 2010	Revise assumption to $1,142,000	NEEA DHP program manager

	Input Assumption	Finding	Recommendation	Sources
19	Evaluation: 2010: $395,000	Budget: $394,450 Billed: $377,995	Revise assumption to $378,000	Ecotope (evaluation contractor for 2010)
20	NEEA Overhead Costs: 2010: $139,500	This value is 10% of the sum of assumptions #18 and # 19. Given our recommendation to revise those assumptions, the corresponding overhead costs are $152,000	Revise assumption to $152,000	Calculation from revised assumptions #18 and #19
21	Government Costs: 2010: $82 per installation	Reviewed method; judged appropriate; we did not independently derive this assumption	No action needed	Interview with NEEA planning analyst
22	Incentives: $1,505	NEEA updates quarterly with average incentives for the 1-to-1 installations in the DHP program tracking system. This is the best possible dataset and approach	No action needed	Interview with NEEA planning analyst
23	Utility Local Program Administrative Costs: $3.0 million	Model assumes utility admin costs are 20% of incentives. Utilities paid $14.9 million in incentives (implication: admin costs are 17% of their total program costs). NEEA vetted this assumption with its Cost Effectiveness Advisory Committee in a 2010 webinar. Research on national program administrative budgets found administrative costs are 48% of total portfolio costs. Adding assumptions #23 and #17 (NEEA's costs) gives region's administrative costs at 24% of total program costs. We judge assumption #23 to be reasonable, yet NEEA might investigate this assumption through survey research	Consider surveying utilities to obtain an estimate of their administrative costs as a proportion of their incentive costs	Goldman, C. et al. 2010. *Energy Efficiency Services Sector: Workforce Size and Expectations for Growth*. Ernest Orlando Lawrence Berkeley National Laboratory

	Input Assumption	Finding	Recommendation	Sources
24	Non Energy Benefit: $1,131	Conservative value – one-half of the value estimated by market research conducted by ECONorthwest for NEEA, which is the best available information	No action needed	Source cited in ACE documentation
25	Cost Effectiveness (Societal perspective): Benefit/Cost=2.1 Levelized Cost= 3.4 cents	Accurate representation of NWPCC methodology and NEEA assumptions	No action needed	Interview with NEEA planning analyst

APPENDIX E: ADDITIONAL UNINCENTED INSTALLATIONS RESEARCH

This memo reports on findings from research into unincented DHPs that NEEA requested Research Into Action undertake. Research into Action completed the following activities:

- Review and summary of the existing ACE Model assumptions regarding unincented DHPs
- Collection of additional data to better describe unincented DHP installations
- Generation of multipliers for the NEEA DHP ACE Model

SUMMARY OF EXISTING ACE MODEL AND ASSUMPTIONS

The existing ACE Model has a placeholder for a count of unincented units, but does not provide an estimated number for such installations. In the absence of an estimated number of unincented units, the model outputs are limited to those associated with DHPs that are tracked by the program. We have learned through interviews with program stakeholders, NEEA staff, regional utilities, and DHP contractors that DHPs are being installed in the region without incentives, and are therefore not tracked in the program database. We discussed the DHP ACE Model with NEEA staff and agreed that the model does not accurately summarize the unincented DHP landscape.

Research Into Action initially conducted a survey of Northwest HVAC contractors to estimate the number of DHPs installed (both with and without incentives) since the NW Ductless Initiative began (2009 – 2010). The survey team completed 214 surveys, using a stratified sample providing 90/10 confidence/precision and estimated to constitute 10% of total (incented and unincented) regional DHP installations. Contractors reported a total of 12,450 DHPs installed without incentives (both residential and commercial). Of those, 4,265 are commercial applications and 8,185 are residential. After collaboration with NEEA staff, Research Into Action re-surveyed 99 of the contractors who previously reported installing DHPs *without* incentives, using a stratified sample providing 90/10 confidence/precision relative to the sample of 214 and estimated to constitute 5% of *unincented* regional DHP installations.

Table 13: Unincented DHP Sample Groups and Dispositions

Group	Description	Goal Sample	Actual Completes
1	Participating contractors	28	26
2	Oriented contractors	28	28
3	Small rural contractors	14	2
4	Small urban contractors	29	18
5	Large rural contractors	6	2
6	Large urban contractors	27	23

Table 14: Unincented DHP Sample and Total Installs by State

State	Percent of Sample	Percent of Total Installs
WA	53%	54%
OR	33%	37%
MT	10%	4%
ID	4%	5%

High Level Findings

- Two-thirds (66%) of unincented installations are residential applications. Of these, between two-thirds (67%) and 88% are in existing single-family homes.
- Nearly three quarters (74%) of unincented single-family (existing) residential DHPs are installed in primary living spaces.
- About half (48%) of those installations replace electric, zonal heat.
- For one-quarter (24%) of units installed in residences, contractors were unable to describe the application (e.g., existing home, new construction, multifamily, or manufactured). By assuming that the units of unknown application are distributed across the housing types in the same proportions as the units of known application, we derived the estimate of 88% as the upper bound of units installed in existing single-family homes (as summarized in the first bullet). We believe this assumption that the applications of known units is a good proxy for the applications of unknown units, and thus we recommend NEEA use the estimate of 88% of residential units installed in existing single-family homes.

Data Details

Table 15 presents the percentages and numbers of the unincented installations as reported by the surveyed contractors and the recalculated totals with the "unknown/don't know" answer reallocated. We weighted the counts to represent the overall population of unincented DHP installations.

Table 15: Unincented DHP Installations

	Without Reallocated "Unknowns"		With Reallocated "Unknowns"	
Application	Percent	Count	Percent	Count
Total Unincented Installations		**12,450**[13]		**12,450**

[13] Total count of unincented units taken from original research collected by Research Into Action in May of 2011. This number includes all unincented installations since the beginning of the NW Ductless Pilot.

Application	Without Reallocated "Unknowns"		With Reallocated "Unknowns"	
	Percent	Count	Percent	Count
Commercial Installations	**34%**	**4,265**	**34%**	**4,265**
Residential Installations	**66%**	**8,185**	**66%**	**8,185**
Single-family homes (existing)	67%	5,468	88%	7,168
In a supplementary or add-on space	*26%*	*1,405*	*26%*	*1,842*
In a primary living space	*74%*	*4,063*	*74%*	*5,326*
Replaced baseboards/zonal heating	*48%*	*1,944*	*49%*	*2,603*
Replaced gas heat	*11%*	*463*	*12%*	*620*
Replaced wood heat	*8%*	*344*	*9%*	*461*
Replaced oil heat	*2%*	*82*	*2%*	*110*
Replaced other heat	*28%*	*1,144*	*29%*	*1,532*
Don't know	*2%*	*86*	-	-
New Construction (single-family homes)	**7%**	**586**	**9%**	**768**
Multifamily Homes	**1%**	**100**	**2%**	**132**
Replaced electric heat	*39%*	*40*	*46%*	*60*
Replaced another form of heat	*26%*	*26*	*30%*	*40*
Installed in new construction	*21%*	*21*	*24%*	*32*
Don't know	*14%*	*14*	-	-
Manufactured Homes	**1%**	**89**	**1%**	**117**
Replaced electric heat	*65%*	*58*	*65%*	*76*
Replaced another form of heat	*35%*	*31*	*35%*	*41*
Installed in new construction	*0%*	*0*	*0%*	*0*
Don't know	*0%*	-	-	-
Unknown or Other	**24%**	**1,941**	**-**	**-**

Summary

- 2,603 unincented DHPs installed in the program's target market; NEEA can either apply to these units the per-unit savings estimate currently assumed in the ACE model for incented units or can await the conclusion of Ecotope's current impact research to provide a per-unit savings estimate.

For the remaining units categorized here, regional DHP experts contacted by Research Into Action as part of this study indicated that per-unit savings estimates are unavailable.

