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Northwest Ductless Heat Pump Initiative: Market Progress Evaluation #8 Addendum - Ductless Heat Pumps in Cold Climates Installer Research

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1. Executive Summary

The Northwest Energy Efficiency Alliance (NEEA) has completed eight market progress evaluation reports (MPERs) for its ductless heat pump (DHP) initiative. NEEA's eighth MPER (MPER #8) determined that, although it is likely that the DHP market will continue to grow across the region, some gaps remain in NEEA's understanding of installers in heating zone 3 (HZ3), including these installers' familiarity with, opinion of, and sales and promotion of DHPs in cold climates.¹

To fill these knowledge gaps, Cadmus completed a telephone survey in 2020 with a representative sample of 37 HVAC installers from HZ3². However, the sample size decreased to 36 for findings related to DHP installation practices given one installer did not install DHPs. The four objectives of the survey were these:

- Investigate the availability of DHPs in HZ3
- Assess installers' familiarity with, opinion of, and promotion of DHP and cold climate DHP technology in HZ3
- Gauge the prevalence of market barriers to DHP adoption in HZ3
- Gauge DHPs' sales drivers in HZ3

Findings from this survey suggest that the DHP market is likely to continue to grow in HZ3. Installers report that DHPs are available and that customer demand is increasing. DHP product capabilities and customer interest in DHPs were the two primary motivators for installers to begin offering DHPs. That said, oriented installers—those who have participated in DHP orientation through the NW Ductless Heat Pump Project (NWDHPP)—are more likely to recommend DHPs to their customers and have a more positive opinion of DHPs than their counterparts who have not participated. In addition, the two groups perceive market barriers differently.

Cadmus presents the following conclusions with respect to installer perceptions of the DHP market in HZ3, along with recommendations to ensure market growth.

¹ Heating zones determined by the National Oceanic and Atmospheric Administration (NOAA) mapped to zip code and included in the Northwest Power Conservation Council workbook "RTF_ClimateZoneCalculation_v2_0.Xlsm," published on May 17, 2019. Link to workbook: nwcouncil.app.box.com/v/ClimateZoneCalcWorkbookv2-0.

² This updated report includes nine survey participants not included in Cadmus' initial report of findings, dated August 7, 2020.

Conclusion 1: DHPs are readily available for purchase in HZ3.

Cadmus found evidence that DHPs and DHPs rated or advertised for cold climates are readily available in HZ3.³ When Cadmus asked residential HVAC contractors who install DHPs to rate the significance of the challenge posed by DHP availability, 94% said it was “not significant at all” (n=36). Of the 988 residential DHP installations reported by surveyed installers, 72% were reported to be cold climate DHPs. Eighty-six percent of HVAC installers who installed cold climate DHPs reported that cold climate DHPs were typically available and in stock when needed for installation (n=28).

Recommendation: No recommendation associated with this finding.

Conclusion 2: Installers recommend DHPs to customers when they consider the units to be the most appropriate application; however, more than half of HZ3 installers recommend them infrequently.

Installers recommend DHPs when they consider them to be an appropriate HVAC solution for a customer’s home. Cadmus asked installers how often they recommend DHPs to customers with electric heat and why. Forty-seven percent of installers said they “always” or “often” recommend DHPs to their customers. A majority of that group cited lower operating costs and/or energy savings as the main reasons they recommend DHPs. Most installers who “sometimes,” “rarely,” or “never” recommend a DHP cited a home’s layout as the main reason for recommending less frequently. Other less common reasons included aesthetic considerations, customer education, and the belief that DHPs are more expensive to operate in cold climates because of the need for backup heat.

Cadmus asked for installers’ opinions of DHPs as HVAC solutions. Approximately one-third offered very positive opinions, saying that DHPs offered a “great” heating and cooling solution or that they recommended them. The rest of the opinions focused primarily on respondents’ views of appropriate technology-use cases. Installers said DHPs were better suited to the following conditions:

- Retrofits of existing homes rather than new construction
- Conditioning a specific area or zone rather than a whole home
- Replacement of electric resistance heating rather than a home with gas
- Homes without ducting or where ducting would prove too expensive to install

There was a mix of opinion regarding DHP performance in cold climates. In general, respondents said they are less effective in temperatures below freezing.