- 768 unincented DHPs installed in residential new construction; 50% (384 units) substitutes a potential new electric heat application (based on distribution of electric and nonelectric heat sources for existing SFD)
- 1,842 unincented DHPs in supplementary or add-on space; electricity savings less than SFD estimate (technical research is needed to determine electricity savings).
- 60 unincented DHPs installed in existing multi-family dwellings displacing electric heat and 20 units in newly constructed multi-family dwellings, substituting a potential new electric heat application (based on distribution of electric and nonelectric heat sources for existing multi-family dwellings); electricity savings less than single family dwelling estimate (technical research is needed to determine electricity savings).
- 76 unincented DHPs installed in manufactured homes displacing electric heat; electricity savings less than single-family dwelling estimate (technical research is needed to determine electricity savings).
- 4,265 unincented DHPs installed in commercial applications *potentially* displacing electric heat; electricity savings unknown (technical research is needed to determine electricity savings).
- 3,200 unincented DHPs displacing or substituting nonelectric heat sources; greenhouse gas emission savings only, no electricity savings.
- These items sum to 12,450 total unincented DHPs

Discussion

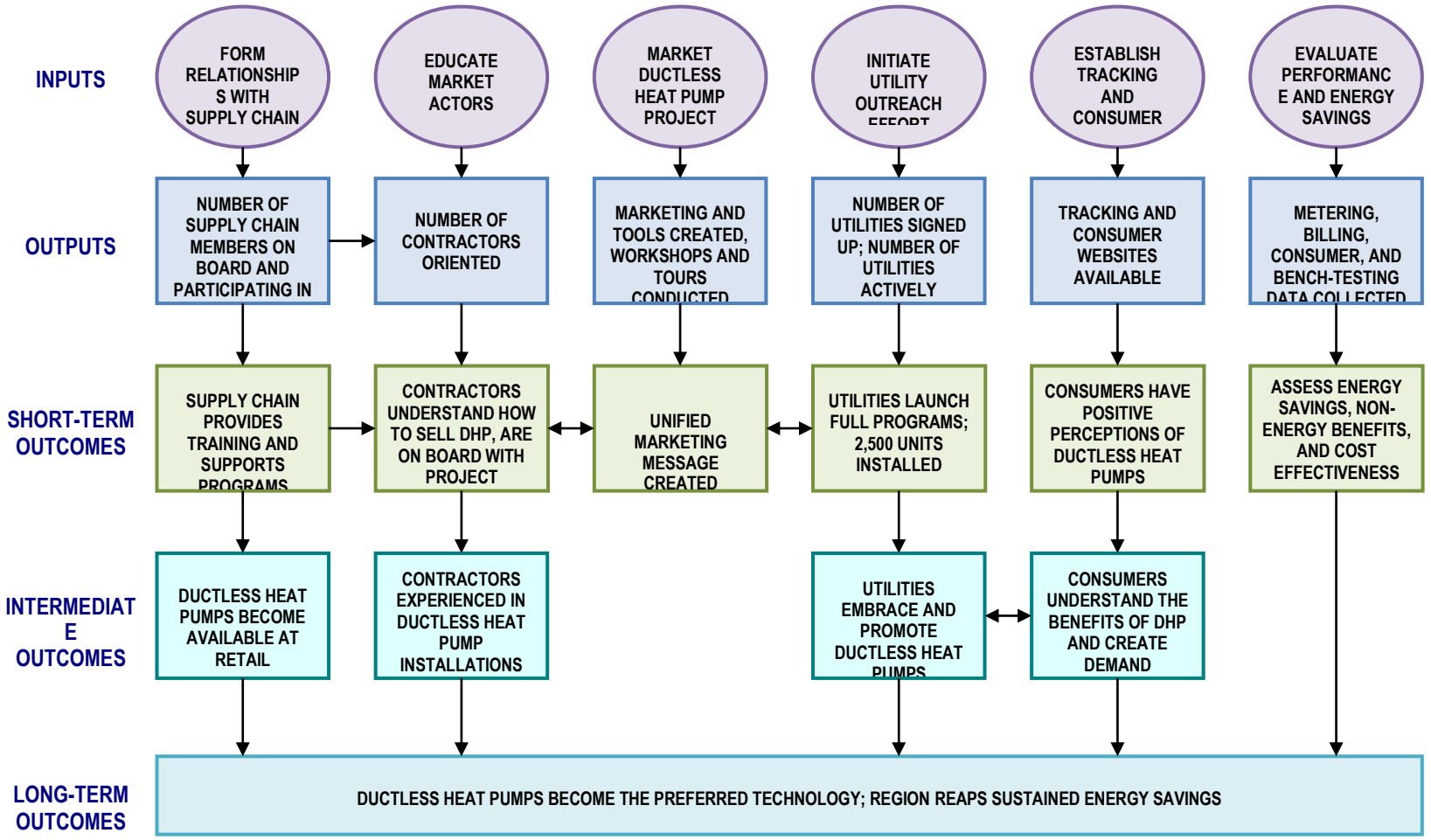
Currently, there are no complete data sources available on the total amount of installed DHPs in the Northwest. This analysis triangulated multiple data sources to create the most accurate picture possible of the total DHP installations in the Northwest.

The initial data collection resulted in a summary of the existing DHP installations in the Northwest, both incented and unincented (survey n = 214). The research team weighted the data to reflect the known population of Northwest HVAC contractors and DHP installations. Our sample consisted of six strata representing six types of contractors. Four of these strata were weighted based on geography (urban/rural) and firm size (small/large) characteristics. Other two groups were weighted based on participation in the program, indicated by participation in a program orientation and completed applications. To further refine the data, we referenced the known program installation data about the surveyed firms. We looked at the actual amount of incentivized installations attributed to each contractor who completed the survey. The research team determined that contacts over reported their own program incented installations by 200 to 250 percent. Based on this determination, we reduced the self-reported incented *and* unincented installation counts by the average over-reporting ratio to bring them in line with actual data.

Research Into Action has access to a various sets amount of sales data from manufacturers. These data provide an incomplete representation of the DHP installation landscape because the nature of the data reported and the level of aggregation varies by manufacturer, model, distributor, region, and type of DHP. The sales data and raw self-reports indicate that the total number of DHPs installed in the region might be as much as two and half times as the figures

listed above. Research Into Action has provided in the above table the numbers with the most substantiated data behind them, and acknowledges that these are conservative estimates.

APPENDIX F: LOGIC MODEL



G APPENDIX G: INTERVIEW GUIDES

DHP MANUFACTURER / DISTRIBUTOR SURVEY, 2010 EVALUATION

Interviewee Name:

Date:

Interviewer:

Hi my name is _____ calling from Research Into Action on behalf of the NW Ductless Heat Pump Project. May I please speak to _____?

Hi my name is _____ calling from Research Into Action on behalf of The Northwest Energy Efficiency Alliance (NEEA). The Northwest Energy Efficiency Alliance (NEEA) is conducting an evaluation of the NW Ductless Heat Pump Project. We are speaking to manufacturers/distributors to learn about the DHP market.

This will take about ____ minutes. Is this a good time?

I will be referring to the ductless heat pump as a DHP to save time.

Role

1. Please describe your role at [company].

DHP Marketing

2. How do you currently market residential DHPs [PROBE: internet, TV, radio, newspaper, magazines?]

3. In the past year, have you altered your marketing? [IF YES] In what ways? [PROBE FOR TYPES AND AMOUNT]

   - ☐ Yes, please specify how:
   - ☐ No
   - ☐ Don't know

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

   - ☐ Yes, please specify how:
   - ☐ No
   - ☐ Don't know

5. Have there been any instances in which the messaging or marketing efforts of the NW Ductless Program and/or the utilities has conflicted with the marketing or messaging efforts of your company?{Probe: If yes, what have you done to resolve the issue}

6. How has the project influenced on your marketing efforts? What types of support (not just monitory have you received? [We're trying to understand if the Program has got them thinking of tailoring their marketing to more zonal heat homes and or other types of homes say with forced air etc]

7. For the Pacific Northwest, does your company's DHP marketing message focus on promoting multi-headed DHP units for whole house solutions (that is, one or more outdoor units with multiple indoor heads) or one-to-one or one-to-two configurations to displace zonal electric heat)? Why?

DHP Sales

8. How many DHP models do you currently have in stock? That qualify for 2010 NW Ductless Heat Pump Program incentives?

9. How many models do you have that don't qualify? What is different about these models?

10. What are the characteristics of your most popular DHP models [PROBE: one-to-one? Qualifies for (reduced) federal tax credit?]

11. Has the market share of any of the DHP brands changed in 2010? How so? [PROBE TO GET NUMERICAL ESTIMATES]

    a. What impact has the Program had on sales of residential DHPs? Since its inception, has the Program impacted the number of DHP units that you…

        i. [MANUFACTURERS ONLY] Manufacturer/distribute? [PROBE TO GET NUMERICAL ESTIMATES]

        ii. [MANUFACTURER REPS ONLY] Distribute? [PROBE TO GET NUMERICAL ESTIMATES]

        iii. [DISTRIBUTORS ONLY] The variety of DHP brands/models you carry?

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

    b. [ALL] What challenges, if any, have you experienced in meeting demand?

12. Has the impact of the Program on residential DHP sales increased, decreased, or stayed the same, in the past year?

    a) [IF INCREASED OR DECREASED] Why is that?

Installers

13. [IF MANUFACTURER] Have you made any changes to your post-pilot DHP installation training activities for contractors? [INTERVIEWER LISTEN FOR: *who conducts training and how, also probe for numbers of trainings]*

14. [IF MANUFACTURER] What any changes, if any, have you made to your post-pilot sales training, technical support, and/or service support?

Big Box

15. [MANUFACTURERS AND MANUFACTURER REPS ONLY]: What is [COMPANY NAME] thinking about working with retailers to sell DHPs?

    a) [IF CONSIDERING RETAIL] What are the potential advantages/disadvantages of working with retailers to sell DHPs? [PROBE: Do you think that potential for misapplication and improper installation of DHPs could be addressed by implementing a sales model similar to that which is currently applied to retail sales of water heaters, in which retail water heater sales include the cost of installation through a network of professional installers? Why/Why not?]

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

    c) Not considering working with retail

Manufactured Homes

16. Do you sell DHPs that are used in manufactured homes?

    - ☐ Yes, how common is this?
    - ☐ No
    - ☐ Don't know

17. Do you sell DHPs that are used in new homes?

- ☐ Yes, How common is this?:
- ☐ No
- ☐ Don't know

18. Are there any barriers preventing DHPs from being used in manufactured or new homes?

- ☐ Yes, please specify:
- ☐ No
- ☐ Don't know

Interactions

19. What involvement have you had with the NW Ductless Heat Pump Program in the past year? [If none, skip to Q23]

20. How has the Program influenced your view the DHP market in the NW? How about the overall US market?

21. Have you had any post-pilot challenges during 2010? [PROBES: With the rebate mechanism? With NEEA/Fluid management? With the activities of installers? With DHP equipment? Anything else?]

Pricing

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

- ☐ Yes, please specify:
- ☐ No
- ☐ Don't know

23. Have the tax credits influenced your business? [Probe: is this any different now that 2 ton units are included? Have the tax credits had any impact on which models are being sold?]

- ☐ Yes, please specify how:
- ☐ No
- ☐ Don't know

Technology

24. Are there any new developments with DHPs in cold climate applications?

Future Projections

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

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

26. Do DHPs constitute a viable market for you? How do they compare with other products that you manufacture (for distributors only: carry?)

27. [IF NOT ANSWERED ALREADY] In the Pacific Northwest, going forward, 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" or "one to two" configurations (to displace zonal electric heat)?

28. [DISTRIBUTORS ONLY] Do you currently stock heat pump water heaters? What is your opinion of the market- viability for heat pump water heaters?

Moving Forward

I would like to ask a little about the current state and future of the DHP market.

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

30. Are there any specific applications for DHPs that seem to be becoming more popular? [Ex: cooling, converting spaces]

General

31. What have you learned from the Program?

32. Do you have any other thoughts or comments about DHPs in general, the market, or the project?

UTILITY INTERVIEW GUIDE

Interviewee Name:

Date:

Interviewer:

Hi my name is _____. I'm calling on behalf of NEEA. I would like to talk to you about your 2010 DHP program.

NW Ductless Heat Pump Project Impressions

1. How has your role as manager of your utility's DHP program changed in the past year? [Probe for detail]

2. Have any changes been made to your utility's DHP program in the past year? What? Why (rationale)? By way of summary, let me briefly run through a list of possible changes; just let me know which ones occurred:

   Changes to incentive amount?

   Changes to customer application process?

   Pre-approval process changes?

   Changes to customer eligibility requirements?

   Changes to customer application?

   Changes to or new marketing initiatives?]

3. What do you see as being the major successes or achievements to date in promoting DHPs to the region?

   a. What factors do you think contributed to these successes?

Interaction

4. Have you had any interactions in the past year with NEEA and/or Fluid staff related to your utility's DHP program? [CLARIFY IF INTERACTION WAS WITH FLUID OR NEEA STAFF].

   ☐ Yes
   ☐ No

a. [IF YES] How if applicable have your interactions with Project staff changed during the course of 2010?

5. Have you had any interactions in the past year with DHP installers?

- ☐ Yes
- ☐ No

a. [IF YES] How have your interactions with DHP installers changed since the Pilot ended ? [Probe for detail]

6. Do you have any concerns about the quality of DHP installations in your territory ?

- ☐ Yes
- ☐ No

7. Do you think the typical installation quality has improved, stayed the same, or declined over the past year?

- ☐ Improved
- ☐ Stayed the same
- ☐ Declined

8. Have you had any interactions in the past year with DHP manufacturers or their reps and distributors?

- ☐ Yes
- ☐ No. Why not?

a. [IF YES] Have your interactions with DHP manufacturers (and reps and distributors) changed since the Pilot ended? [Probe for detail]

9. Have there been any changes to your utility's use of the Program implementation team for assistance and support in the past year?

10. Do you interact with other utilities concerning their DHP programs?

a. What about?

b. How frequently?

c. Have you engaged in any activities to help other utilities with their DHP programs?

d. Have your interactions with other utilities changed in the past year?

Marketing

11. What additional marketing activities have you done for the heat pump program in 2010?

    a. Considering your marketing activities in 2010, which have been most successful?

    b. Which activities in 2010 have been least successful?

    c. Have these activities led to any "lessons learned" regarding marketing DHPs?

    d. Have there been any efforts to market DHPs to specific demographics?

        a. [IF YES] Why? What have you learned about the targeted demographic(s)?

        b. [ASK ALL] Do you maintain demographic information for your DHP customers?

DHP Installations

12. What were your program goals for 2010(numerically, or simply "higher/lower" than Pilot, perhaps with percentage)?

    a. Did you meet your 2010 goals?

    __met goal

    __exceeded and met the demand

    __potentially exceeded, but limited incentives to budgeted amount

    __fell short of goal

        a. [IF YES] What factors contributed to meeting the goals?

        b. [IF NO] What factors do you attribute your utility having not met the goals

13. How closely are the resources provided through the NW Ductless Heat Pump Project aligned with consumer demand for DHP technology in your service territory?

14. Do you think that the climatic conditions within your service territory are a barrier or an asset to DHP sales?

15. Does your utility receive what you would describe as a large volume of inquiries regarding DHPs and the utility DHP program?

    a. What was the typical cost of a DHP installation in your territory last year? Was there any difference from 2009? What factors if any have lead to differing costs, such as brand, installer, location?

    b. Has the typical cost changed over the past year?

        i. [IF YES] What factors have contributed to this change? [PROBE: DHP brand? Inflation? Contractor cost?]

    c. Is the typical cost of a DHP installation in your service territory different from other service territories or regions?

        ii. [IF YES] Do you have any insights or concerns as to why your costs may differ from that of other service territories or regions?

        iii. Are DHPs being sold in big box retail stores in your territory?

16. Realizing that program resources are finite, which of the following scenarios would you prefer: READ AND PICK ONE.

    1 Larger incentive than currently available, but for a shorter period of time
    2 Smaller incentive for a longer period of time
    3 Current incentive level and program duration
    8 DON'T KNOW
    9 REFUSED

17. Will you continue to offer incentives this year?

18. What feedback have you received from consumers?

    a. Which of this feedback, if any, occurred since we last spoke in fall 2009?

Future Projections

19. Do DHPs constitute a viable market in your utility's service territory?

20. Do you think the market interest in your utility's service territory will grow or fade over time?

21. What do you consider to be "good" and "cost-effective" applications for DHPs?

a. [IF NOT ANSWERED] What do you think are good subsectors within the residential sector—by housing type, heating equipment type, etc?

b. Do you have any concerns about the cost-effectiveness of DHPs, or their cost-effectiveness in specific markets?

22. The Program primarily targets existing single-family, site-built homes using electric heat and secondarily targets existing manufactured homes using electric heat. Does your utility intend to target additional types of homes ?

a. Is your utility targeting commercial customers for DHP installations?

b. Multi-family residences?

c. Manufactured homes?

23. [IF NOT ANSWERED] Which additional market segments have potential for uptake of DHPs? What conditions are necessary or market barriers need to be addressed, to increase market adoption of DHPs in the Pacific Northwest and in your service territory in particular?

a. [PROBES: Market research into the technical potential, market constraints, and market needs of DHP submarkets (including new and existing manufactured housing, residential new construction, home remodels and conversions, and small commercial property owners)?]

i. [IF NOT ADDRESSED] With regards to addressing each of the market barriers, what roles and activities do you see for the various actors in the Project—that is NEEA, Fluid, the utilities, the manufacturers (and manufacturer reps and distributors), the installers?

b. [IF NOT ADDRESSED] What types of marketing activities would be most helpful for NEEA to engage in?

General

24. What are the main challenges you are facing in the future?

a. How have you addressed these challenges?

b. Have any new challenges developed in the past year? How have you addressed these challenges?

25. Aside from the issues we have already talked about, what lessons have you learned from your involvement with the Project so far? [PROBE: Project staff, utility involvement, the manufacturers (and reps and distributors), installers, residential customers]

26. Do you have any final comments – either positive or negative, that you'd like to share about your utility's involvement with NW Ductless Program?

Thank you for your time.

DHP 2010 IMPLEMENTATION TEAM SURVEY

Interviewee Name:

Date:

Interviewer:

Hi my name is _____ calling from Research Into Action on behalf of the NW Ductless Heat Pump program. May I please speak to _____?

Background

1. NEEA: How has your role with the Northwest Ductless Heat Pump Project changed in this second phase of the Project?
   FLUID: How has Fluid's role in the Northwest Ductless Heat Pump Project changed in 2010? [Probe for detail]

   a. FLUID: Related to these changes, how has *your* role changed, specifically?[Probe for detail]

2. What do you see as being the Project's major successes or achievements in 2010 ? What have you done differently since the beginning of 2011?

   a. What do you think contributed to these successes?

3. What are the main challenges you have faced?

   a. How have you addressed these challenges?

   b. [If not addressed] Do you anticipate any future challenges associated with market adoption of DHPs in the Pacific Northwest?