³ The term “cold climate” is a general term used to describe any location that experiences extended periods of below freezing temperatures. Ductless systems rated for cold climates are sometimes called “extended capacity,” cold climate, “low temperatures,” or other names for systems that claim to maintain comfortable interior temperatures at more extreme low ambient temperatures. NEEA’s specification for a cold climate DHP is one that can deliver 80% of its rated capacity at 5 degrees Fahrenheit.

Recommendation: NEEA or utilities and program administrators should consider continuing to offer, or influencing the supply chain to offer, the development and dissemination of training and tools to assist contractors with appropriate DHP product selection, sizing and backup heat control strategy.

Conclusion 3: Installers who have not received DHP orientation through the NWDHPP recommend DHPs less frequently and are less likely to have a favorable opinion of the technology.

Installers who have participated in DHP orientation through the NWDHPP are more likely to recommend DHPs to their customers. Forty-eight percent of HZ3 installers said they frequently recommended DHPs to customers with electric heat. However, the percentage varies significantly when comparing oriented and non-oriented installers. Of 36 installers surveyed, 14 received orientation and 22 did not. More of the oriented installers frequently recommended DHPs to their customers, 71% compared to 32% of non-oriented installers.

Cadmus found qualitative evidence that oriented installers are more likely to have a positive opinion of DHPs than non-oriented installers. Oriented installers are less likely to express an opinion that DHPs are good in certain (but not all) applications or that DHPs can face performance issues in cold temperatures. These differences may explain why oriented installers recommend DHPs more frequently to their customers. When asked for their opinion of DHPs, all oriented and most non-oriented installers provided positive opinions; of the four installers who provided neutral or negative opinions, none had received NWDHPP orientation.

Recommendation: To ensure continued market growth of DHPs in cold climates, installers must perceive DHPs as an appropriate application and recommend this solution to their customers. Because training is key to installers' perceptions, NEEA or utilities and program administrators should consider continuing to offer, or influencing the supply chain to offer, cold climate-focused training materials to HZ3 contractors who have not participated in NWDHPP orientation.

Conclusion 4: Installers perceive a variety of challenges to selling and installing DHPs, including installation-related challenges, workforce challenges, customer familiarity, and high first cost.

Cadmus gave installers in HZ3 a list of 11 potential challenges to selling or installing DHPs and asked them to rate these challenges according to how significant each was to successful operation of their businesses. HZ3 installers identified the most significant market barriers they perceived; these included workforce challenges (e.g., finding sufficient trained installers), DHPs' initial high costs for customers, lack of customer familiarity and confidence in the technology, and installation-related challenges. Four contractors further elaborated on installation-related challenges, reiterating that DHP placement in cold climates could be challenging, specifically that "outdoor unit placement is critical to account for snow load." Over half the installers rated lack of customer familiarity as a "very" or "somewhat" significant challenge to selling DHPs. None of the respondents rated DHP availability, maintenance-related

challenges, lack of installation information, or new licensing or training requirements as “very significant” market barriers.

Cadmus compared the most prevalent market barriers, or those that received the highest rating of “very significant,” between installers who have received orientation through the NWDHPP (oriented installers) and those who have not. A greater proportion of non-oriented installers rated these barriers as “very significant,” with one exception. Oriented installers rated workforce challenges as the most significant challenge, with 46% rating it “very significant.”

Recommendations:

- Respondents identified workforce challenges as the most significant challenge to selling and installing DHPs, with oriented installers identifying it as their single greatest challenge. NEEA partners should explore working with community partners on workforce training programs.
- The other significant barriers were more common among non-oriented installers, underscoring the continued need for training for HZ3, as noted above.

Conclusion 5: Customer interest in DHPs has encouraged installers to offer DHPs and is growing, but some installers still perceive customer familiarity as a challenge.