4. Have there been any changes to the market sector(s) targeted in 2010? What changes?

   a. [IF YES] What prompted these changes?

5. What conditions are necessary or market barriers need to be addressed, to increase market adoption of DHPs in the Pacific Northwest moving forward?

   a. [PROBES: Continued (or modified) consumer incentive program? Continued upstream market support targeting installers and manufacturers (and reps and distributors)? Marketing activities (targeting consumers and/or installers)?]

6. [IF NOT ADDRESSED] With regards to addressing each of the market barriers, what roles and activities do you see for the various actors in the Pilot—that is NEEA, Fluid, the utilities, the manufacturers (and reps and distributors), and installers?

7. What is NEEA's/FLUID's thinking about working with retailers to sell DHPs?

Marketing

8. What marketing activities were conducted in 2010?

    a. Which were the most successful?

    b. What new marketing approaches have you used in 2011?

    c. Have the activities led to any "lessons learned" regarding marketing DHPs? [If yes] What are these?

9. What do you consider to be the ideal incentive amount for DHPs marketed through the Program?

    a. PROBE: Does the ideal incentive amount vary by geographic area, etc?

10. Overall, have you noticed the prices of DHPs going down?

Interactions

11. Have your interactions with FLUID/NEEA changed in 2010? Any issues?

    a. FLUID: Have management directives been clear and reasonable?

    b. FLUID: Have expectations been clear and reasonable?

    c. BOTH: Have any issues come up?

        i. [If yes] How have the issues been resolved?

12. Have your interactions with installers changed in 2010? Any issues?

13. FLUID: Have your interactions with installers changed in 2010? Any issues?

    a. [IF NOT ADDRESSED] What sorts of feedback you have received from installers in 2010?

i. [PROBES: regarding the DHP market, regarding DHP orientation sessions, regarding DHP manufacturer training, regarding current market conditions, regarding their interaction with utilities, regarding consumer satisfaction, etc.]

14. Have your interactions with utilities changed in 2010? Any issues?

    a. How have the utility DHP programs changed in the 2010 phase of the Program?

15. Have your interactions with DHP manufacturers (also: manufacturer representatives or distributors) changed in 2010? Any issues?

16. Have you received any feedback from consumers during the 2010 phase of the Program? [IF SO, please describe what they said].

General Comments

In this final set of questions, think about what the market needs in order to increase market adoption of DHPs in the Pacific Northwest.

17. How effective do you think the Project was in 2010?

18. Aside from the issues we have already talked about, what lessons have you learned from your involvement with the Project so far?

19. Aside from the obstacles we have already talked about, have you noticed any additional obstacles with the program so far?

20. Do you have any final comments – either positive or negative, that you'd like to share about the Project?

HVAC CONTRACTOR SURVEY INSTRUMENT – CSRS #91907NEEA 2010 DHP EVALUATION, APRIL 2011

Completes Desired

Strata	Sample Definition	Quota Definition	Population	Desired Completes (85/10 C/P)
Group 1 Participating Contractors	(E=1 & F=0) or (E=1 & F=1) SAMPLE 1	Q.1c=Yes	457	47 is 85/10 Quota 1=47
Group 2 Oriented (Nonparticipating) Contractors	E=0 & F=1 SAMPLE 2	Q1c=No/DK/RF/Blank and Q1d=Yes	354	45 is 85/10 Quota 2=45
Group 3 Small Rural Contractors	E=0 & F=0 & G=0 & H=0 SAMPLE 3	1c=No/DK/RF/Blank and Q1d=No/DK/RF/Blank and Q3 is less than or equal to 3 and Q0=Rural	274	44 is 85/10 Quota 3=44
Group 4 Small Urban Contractors	E=0 & F=0 & G=1 & H=0 SAMPLE 4	1c=No/DK/RF/Blank and Q1d=No/DK/RF/Blank and Q3 is less than or equal to 3 and Q0=Urban	1652	50 is 85/10 Quota 4=50
Group 5 Large Rural Contractors	E=0 & F=0 & G=0 & H=1 SAMPLE 5	1c=No/DK/RF/Blank and Q1d=No/DK/RF/Blank and Q3 is 4 or more and Q0=Rural	71	30 (or max possible) Quota 5=30
Group 6 Large Urban Contractors	E=0 & F=0 & G=1 & H=1 SAMPLE 6	1c=No/DK/RF/Blank and Q1d=No/DK/RF/Blank and Q3 is 4 or more and Q0=Urban	681	48 is 85/10 Quota 6=48
Total				Overall Quota=264

INTRO1 - Hi, my name is _____ calling from CSRS on behalf of the Northwest Energy Efficiency Alliance, also known as NEEA (KNEE-A) – and the Northwest Ductless Heat Pump Program. Does your firm sell residential HVAC equipment?

1 YES → CONTINUE
2 NO → THANK AND TERMINATE, RECORD AS NQ.INTRO1
8 DON'T KNOW →THANK AND TERMINATE, RECORD AS DK.INTRO1
9 REFUSED → THANK AND TERMINATE, RECORD AS RF.INTRO1

I would like to talk with a sales manager or the person who is most knowledgeable about your firms' sales of residential HVAC equipment, especially ductless heat pumps. Who would I need to speak with? *GET REFERRAL TO CORRECT PERSON.*

_____

1 CORRECT PERSON IS AVAILABLE → CONTINUE
2 CORRECT PERSON **IS NOT** AVAILABLE → SCHEDULE CALL BACK

INTRO2 - Hi, my name is _____ calling from CSRS on behalf of the NEEA (KNEE-A). NEEA (KNEE-A) is conducting an evaluation of the Northwest Ductless Heat Pump Program. I would like to ask about your firm's familiarity and experiences with ductless heat pumps. Is this a good time? [IF ASK: TELL RESPONDENT IT WILL TAKE ABOUT 15 MINUTES DEPENDING ON THEIR ANSWERS]

1 YES → CONTINUE
2 NO → SCHEDULE CALL BACK
9 REFUSED → THANK AND TERMINATE, RECORD AS RF.INTRO2

Installer Background

[IF LOCCOUNTY IS BLANK ASK Q.0 OTHERWISE SKIP TO Q.1a] Thinking only about the location I've called to, what state and county is your company located in?

1 Washington
2 Oregon
3 Idaho
4 Montana

WASHINGTON COUNTY:

53001 ADAMS COUNTY	53029 ISLAND COUNTY	53057 SKAGIT COUNTY
53003 ASOTIN COUNTY	53031 JEFFERSON COUNTY	53059 SKAMANIA COUNTY
53005 BENTON COUNTY	53033 KING COUNTY	53061 SNOHOMISH COUNTY
53007 CHELAN COUNTY	53035 KITSAP COUNTY	53063 SPOKANE COUNTY
53009 CLALLAM COUNTY	53037 KITTITAS COUNTY	53065 STEVENS COUNTY
53011 CLARK COUNTY	53039 KLICKITAT COUNTY	53067 THURSTON COUNTY
53013 COLUMBIA COUNTY	53041 LEWIS COUNTY	53069 WAHKIAKUM COUNTY
53015 COWLITZ COUNTY	53043 LINCOLN COUNTY	53071 WALLA WALLA COUNTY
53017 DOUGLAS COUNTY	53045 MASON COUNTY	53073 WHATCOM COUNTY
53019 FERRY COUNTY	53047 OKANOGAN COUNTY	53075 WHITMAN COUNTY
53021 FRANKLIN COUNTY	53049 PACIFIC COUNTY	53077 YAKIMA COUNTY
53023 GARFIELD COUNTY	53051 PEND OREILLE COUNTY	88888 DON'T KNOW
53025 GRANT COUNTY	53053 PIERCE COUNTY	99999 REFUSED
53027 GRAYS HARBOR COUNTY	53055 SAN JUAN COUNTY	

OREGON COUNTY:

41001 BAKER COUNTY	41027 HOOD RIVER COUNTY	41053 POLK COUNTY
41003 BENTON COUNTY	41029 JACKSON COUNTY	41055 SHERMAN COUNTY
41005 CLACKAMAS COUNTY	41031 JEFFERSON COUNTY	41057 TILLAMOOK COUNTY
41007 CLATSOP COUNTY	41033 JOSEPHINE COUNTY	41059 UMATILLA COUNTY
41009 COLUMBIA COUNTY	41035 KLAMATH COUNTY	41061 UNION COUNTY
41011 COOS COUNTY	41037 LAKE COUNTY	41063 WALLOWA COUNTY
41013 CROOK COUNTY	41039 LANE COUNTY	41065 WASCO COUNTY
41015 CURRY COUNTY	41041 LINCOLN COUNTY	41067 WASHINGTON COUNTY
41017 DESCHUTES COUNTY	41043 LINN COUNTY	41069 WHEELER COUNTY
41019 DOUGLAS COUNTY	41045 MALHEUR COUNTY	41071 YAMHILL COUNTY
41021 GILLIAM COUNTY	41047 MARION COUNTY	88888 DON'T KNOW
41023 GRANT COUNTY	41049 MORROW COUNTY	99999 REFUSED
41025 HARNEY COUNTY	41051 MULTNOMAH COUNTY	

IDAHO COUNTY:

16001 ADA COUNTY	16033 CLARK COUNTY	16065 MADISON COUNTY
16003 ADAMS COUNTY	16035 CLEARWATER COUNTY	16067 MINIDOKA COUNTY
16005 BANNOCK COUNTY	16037 CUSTER COUNTY	16069 NEZ PERCE COUNTY
16007 BEAR LAKE COUNTY	16039 ELMORE COUNTY	16071 ONEIDA COUNTY
16009 BENEWAH COUNTY	16041 FRANKLIN COUNTY	16073 OWYHEE COUNTY
16011 BINGHAM COUNTY	16043 FREMONT COUNTY	16075 PAYETTE COUNTY
16013 BLAINE COUNTY	16045 GEM COUNTY	16077 POWER COUNTY
16015 BOISE COUNTY	16047 GOODING COUNTY	16079 SHOSHONE COUNTY
16017 BONNER COUNTY	16049 IDAHO COUNTY	16081 TETON COUNTY
16019 BONNEVILLE COUNTY	16051 JEFFERSON COUNTY	16083 TWIN FALLS COUNTY
16021 BOUNDARY COUNTY	16053 JEROME COUNTY	16085 VALLEY COUNTY
16023 BUTTE COUNTY	16055 KOOTENAI COUNTY	16087 WASHINGTON COUNTY
16025 CAMAS COUNTY	16057 LATAH COUNTY	88888 DON'T KNOW
16027 CANYON COUNTY	16059 LEMHI COUNTY	99999 REFUSED
16029 CARIBOU COUNTY	16061 LEWIS COUNTY	
16031 CASSIA COUNTY	16063 LINCOLN COUNTY	

MONTANA COUNTY:

30001 BEAVERHEAD COUNTY	30041 HILL COUNTY	30081 RAVALLI COUNTY
30003 BIG HORN COUNTY	30043 JEFFERSON COUNTY	30083 RICHLAND COUNTY
30005 BLAINE COUNTY	30045 JUDITH BASIN COUNTY	30085 ROOSEVELT COUNTY
30007 BROADWATER COUNTY	30047 LAKE COUNTY	30087 ROSEBUD COUNTY
30009 CARBON COUNTY	30049 LEWIS AND CLARK COUNTY	30089 SANDERS COUNTY
30011 CARTER COUNTY	30051 LIBERTY COUNTY	30091 SHERIDAN COUNTY
30013 CASCADE COUNTY	30053 LINCOLN COUNTY	30093 SILVER BOW COUNTY
30015 CHOUTEAU COUNTY	30055 MCCONE COUNTY	30095 STILLWATER COUNTY
30017 CUSTER COUNTY	30057 MADISON COUNTY	30097 SWEET GRASS COUNTY
30019 DANIELS COUNTY	30059 MEAGHER COUNTY	30099 TETON COUNTY
30021 DAWSON COUNTY	30061 MINERAL COUNTY	30101 TOOLE COUNTY
30023 DEER LODGE COUNTY	30063 MISSOULA COUNTY	30103 TREASURE COUNTY
30025 FALLON COUNTY	30065 MUSSELSHELL COUNTY	30105 VALLEY COUNTY
30027 FERGUS COUNTY	30067 PARK COUNTY	30107 WHEATLAND COUNTY
30029 FLATHEAD COUNTY	30069 PETROLEUM COUNTY	30109 WIBAUX COUNTY
30031 GALLATIN COUNTY	30071 PHILLIPS COUNTY	30111 YELLOWSTONE COUNTY
30033 GARFIELD COUNTY	30073 PONDERA COUNTY	88888 DON'T KNOW
30035 GLACIER COUNTY	30075 POWDER RIVER COUNTY	99999 REFUSED
30037 GOLDEN VALLEY COUNTY	30077 POWELL COUNTY	
30039 GRANITE COUNTY	30079 PRAIRIE COUNTY	

1a Are you familiar with ductless heat pumps, also known as DHPs or mini-splits?
- 1 YES → CONTINUE
- 2 NO → THANK AND TERMINATE, RECORD AS NQ.Q1A
- 8 DON'T KNOW → THANK AND TERMINATE, RECORD AS DK.Q1A
- 9 REFUSED → THANK AND TERMINATE, RECORD AS RF.Q1A

1b Most of the electric utilities in this region offer incentives for qualifying residential ductless heat pumps through the Northwest Ductless Heat Pump Program. Are you familiar with this program?
- 1 Yes
- 2 No --> skip to Q 2
- 8 Don't know → SKIP TO Q.2
- 9 REFUSED → SKIP TO Q.2

1c Has your firm received incentives through the Northwest Ductless Heat Pump Program?
- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 REFUSED

1d. Has anyone at your company attended a contractor orientation session for the Northwest Ductless Heat Pump Program? [IF NECESSARY: This could be in person or via a webinar]
- 1 YES
- 2 NO
- 8 DON'T KNOW
- 9 REFUSED

2. Which DHP brands is your firm able to offer? (DO NOT READ LIST) ACCEPT MULTIPLE ANSWERS
- 01 AMCOR
- 02 COMFORT AIRE
- 03 DAIKIN
- 04 FUJITSU
- 05 LG
- 06 MITSUBISHI
- 07 SAMSUNG
- 08 SANYO
- 09 TOSHIBA-CARRIER
- 10 OTHER (SPECIFY): _____
- 88 DON'T KNOW
- 99 REFUSED

3. How many people are employed by your firm at this location? [only if needed: Please count part time staff as .5. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE. ROUND UP TO WHOLE NUMBER]

_____ 9999=REFUSED → THANK AND TERMINATE, RECORD AS NQ.Q3

4. About how many of your company's staff have received manufacturer training on ductless heat pumps? [BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE]

_____ 8888=DON'T KNOW 9999=REFUSED

5. Do you have any plans to send staff to DHP manufacturer training in the next year?
   1 YES
   2 NO
   8 DON'T KNOW
   9 REFUSED

6. Which of the following activities does your firm engage in? [Read all]:

		Yes	No	Don't Know	Refused
a.	Sales of Residential HVAC equipment	1	2	8	9
b.	Sales of Commercial HVAC equipment	1	2	8	9
c.	Home remodels	1	2	8	9

7. Has your firm been in business for more than two years?
   1 YES
   2 NO
   8 DON'T KNOW
   9 REFUSED

8. In what states does your firm install residential HVAC equipment? [MARK all that apply]
   1 Washington
   2 Oregon
   3 Idaho
   4 Montana
   8 DON'T KNOW → SKIP TO Q.10
   9 REFUSED → SKIP TO Q.10

9a. [IF Q8=1 ASK Q.9a] What counties in Washington do you install residential HVAC equipment?

53001 ADAMS COUNTY	53029 ISLAND COUNTY	53057 SKAGIT COUNTY
53003 ASOTIN COUNTY	53031 JEFFERSON COUNTY	53059 SKAMANIA COUNTY
53005 BENTON COUNTY	53033 KING COUNTY	53061 SNOHOMISH COUNTY
53007 CHELAN COUNTY	53035 KITSAP COUNTY	53063 SPOKANE COUNTY
53009 CLALLAM COUNTY	53037 KITTITAS COUNTY	53065 STEVENS COUNTY
53011 CLARK COUNTY	53039 KLICKITAT COUNTY	53067 THURSTON COUNTY
53013 COLUMBIA COUNTY	53041 LEWIS COUNTY	53069 WAHKIAKUM COUNTY
53015 COWLITZ COUNTY	53043 LINCOLN COUNTY	53071 WALLA WALLA COUNTY
53017 DOUGLAS COUNTY	53045 MASON COUNTY	53073 WHATCOM COUNTY
53019 FERRY COUNTY	53047 OKANOGAN COUNTY	53075 WHITMAN COUNTY
53021 FRANKLIN COUNTY	53049 PACIFIC COUNTY	53077 YAKIMA COUNTY
53023 GARFIELD COUNTY	53051 PEND OREILLE COUNTY	88888 DON'T KNOW
53025 GRANT COUNTY	53053 PIERCE COUNTY	99999 REFUSED
53027 GRAYS HARBOR COUNTY	53055 SAN JUAN COUNTY	

9b. [IF Q8=2 ASK Q.9b] What counties in Oregon do you install residential HVAC equipment?