Installers reported that customer interest in DHPs was a significant motivator for them to begin offering DHPs, with approximately one-third rating it as a “very significant” motivator, and another 58% rating it as a “somewhat significant” motivator. Installers also report that customer demand for DHPs has grown over the past year. On average, installers reported that 43% of their residential DHP customers specifically requested a DHP in the last year, and 57% said this percentage of customers was higher than in prior years. However, installers also perceived customer familiarity with DHPs and, to a lesser extent, confidence in DHPs were significant challenges to selling DHPs. Over half the installers rated lack of customer familiarity as a “very” or “somewhat” significant challenge to selling DHPs.

Recommendations:

- To continue building customer demand, energy efficiency program administrators, manufacturers, and installers should continue to promote DHPs to consumers as an HVAC solution that can provide a variety of benefits. These benefits include those identified as most motivating based on research conducted for MPER 6: reducing monthly heating costs, providing both cooling and heating, providing more even heating (compared to zonal heat), not requiring duct installation, and coming with a five-to-seven-year warranty.
- To continue building customer demand, program administrators and market actors should ensure that product information and benefits are readily available online. Research conducted for MPER 6 and MPER7 found that consumers most frequently become aware of DHPs via word of mouth and internet advertising and, to a lesser extent, via radio or TV advertising. In addition,

most consumers who are considering a DHP purchase first consult with friends, family, or colleagues and conduct internet research.

2. Background and Methodology

2.1. Introduction

2.1.1. DHP Initiative Overview

In 2008, the Northwest Energy Efficiency Alliance (NEEA) launched the Northwest Ductless Heat Pump Project (NWDHPP) as a pilot to demonstrate the viability of inverter-driven ductless heat pumps (DHPs) to displace electric resistance heat in existing Northwest homes. The DHP Initiative, which NEEA launched at full scale in 2010, encompasses a range of activities designed to accelerate DHP technology's adoption by working with upstream and midstream market actors, promoting and supporting effective installations of DHPs in existing homes, supporting initiatives offered by Northwest utilities, and building consumer and market awareness.

2.1.2. Initiative Transition

As part of NEEA's market-transformation initiative life cycle, when sufficient evidence appears that the market will continue to grow in the absence of direct NEEA intervention, NEEA transitions its initiatives out of active market development and into long-term monitoring and tracking (LTMT).

NEEA's *Northwest Ductless Heat Pump Initiative: Market Progress Evaluation Report #8* (MPER #8) determined that, although the DHP market likely will continue to grow across the region, gaps remain in NEEA's understanding of installers in heating zone 3 (HZ3), including installers' familiarity with, opinion of, and sales and promotion of DHPs in cold climates.

2.2. Research Approach and Objectives

Cadmus completed a phone survey with a representative sample of HZ3 DHP installers. Calls were completed in spring and summer of 2020, during COVID-19 while state shelter in place orders were in effect. The survey instrument is included in *Appendix A*. These installers serve a critical function, given that their opinions matter in encouraging or discouraging consumers to adopt DHPs in general and also specifically for cold climate DHPs or DHPs designed to operate efficiently at colder temperatures.⁴ The survey addressed the following research objectives:

- Investigate the availability of DHPs in HZ3
- Assess installers' familiarity with, opinion of, and promotion of DHP and cold climate DHP technology in HZ3

⁴ The term "cold climate" is a general term used to describe any location that experiences extended periods of below freezing temperatures. Ductless systems rated for cold climates are sometimes called "extended capacity," cold climate, "low temperatures," or other names for systems that claim to maintain comfortable interior temperatures at more extreme low ambient temperatures. NEEA's specification for a cold climate DHP is one that can deliver 80% of its rated capacity at 5 degrees Fahrenheit.

- Gauge the prevalence of market barriers to DHP adoption in HZ3
- Gauge DHPs’ sales drivers in HZ3

2.2.1. Sample Design

Cadmus drew a sample of HVAC installers with business addresses located in HZ3. As shown in Table 1, the sample frame included 467 telephone numbers. Cadmus set survey targets based on the proportion of HZ3 installers by state, to ensure representative sampling by state. Survey completes represent the population of HZ3 HVAC installers with 90% confidence interval and 13% precision (90/13).