41001 BAKER COUNTY	41027 HOOD RIVER COUNTY	41053 POLK COUNTY
41003 BENTON COUNTY	41029 JACKSON COUNTY	41055 SHERMAN COUNTY
41005 CLACKAMAS COUNTY	41031 JEFFERSON COUNTY	41057 TILLAMOOK COUNTY
41007 CLATSOP COUNTY	41033 JOSEPHINE COUNTY	41059 UMATILLA COUNTY
41009 COLUMBIA COUNTY	41035 KLAMATH COUNTY	41061 UNION COUNTY
41011 COOS COUNTY	41037 LAKE COUNTY	41063 WALLOWA COUNTY
41013 CROOK COUNTY	41039 LANE COUNTY	41065 WASCO COUNTY
41015 CURRY COUNTY	41041 LINCOLN COUNTY	41067 WASHINGTON COUNTY
41017 DESCHUTES COUNTY	41043 LINN COUNTY	41069 WHEELER COUNTY
41019 DOUGLAS COUNTY	41045 MALHEUR COUNTY	41071 YAMHILL COUNTY
41021 GILLIAM COUNTY	41047 MARION COUNTY	88888 DON'T KNOW
41023 GRANT COUNTY	41049 MORROW COUNTY	99999 REFUSED
41025 HARNEY COUNTY	41051 MULTNOMAH COUNTY	

9c. [IF Q8=3 ASK Q.9c] What counties in Idaho do you install residential HVAC equipment?

16001 ADA COUNTY	16033 CLARK COUNTY	16065 MADISON COUNTY
16003 ADAMS COUNTY	16035 CLEARWATER COUNTY	16067 MINIDOKA COUNTY
16005 BANNOCK COUNTY	16037 CUSTER COUNTY	16069 NEZ PERCE COUNTY
16007 BEAR LAKE COUNTY	16039 ELMORE COUNTY	16071 ONEIDA COUNTY
16009 BENEWAH COUNTY	16041 FRANKLIN COUNTY	16073 OWYHEE COUNTY
16011 BINGHAM COUNTY	16043 FREMONT COUNTY	16075 PAYETTE COUNTY
16013 BLAINE COUNTY	16045 GEM COUNTY	16077 POWER COUNTY
16015 BOISE COUNTY	16047 GOODING COUNTY	16079 SHOSHONE COUNTY
16017 BONNER COUNTY	16049 IDAHO COUNTY	16081 TETON COUNTY
16019 BONNEVILLE COUNTY	16051 JEFFERSON COUNTY	16083 TWIN FALLS COUNTY
16021 BOUNDARY COUNTY	16053 JEROME COUNTY	16085 VALLEY COUNTY
16023 BUTTE COUNTY	16055 KOOTENAI COUNTY	16087 WASHINGTON COUNTY
16025 CAMAS COUNTY	16057 LATAH COUNTY	88888 DON'T KNOW
16027 CANYON COUNTY	16059 LEMHI COUNTY	99999 REFUSED
16029 CARIBOU COUNTY	16061 LEWIS COUNTY	
16031 CASSIA COUNTY	16063 LINCOLN COUNTY	

9d. [IF Q8=4 ASK Q.9d] What counties in Montana do you install residential HVAC equipment?

30001 BEAVERHEAD COUNTY	30041 HILL COUNTY	30081 RAVALLI COUNTY
30003 BIG HORN COUNTY	30043 JEFFERSON COUNTY	30083 RICHLAND COUNTY
30005 BLAINE COUNTY	30045 JUDITH BASIN COUNTY	30085 ROOSEVELT COUNTY
30007 BROADWATER COUNTY	30047 LAKE COUNTY	30087 ROSEBUD COUNTY
30009 CARBON COUNTY	30049 LEWIS AND CLARK COUNTY	30089 SANDERS COUNTY
30011 CARTER COUNTY	30051 LIBERTY COUNTY	30091 SHERIDAN COUNTY
30013 CASCADE COUNTY	30053 LINCOLN COUNTY	30093 SILVER BOW COUNTY
30015 CHOUTEAU COUNTY	30055 MCCONE COUNTY	30095 STILLWATER COUNTY
30017 CUSTER COUNTY	30057 MADISON COUNTY	30097 SWEET GRASS COUNTY
30019 DANIELS COUNTY	30059 MEAGHER COUNTY	30099 TETON COUNTY
30021 DAWSON COUNTY	30061 MINERAL COUNTY	30101 TOOLE COUNTY
30023 DEER LODGE COUNTY	30063 MISSOULA COUNTY	30103 TREASURE COUNTY
30025 FALLON COUNTY	30065 MUSSELSHELL COUNTY	30105 VALLEY COUNTY
30027 FERGUS COUNTY	30067 PARK COUNTY	30107 WHEATLAND COUNTY
30029 FLATHEAD COUNTY	30069 PETROLEUM COUNTY	30109 WIBAUX COUNTY
30031 GALLATIN COUNTY	30071 PHILLIPS COUNTY	30111 YELLOWSTONE COUNTY
30033 GARFIELD COUNTY	30073 PONDERA COUNTY	88888 DON'T KNOW
30035 GLACIER COUNTY	30075 POWDER RIVER COUNTY	99999 REFUSED
30037 GOLDEN VALLEY COUNTY	30077 POWELL COUNTY	
30039 GRANITE COUNTY	30079 PRAIRIE COUNTY	

10. Based on your experience with customers with electric heat in your service territory, about what proportion do you estimate have systems with a central thermostat, such as forced air furnaces?

_____% 888=DON'T KNOW 999=REFUSED Prior Experience

Next, I'd like to ask about your firm's experiences with DHPs.
IF Q.1b=YES CONTINUE OTHERWISE SKIP TO Q.12a

11a. About how many DHPs has your firm installed **that received incentives** through the Northwest Ductless Heat Pump Program? [FIRST try to get them to be as specific as possible OTHERWISE ASKS FOR RANGE AND ENTER RESPONSE UNDER RANGE. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE.]

Exact or estimated number: _____ 8888=DON'T KNOW 9999=REFUSED

11b. [ASK IF Q11a=8888 OR 9999] Range:

00	NONE
01	1 TO 4
02	5 TO 10
03	11 TO 25
04	26 TO 50
05	51 TO 75
06	76 TO 100
07	101 TO 150
08	151 TO 200
09	OVER 200
88	DON'T KNOW
99	REFUSED

12a. About how many DHPs has your firm installed in homes in the last two years (2009 and 2010) that did not receive utility incentives through the Northwest Ductless program? [FIRST try to get them to be as specific as possible OTHERWISE ASKS FOR RANGE AND ENTER RESPONSE UNDER RANGE. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE.]

Exact or estimated number: _____ 8888=DON'T KNOW 9999=REFUSED

12b. [ASK IF Q12a=8888 OR 9999] Range:

00	NONE
01	1 TO 4
02	5 TO 10
03	11 TO 25
04	26 TO 50
05	51 TO 75
06	76 TO 100
07	101 TO 150

08 151 TO 200
09 OVER 200
88 DON'T KNOW
99 REFUSED

12c.[If Q12a or q12b =1 OR MORE ASK Q.12c (unincented/ non-program units)] Why did these installations not go through the program? [IF NEEDED CAN read LIST; probe to code; MARK all that apply]

1 DID NOT QUALIFY DUE TO HEATING FUEL SERVING HOME
2 DID NOT QUALIFY BECAUSE OF APPLICATION [NOT PRIMARY HEAT OR PRIMARY LIVING SPACE]
3 INSTALLED IN AN AREA WHERE THERE IS NO DHP PROGRAM
4 DISLIKE UTILITY PROGRAM REQUIREMENTS
5 OTHER 1 (PLEASE SPECIFY) _____
6 OTHER 2 (PLEASE SPECIFY) _____
8 DON'T KNOW
9 REFUSED

12d.[If Q12a or q12b =1 OR MORE ask q.12d (unincented/ non-program units)] About what percent of the non-program residential units you installed in the past year are from each of the manufacturers you supply? [Percentages must total 100%.]

Amcor _____%
Comfort Aire_____%
Daikin_____%
Fujitsu_____%
LG_____%
Mitsubishi ____%
Samsung____%
Sanyo _____%
Toshiba- Carrier____%
OTHER 1_____%
OTHER 2 _____%
DON'T KNOW 888
REFUSED 999

If % provided for other, then please specify brand

12e.[If Q12a or q12b =1 OR MORE ask q.12e (unincented/ non-program units)] Please estimate the proportion of non-program residential units your company installs that are one-to-one systems, as distinguished from a multi-headed system. What percent are one-to-one applications? [IF NEEDED: ONE TO ONE SYSTEMS - one outdoor unit (compressor) and one indoor unit (air handler). MULTIPLE HEADED SYSTEM – MULTIPLE INDOOR UNITS.] [BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE]

_____% 888=DON'T KNOW 999=REFUSED

12f.[If Q12a or q12b =1 IS MORE ASK Q.12f (unincented/ non-program units)] About what proportion of your sales in 2010 of non-program residential units were in newly constructed homes? [BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE]

_____% 888=DON'T KNOW 999=REFUSED

12g.[If Q12a or q12b = 1 IS MORE ASK Q.12g (unincented/ non-program units)] About what proportion of your sales in 2010 were in newly heated areas of the home, including new additions to existing homes, such as garages, bonus rooms or in-law units? [BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE]

____% 888=DON'T KNOW 999=REFUSED

[NOTE: Q12f AND Q12g DOES NOT NEED TO ADD TO 100%]

13a.About how many DHPs did your firm install in homes before October of 2008 when the incentive program started? [FIRST try to get them to be as specific as possible OTHERWISE ASKS FOR RANGE AND ENTER RESPONSE UNDER RANGE. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE.]