Table 1. Sample Frame and Survey Completes by State

State	Sample Frame HZ3 Installers	Removed from List as ineligible*	Added to List**	Final Count of HZ3 Installers	Survey Targets	Cadmus Called	Survey Completes	Response Rate
Idaho	137	24	2	115	14	78	14	18%
Montana	302	21	0	302	18	107	20	19%
Oregon	18	0	0	18	2	5	2	40%
Washington	10	1	0	9	1	3	1	33%
Total	467	46	2	444	35	193	37	19%

* After calling 193 businesses, Cadmus determined that 46 were ineligible because they did not install HVAC equipment, had a wrong number, or were no longer in business

** On two occasions, installers who were called recommended that Cadmus call another installer located in HZ3, so these installers were not included on the initial list.

Of 467 installers in the sample frame, Cadmus expected that some HVAC companies installed DHPs and some did not and that some were oriented installers and some were not. MPER #8 estimated that 96% of the HVAC companies in the four states sold DHPs, with this percentage higher for Idaho (97%) and lower for Montana (88%). Cadmus completed 36 surveys with HVAC companies that installed DHPs and one with a HVAC company that did not, for a total of 37 completed surveys. MPER #8 also estimated that 50% of installers across the four states are oriented installers. Cadmus completed surveys with 14 DHP installers who received orientation and 22 who did not. The 14 oriented installers include one in Oregon, six in Idaho, and seven in Montana.

Sample Frame Development

Table 2 shows how Cadmus developed the sample frame of 467 telephone numbers. As part of MPER #8, conducted in 2019, Cadmus purchased a list of telephone numbers for use in a call-down survey designed to determine the regional availability of HVAC contractors that install DHPs. This list included telephone numbers of businesses identified as plumbing, heating, and air-conditioning contractors in all three heating zones.

To arrive at the 2020 sample frame, Cadmus completed the following steps:

- Removed HVAC businesses in HZ1 and HZ2
- Removed any businesses called in 2019 that confirmed they did not sell HVAC equipment, or they participated in MPER #8 survey

- Removed any businesses that fall outside of NEEA’s service territory
- Included 29 new phone numbers provided by NorthWestern Energy that fit the eligibility requirements

Table 2. Sample Frame Development Counts by State

State	Population*	Only HZ3 Installers (Remove HZ1 and HZ2)	Remove Ineligible Businesses**	Include Businesses Provided by NorthWestern	Sample Frame HZ3 Installers
Idaho	915	157	20	0	137
Montana	592	318	45	29	302
Oregon	1,696	20	2	0	18
Washington	2,473	10	0	0	10
Total	5,676	505	67	29	271

*This purchased list included contacts ineligible for this survey(closed businesses or businesses not selling HVAC equipment).

**Remove any businesses called in 2019 that confirmed they did not sell HVAC equipment or they participated in MPER #8 survey as well as any businesses confirmed as outside NEEA’s territory.

3. Detailed Findings

In spring and summer of 2020, Cadmus completed a telephone survey with a representative sample of DHP installers from HZ3. This survey investigated the availability of DHPs and cold climate DHPs in HZ3; gathered insights to assess installers’ familiarity with, opinion of, and promotion of DHP technology in cold climates; and gauged DHP sales drivers as well as prevalence of market barriers to DHP adoption in HZ3. This section presents detailed findings from the telephone survey and, where applicable, comparisons to the 2019 MPER #8 findings.

3.1. DHP Availability in HZ3

Installers reported that DHPs and cold climate DHPs are readily available and easy to purchase in HZ3. When Cadmus asked residential HVAC contractors in HZ3 who install DHPs to rate how significant of a challenge DHP availability is to the successful operation of the installers’ business, 94% said “not significant at all” (n=36). Eighty-six percent of HVAC installers who installed cold climate DHPs in residential homes in HZ3 in the past 12 months reported that *cold climate* DHPs were typically available and in stock when they need them for installation (n=28).

3.2. Installer Familiarity, Opinion, and Promotion of DHPs in HZ3

Installers agreed that DHPs provided an effective heating and cooling solution, and 47% of installers frequently recommended them to their customers (n=36). Most installers reported currently offering Mitsubishi, Daikin, and Fujitsu DHPs, and most reported they were familiar with and installed cold climate product lines from these three brands. This section further discusses installers’ familiarity with, opinion of, and promotion of DHPs in HZ3 and compares key findings with those from MPER #8.

3.2.1. Installer Familiarity and Installations of DHPs and Cold Climate DHPs

This section shows installers’ familiarity with and installation of various DHP brands and their corresponding cold climate product lines. Additionally, it summarizes the number of DHP and cold climate DHP installations. Finally, it explains the criteria installers use in choosing DHPs for installation in cold climates.

Installer Familiarity: DHP Brands Installed 2019 Compared to 2020

Most installers reported currently offering Mitsubishi, Daikin and Fujitsu DHPs. As shown in Table 3, this finding is similar to those from MPER #8.

Table 3. DHP Brands Installers Offer Their Customers: 2019 Compared to 2020

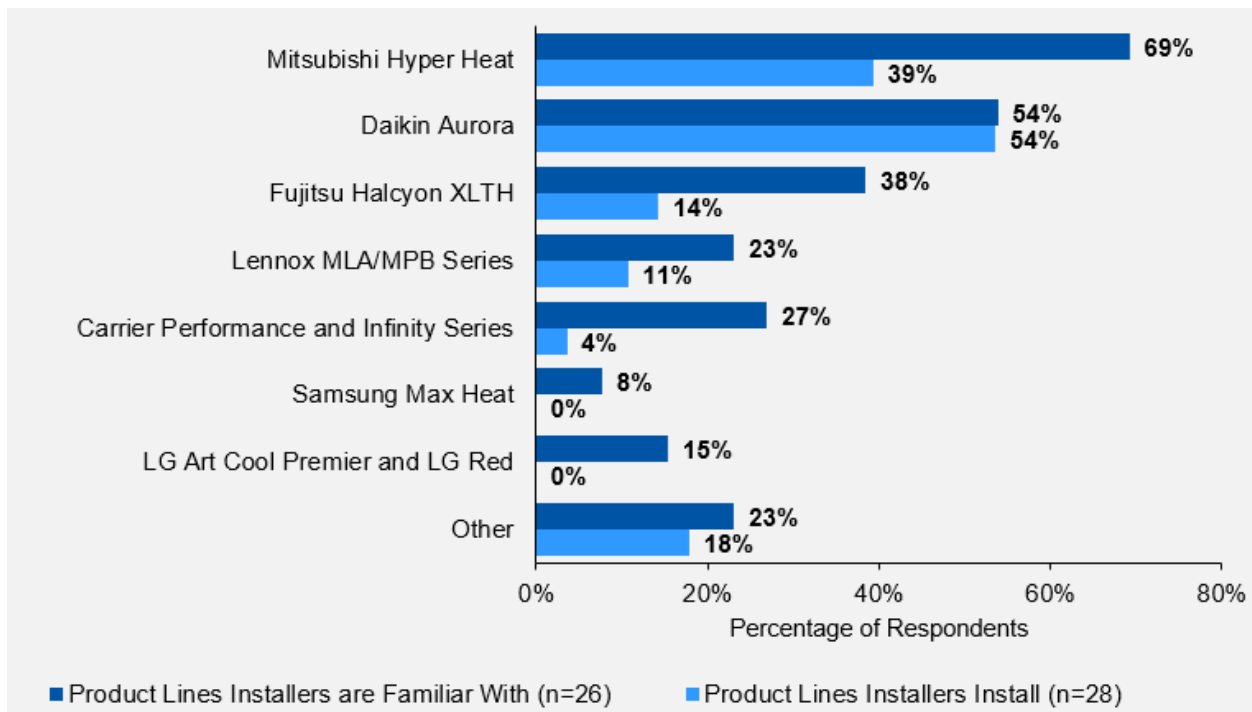
Brand	HZ3 Installers, 2020	HZ3 Installers, 2019	All Heating Zone Installers, 2019
	% offering (n=35)	% offering (n=16)	% offering (n=87)
Mitsubishi	69%	56%	67%
Daikin	60%	63%	61%
Fujitsu	54%	63%	38%

2020 DHPs in Cold Climates Installer Survey Question F1 and 2019 MPER# 8 Installer Survey Question F2: Which DHP brands does your company currently offer to customers?