Exact or estimated number: _____ 8888=DON'T KNOW 9999=REFUSED

13b.[ASK IF Q13a=8888 OR 9999] Range:

00 none
01 1 to 4
02 5 to 10
03 11 to 25
04 26 to 50
05 51 to 75
06 76 to 100
07 101 TO 150
08 151 TO 200
09 Over 200
88 DON'T KNOW
REFUSED

13c.[IF Q11a or Q11b IS 1 OR MORE] In the future, do you anticipate selling more DHPs, the same amount as you sold in 2010, or fewer DHPs?

1 More DHPs
2 The same amount as you sold in 2010
3 Fewer DHPs
8 DON'T KNOW
9 REFUSED

[Ask the following questions (if Q11a or Q11b = 1 or more) or (Q12a OR q12b = 1 or more) or (Q13a OR q13b = 1 or more) {AT LEAST 1 residential DHP sales of any type} skip to Q.20 otherwise continue]

14a.Have you recommended DHPs to any of your residential customers?

1 Yes → CONTINUE
2 No → SKIP TO Q.14d
8 Don't know → skip to q.14e
9 REFUSED → skip to q.14e

14b. Which of the following applications have you recommended them for? Read all.

		Yes	No	Don't Know	Refused
a.	Manufactured homes	1	2	8	9
b.	Multifamily homes	1	2	8	9
c.	Newly constructed homes	1	2	8	9
d.	Spaces like basements, in-laws units, garages – spaces that were previously unheated or are new additions to existing homes	1	2	8	9
e.	Homes with zonal electric heat	1	2	8	9
f.	Homes with wood heat	1	2	8	9
g.	Homes with gas heat	1	2	8	9
h.	Anything else? [IF YES, PLEASE SPECIFY _____]	1	2	8	9

14c.What are some common reasons why your customers have decided not to install a DHP? [Do not read. Probe to code. Check all that apply]

1 COST
2 APPEARANCE
3 LACK OF INTEREST
4 UNFAMILIAR WITH THE TECHNOLOGY; LACK OF CONFIDENCE WITH THE TECHNOLOGY
5 ANOTHER TECHNOLOGY IS BETTER SUITED TO THEIR NEEDS
6 OTHER (PLEASE SPECIFY): _____
8 DON'T KNOW
9 REFUSED

SKIP TO Q.14e

14d.Why have you not recommended DHPs to any of your residential customers? [DO NOT READ. PROBE TO CODE. CHECK ALL THAT APPLY]

1 COST

2 APPEARANCE
3 LACK OF INTEREST
4 UNFAMILIAR WITH THE TECHNOLOGY; LACK OF CONFIDENCE WITH THE TECHNOLOGY
5 ANOTHER TECHNOLOGY IS BETTER SUITED TO THEIR NEEDS
6 OTHER (PLEASE SPECIFY): _____
8 DON'T KNOW
9 REFUSED

14e. Do you plan to recommend DHPs to your residential customers going forward?
1 YES
2 NO
8 DON'T KNOW
9 REFUSED

14f. Briefly, what advantages do you think DHPs offer? [DO NOT READ, CHECK ALL THAT APPLY]
1 LOWER OPERATING COSTS
2 LOWER INSTALLATION COSTS
3 ABILITY TO HEAT **AND** COOL
4 SIMPLE TO OPERATE
5 NO DUCTS
6 SAVING ENERGY
7 OTHER (SPECIFY): _____
8 DON'T KNOW
9 REFUSED

14g. Briefly, what do you see are the disadvantages of DHPs? [DO NOT READ, CHECK ALL THAT APPLY]
1 COST
2 APPEARANCE
3 UNFAMILIAR TECHNOLOGY
4 DON'T WORK WELL IN VERY COLD WEATHER
5 OTHER (SPECIFY): _____
8 DON'T KNOW
9 REFUSED

If asked the Q14A TO Q14g (company has not installed any DHPs), then SKIP TO vERIFY1
RECORD as cm.q14

20. Did you install any "short run ducted" or "concealed duct" DHP systems homes in the last two years? [IF NEEDED: Some manufacturers offer DHP units that allow a short run of ductwork to be connected to a concealed indoor unit. They offer similar features to a true

"ductless" heat pump, but incorporate the use of small ducts to distribute hot and cold air. These units are typically called "short run ducted" or "concealed duct" systems.]

1 YES → CONTINUE
2 NO → SKIP TO Q.22A
8 DON'T KNOW → SKIP TO Q.22A
9 REFUSED → SKIP TO Q.22A

21. What percent of all installations are of the "short run" or "concealed duct" type? [BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE]

_____% 888=DON'T KNOW 999=REFUSED

22a. About how many residential-size DHPs – units of 3 tons or less – has your firm installed in commercial establishments in the last two years? [FIRST try to get them to be as specific as possible OTHERWISE ASK FOR RANGE AND ENTER RESPONSE UNDER RANGE. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE.] [If necessary: Examples of a residential DHP installation in a commercial establishment would be server rooms in small offices, and small businesses such as restaurants or cafes]

Exact or estimated number: _____ 8888=DON'T KNOW 9999=REFUSED

22b. [ASK IF Q22a=8888 OR 9999] Range:

00 NONE
01 1 TO 4
02 5 TO 10
03 11 TO 25
04 26 TO 50
05 51 TO 75
06 76 TO 100
07 101 TO 150
08 151 TO 200
09 OVER 200
88 DON'T KNOW
99 REFUSED

23a. About how many of your residential customers have purchased central or room air conditioning equipment in the last two years, excluding any DHP sales? [FIRST try to get them to be as specific as possible OTHERWISE ASK FOR RANGE AND ENTER RESPONSE UNDER RANGE. BEFORE ACCEPTING A DON'T KNOW/REFUSED ASK FOR THE RESPONDENT'S BEST ESTIMATE.]

Exact or estimated number: _____ 8888=DON'T KNOW 9999=REFUSED

23b. [ASK IF Q23a=8888 OR 9999] Range:

00 NONE
01 1 TO 4
02 5 TO 10
03 11 TO 25
04 26 TO 50
05 51 TO 75
06 76 TO 100
07 101 TO 150
08 151 TO 200
09 OVER 200
88 DON'T KNOW
99 REFUSED

Marketing and Outreach

24. About what percentage of customers contacted you … [CAN TOTAL MORE THAN 100%]
    In response to marketing by your firm ____%
    In response to utility marketing they saw ____%
    Due to word of mouth_____%
    Any other ways? Please specify, ____%
    DON'T KNOW 888
    REFUSED 999

25. And thinking of your **DHP** customers, about what proportion came to you seeking a DHP, and what proportion came to you seeking to improve their heating or cooling, but didn't specifically request a bid for a DHP? [PERCENTAGES MUST ADD UP TO 100%]
    Asked for DHP ____%
    Didn't specifically request DHP ____%
    DON'T KNOW 888
    REFUSED 999

26. When you want to introduce customers who are not familiar with the technology to DHPs, would you say you…[MARK all that apply]
    1 Use marketing materials distributed by the Northwest Ductless Program
    2 Use marketing materials your firm created
    3 Use materials your supplier or manufacturer created
    4 Or something else (please specify) _____
    8 DON'T KNOW
    9 REFUSED

27. What types of DHP marketing, if any, has your company done? [DO NOT READ]
    1 PRINT- FLIERS, NEWSPAPER ADS
    2 RADIO
    3 TV

4 OTHER, PLEASE SPECIFY: _____
8 DON'T KNOW
9 REFUSED

28. What do you do, if anything, to encourage referrals from your DHP customers?
1 NOTHING
2 PROVIDE INCENTIVES FOR REFERRALS
3 SUGGEST THAT YOUR CUSTOMERS REFER OTHERS
4 OTHER: PLEASE SPECIFY _____
8 DON'T KNOW
9 REFUSED

29. What other types of support, if any, would be beneficial to you? [CHECK ALL THAT APPLY, READ LIST IF NECESSARY]

1 ADDITIONAL SUPPORT FROM DISTRIBUTORS (TECHNICAL SERVICE SUPPORT)
2 ADDITIONAL MARKETING MATERIALS/RESOURCES
3 ADDITIONAL SUPPORT FROM MANUFACTURERS
4 OTHER, PLEASE SPECIFY:_____
5 NONE
8 DON'T KNOW
9 REFUSED

30. What are the key reasons your customers consider DHPs? [IF NEEDED read LIST; probe to code; MARK all that apply]
01 REPLACING EXISTING UNSATISFACTORY EQUIPMENT
02 CONDITIONING A SPACE WITHOUT DUCTS
03 CONDITIONING A SPACE NOT SERVED BY THEIR EXISTING HEAT
04 ADDING COOLING TO A SPACE
05 ADDING COOLING TO THE WHOLE HOUSE
06 REDUCING HEATING COSTS
07 OTHER 1, PLEASE SPECIFY:_____
08 OTHER 2, PLEASE SPECIFY:_____
88 DON'T KNOW
99 REFUSED