Installer Familiarity and Installations: Cold Climate Product Lines

Eighty-one percent of installers who install DHPs (29 of 36) said they were familiar with models of DHPs advertised as working better in cold climates, often referred to as “cold climate,” “extended capacity,” or “low-ambient” DHPs (n=36). As shown in Figure 1, most of those installers reported installing Mitsubishi, Daikin, or Fujitsu DHPs and said they were familiar with and install cold climate product lines from these three brands. Additionally, six installers said they are familiar with and install Lennox’s cold-climate product line. The “other” category includes Bryant, Napoleon, and Trane DHPs and an alternate Daikin cold-climate product line, the Daikin MXL Series.

Figure 1. Installer Familiarity with and Installations of Cold Climate Product Lines



2020 DHPs in Cold Climates Installer Survey: F3: Which of the following **cold climate DHP** product lines are you familiar with...? G5: Which **cold climate DHP** product lines do you install?

DHP Installations

HZ3 HVAC installers surveyed reported installing 988 residential DHPs in the past year (n=35), with five installers accounting for 51% (500) of the reported installations. The installers reported a wide range for the number of DHPs installed, with 80% of the installers installing 30 or fewer DHPs in the past year. Of the 988 DHP installations in the past year, 33% replaced customers’ existing equipment to heat and cool their primary living spaces, and 67% of which were installed in a home’s newly heated area, such as a garage, bonus room, or new addition (n=35). Most installers reported that their DHP customers sought to improve their heating and cooling (72%, n=36); 6% said their customers wanted to improve just their heating, and 22% sought to improve just their cooling.

Cold Climate DHP Installations

Of the 988 residential DHPs installers reported installing, 72% were cold climate DHPs. This percentage is significantly lower than the percentage of HZ3 installers reported in MPER #8, yet still higher than the percentage of installers located across all of the heating zones reported in MPER #8. Table 4 compares the 2020 survey to installer survey results from MPER #8. In 2019, HZ3 installers reported installing 307 residential DHPs, 90% of which were cold climate heat pumps (n=16). HZ3 installers responding in 2019 and 2020 consistently reported installing a higher percentage of cold climate DHPs than the combined percentage for all three heating zones (51% of 5,099 DHPs in 2019).

Table 4. Number of Residential DHPs and Cold Climate DHPs Installed: 2019 and 2020 Comparison

	MPER # 8 2019 All Heating Zones (n=87)	MPER #8 2019 Responses HZ3 (n=16)	2020 Responses HZ3 (n=35)
Number of residential DHPs installed	5,099	307	988
Percentage of DHPs installed in past year that were cold climate DHPs	51%	90%	72%

2020 DHPs in Cold Climates Installer Survey Question G1 and G4 and 2019 MPER# 8 Installer Survey Question C1 and C3: “In the past 12 months, approximately how many residential DHPs did you install (this includes installations in the single-family, multifamily, and manufactured homes)?” And “Of the [INSERT NUMBER FROM G1] residential DHP installations you performed in the past 12 months; approximately how many were cold climate DHPs?”

Criteria Installers Use when Choosing a Cold Climate DHP for Installation

Cadmus asked what criteria installers use in choosing a DHP for installation in cold climates and coded the open-ended responses, producing the results shown in Table 5. Installers most frequently mentioned choosing those products that performed well in past installations, followed by those products able to heat at the negative temperature range required and those they believe to be backed by a strong supply chain.