31. What features of the DHP are most appealing to your customers? [IF NEEDED read LIST; probe to code; MARK all that apply]
01 HEATING WITHOUT DUCTS
02 COOLING CAPABILITY
03 MORE COMFORTABLE HEATING THAN EXISTING EQUIPMENT
04 MORE CONTROLLABLE HEATING THAN EXISTING EQUIPMENT
05 COST

06 INCENTIVES
07 OTHER 1, PLEASE SPECIFY: _____
08 OTHER 2, PLEASE SPECIFY: _____
88 DON'T KNOW
99 REFUSED

32. Initially what concerns, if any, do customers typically have about DHPs? [IF NEEDED READ LIST; probe to code; mark all that apply]
0 NONE
1 APPEARANCE
2 COST
3 EFFECTIVENESS
4 NEEDING MORE THAN ONE UNIT
5 OTHER 1, PLEASE SPECIFY:_____
6 OTHER 2, PLEASE SPECIFY:_____
8 DON'T KNOW
9 REFUSED

ASK REMAINING QS IF Q1b=YES, FAMILIAR WITH PROGRAM. ELSE, SKIP TO VERIFY1 RECORD AS CM.Q32

Program Services

33. Have you or your staff visited the Northwest Ductless Heat Pump Program website? [Note: the address is nwductless.com]
1 YES → CONTINUE
2 NO → SKIP TO Q.35
8 DON'T KNOW → SKIP TO Q.35
9 REFUSED → SKIP TO Q.35

34. Please rate how useful you found the website information to be, using a five-point scale with 1 meaning "not at all useful" and 5 meaning "extremely useful"?
1 1 – Not At All Useful
2 2
3 3
3 4
5 5 – Extremely Useful
8 DON'T KNOW
9 REFUSED

35. Have you contacted Northwest Ductless Program staff?
1 YES → CONTINUE
2 NO → SKIP TO Q.37
8 DON'T KNOW → SKIP TO Q.37
9 REFUSED → SKIP TO Q.37

36. How responsive was the Program staff on a five-point scale with 1 meaning "not at all responsive" and 5 meaning "extremely responsive"?
    1 1 – Not At All Responsive
    2 2
    3 3
    4 4
    5 5 – Extremely Responsive
    8 DON'T KNOW
    9 REFUSED

37. Are there any **resources or support** that might help you to increase the number of ductless heat pumps you sell? [Probe: Specifically, are there any resources that the Project could provide?]
    1 YES
    2 NO
    8 DON'T KNOW
    9 REFUSED

37a. Record comments [IF RESPONDENT MADE ANY COMMENTS WHEN ANSWERING Q37 RECORD COMMENT HERE]

_____
_____
_____
_____

38. Realizing that program resources are finite, which of the following scenarios would you prefer: READ AND PICK ONE.
    1 Larger incentive than currently available, but for a shorter period of time
    2 Smaller incentive for a longer period of time
    3 Current incentive level and program duration
    8 DON'T KNOW
    9 REFUSED

38a. Record comments [IF RESPONDENT MADE ANY COMMENTS WHEN ANSWERING Q38 RECORD COMMENT HERE]

_____
_____
_____
_____

39. Have you heard of the Northwest Ductless Heat Pump Program's "displacement not replacement" approach to DHP installations?
    1 YES → CONTINUE
    2 NO → SKIP TO Q.40
    8 DON'T KNOW → SKIP TO Q.40
    9 REFUSED → SKIP TO Q.40

39a. Would you say that your staff has a good understanding of what the program intends by "displacement not replacement", a fair understanding, or a poor understanding?

1 Good understanding
2 Fair understanding
3 Poor understanding
8 DON'T KNOW
9 REFUSED

40. Would you like to offer any comments, either positive or negative, about the Northwest Ductless Heat Pump Program or the ductless heat pump technology?

_____
_____
_____
_____

CONTINUE AND RECORD AS CM.Q40

Verify1. (IF WE ALREADY HAVE A NAME) Those are all the questions I have. I would also like to verify that your name is _____ and that I reached you at _____.

VERIFY2. (IF THERE IS NO NAME) Those are all the questions I have. In case my supervisor needs to verify my work, may I please have your name?

_____

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

DHP PARTICIPANT INTERVIEW GUIDE, 2010 EVALUATION

Interviewee Name:

Date:

Interviewer:

Hi my name is _____ calling from Research Into Action on behalf of [utility]. The Northwest Energy Efficiency Alliance (NEEA) is conducting an evaluation of the NW Ductless Heat Pump Program. We are speaking to people who installed ductless heat pumps in their homes to learn about your experiences with the heat pump.

This will take about ____ minutes. Is this a good time?

I will refer to the ductless heat pump as a DHP to save time.

Awareness

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

   - ☐ Friend or acquaintance had one
   - ☐ Utility advertising, bill stuffer
   - ☐ Newspaper ad
   - ☐ Newspaper story
   - ☐ Television ad
   - ☐ Contractor
   - ☐ Internet research
   - ☐ Other:

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

   - ☐ Friend or acquaintance had one
   - ☐ Utility advertising, bill stuffer
   - ☐ Newspaper ad
   - ☐ Newspaper story
   - ☐ Television ad
   - ☐ Contractor
   - ☐ Internet research
   - ☐ Other:

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

- ☐ Friend or acquaintance who had one
- ☐ Utility advertising, bill stuffer
- ☐ Newspaper ad
- ☐ Newspaper story
- ☐ Television ad
- ☐ Contractor
- ☐ Internet research
- ☐ Other:

4. Since you purchased the DHP, have you purchased any other heating or cooling equipment (If needed: space heaters, window ACs)?

   - ☐ Yes
   - ☐ No
   - ☐ Don't Know

5. [If yes:] What did you purchase? [check all that apply]

   - ☐ Heating, specify type:_____
   - ☐ Cooling, specify type:_____

Motivation

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

   - ☐ Needed space conditioning, had no ducts
   - ☐ Needed additional or supplemental space conditioning
   - ☐ Existing heating was not working well enough
   - ☐ Existing heating was broken
   - ☐ Wanted to add cooling
   - ☐ Other, please specify:_____

7. 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?

   a. Was customers idea
   b. Was contractor suggestion
   c. Other:

8. 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 Q10-13)

	9. Type of heat	10. Fuel	11. Do you still use it?	12. Before the DHP, what was your primary heat?	13. What is your primary heat now?
Forced Air Furnace					
Baseboards					
Wall Heaters					
Electric radiant heat					
Wood heat					
DHP					
Space Heaters					
Other					

14. [If they used wood] About how much wood did you typically use in a season?
__cords OR __pounds of pellets

15. Did you have any cooling equipment before you purchased the DHP? What kind?

a. None
b. Window AC
c. Full house AC
d. Portable AC
e. Swamp cooler
f. Other:_____

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

Please rate how important each of the following factors was in your decision to purchase a DHP:

How important was…	1	2	3	4	5
16. The comfort potential offered by the DHP					
17. The cost of the DHP, including the incentives					
18. The potentially cheaper operating costs of the DHP compared to your previous heating/cooling system					
19. The cooling capability of the DHP					

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

- ☐ Yes, please specify: _____
- ☐ No

21. How did you gather information about the DHP before you made your purchase? [Check all that apply]

- ☐ Online
- ☐ Contractor provided materials
- ☐ Speaking to the contractor
- ☐ Speaking to someone who already had a DHP installed
- ☐ Did not look for any information
- ☐ Other, please specify: _____

22. Was there anything you were concerned about when you were considering a DHP? [DO NOT READ; Check all that apply]

- ☐ Appearance
- ☐ Capability/functionality
- ☐ Cost
- ☐ Reliability
- ☐ Maintenance

- ☐ Other, please specify:_____

23. [IF YES] How did you overcome those concerns?

24. Now I'd

a. Yes, one page quick reference guide
b. Yes, other information
c. No information
d. Other:_____
e. Don't remember

DHP Experience

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

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

- ☐ Heating
- ☐ Cooling
- ☐ Both

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

- ☐ Yes, heating
- ☐ Yes, cooling
- ☐ No

  Elaboration:_____

27. Have you cleaned the filter in your DHP?

- ☐ Yes, how often:
- ☐ No
- ☐ Don't know

28. 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?

- ☐ Manual
- ☐ Automatic

- ☐ Mixed
- ☐ Don't know

Satisfaction

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
29. Sound level of the indoor unit					
30. Electricity bill since installing the DHP					
31. Comfort of the new heat					
32. Comfort for the new cooling					
33. Maintenance the DHP requires					

34. Overall, has the DHP met your expectations?

- ☐ Yes
- ☐ No, how so?_____

35. Have you, or would you, recommend the DHP to a friend or colleague?

a. Yes, have
b. Yes, would
c. No
d. Don't know

36. [IF RESPONDENT SAYS THEY WOULD RECOMMEND THE DHP OR ALREADY HAVE] What are some of the reasons you (would) recommend(ed) the DHP?

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

Thank you for your time.