Table 5. Criteria HZ3 Installers Use to Choose a DHP for Installation in Cold Climates

Theme	Number of Mentions (n=28)
DHPs that performed well in past installations	13
DHPs that are able to heat at the negative temperature range required/perform in cold climates	8
DHPs that are backed by a strong supply chain (i.e. vendors and distributors provide technical support and replacement parts are readily available)	7
DHPs are competitively priced	5
DHPs fit layout of customer’s home	4

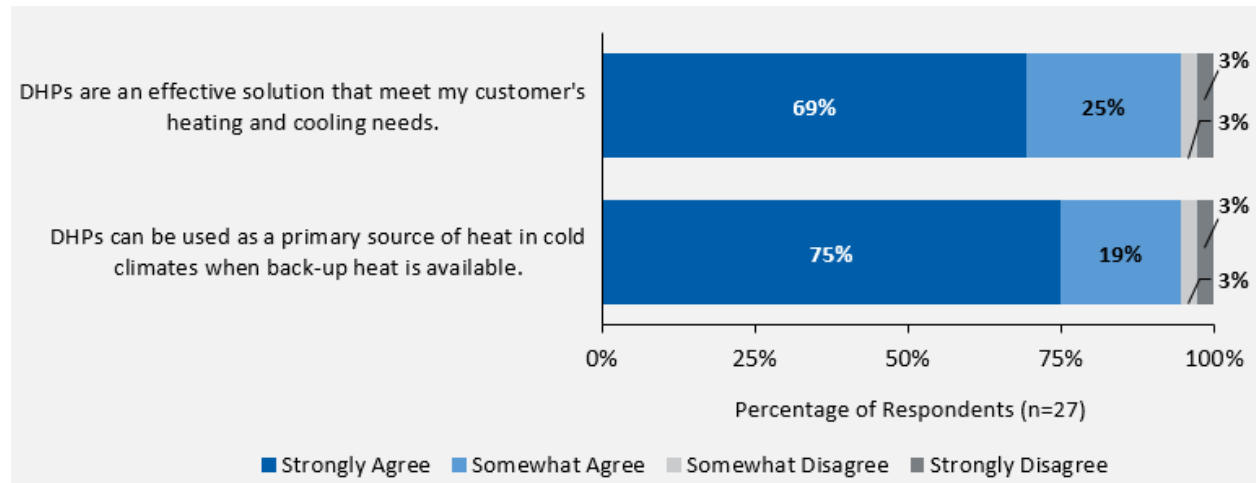
2020 DHPs in Cold Climates Installer Survey: Question G7: What criteria do you use to choose a DHP for installation in cold climates?

3.2.2. Installer Opinion of DHPs

Cadmus asked installers whether they agreed that DHPs provided an effective solution and whether they could serve as the primary heating source in cold climates when back-up heat is available. As shown in Figure 2, the vast majority of installers agreed with both statements, with 69% strongly

agreeing that DHPs are an effective solution and 75% strongly agreeing DHPs can be used as the primary heat source in cold climates when back-up heat is available.

Figure 2. Level of Agreement with DHP Statements



2020 DHPs in Cold Climates Installer Survey: Question C5: For each of the following statements, please tell me if you strongly agree, somewhat agree, somewhat disagree or strongly disagree...

Cadmus also asked installers for their opinions of DHPs as HVAC solutions. Cadmus coded the 36 open-ended responses, as shown in Table 6 (opinions from the oriented installers are shown in bold). All oriented installers (n=14) and most non-oriented installers (18; n=22) provided positive opinions. Of the four installers who did not provide positive opinions, none had received NWDHPP orientation. Non-oriented installers, despite mostly expressing positive opinions, were more likely to caveat that DHPs are best for certain applications or can face performance declines in low temperatures. Of the 32 installers who provided positive opinions, 12 specified that they only install DHPs for certain applications (eight of these 12 were non-oriented installers), and four mentioned that DHP performance can decline in low temperatures (all four were non-oriented installers).

As shown in Table 6, several installers said DHPs were better suited to certain applications than others: retrofits of existing homes rather than new construction, conditioning a specific area or zone rather than whole home, replacing electric resistance heating rather than a home with gas, and homes without ducting (or where ducting would be too expensive to install). There was also a mix of opinion among non-oriented installers regarding their performance in cold climates, though the range of temperatures that caused concern varied from below freezing to below 40 degrees Fahrenheit.

Cadmus surveyed one HVAC installer who did not install DHPs. This installer reported not having “confidence in them actually working.” Though stating DHPs were a good fit for some residential applications, this installer mainly expressed concerns that the equipment would not perform over time. In addition to lacking confidence in the technology’s performance, the installer said, “You have three or four years that you can get replacement parts, and then after that you have difficulty getting parts.”

An HVAC installer who installed DHPs also thought replacement parts might not be readily available, saying, “Parts not being readily available for repairs makes DHPs a poor choice for [a] primary heat source when there is no back-up heat.”

Table 6. Direct Quotes of HZ3 Installers’ Opinions of DHPs

Theme	Respondents (n=36)	Direct Quotes
<i>Positive Direct Quotes, No Reservations Mentioned</i>		
Positive Opinion, no reservations	16	<p>“They are the cat’s meow. I think they are great.”</p> <p>““I love them. The newer ones are much better. Very efficient and work in cold””</p> <p>“I think they are great. I wish I had one”</p> <p>“I think they are wonderful”</p> <p>“I think they are great.”</p> <p>“They are a great solution”</p> <p>“I think they are a great solution”</p> <p>“I think they are good for where we are.”</p> <p>“I think they are a good solution: they offer both heating and cooling.”</p> <p>“They are a thing of the future. They are getting better and better performance wise.”</p> <p>“I highly recommend them”</p> <p>“I think they are good for where we are”</p> <p>“I think they are an excellent product”</p> <p>“I think the products we use are great.”</p> <p>“I think they are a great option.”</p> <p>“I love them.”</p>
<i>Positive Direct Quotes Regarding Appropriate Application</i>		
Positive Opinion, general customer and home dependent	8	<p>“They work in many locations, easy to install and maintain. Great feedback from customers. Aesthetics are better now.”</p> <p>“They have their place for the cost. Install when people do not have duct systems. A solution for people with older homes with electric heat.”</p> <p>“I think they are good in some situations where they work and others that don’t”</p> <p>“They are pretty good, especially for someone in a market with electric heating already. It is a good alternative to electric baseboard heat. It is also a good alternative in situations where additional heat is required in a home that has electric heat.”</p> <p>“They have a role and a purpose. In certain situations they are a perfect solution.”</p> <p>“I think they have their place. Homeowner and home dependent on what they want and what would work”</p> <p>“Best for 85-90% of homes, unless gas is available.”</p> <p>“Fantastic, we offer them in many cases”</p>

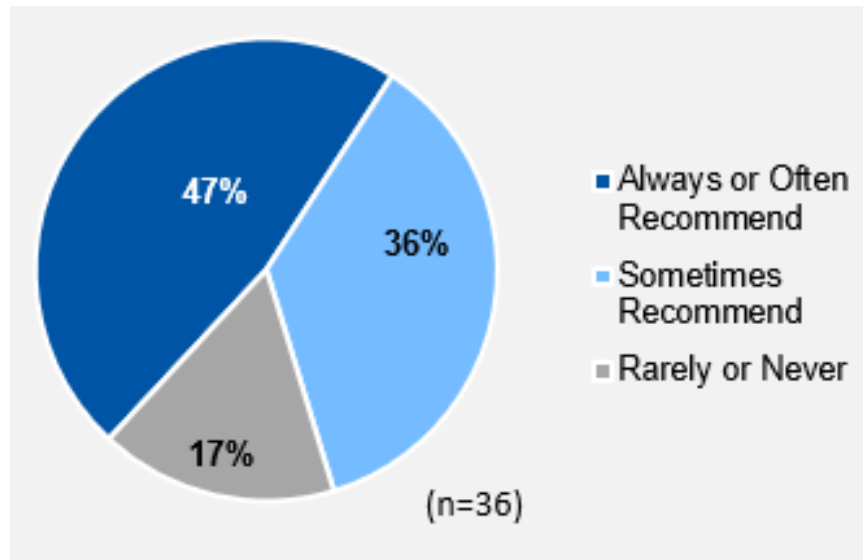
Theme	Respondents (n=36)	Direct Quotes
Temperature Constraints	4	<p>“I think they are working great, but they need back-up for 15-30 below”</p> <p>“They are good for cooling and for heating down to freezing, after that they are not as good.”</p> <p>“It is a good tool to have. Back-up heat is critical in the winter months.”</p> <p>“They are great in the right application. But, you have to know the applications and the limitations. They regularly get temperatures of 70-90 below with windchill.”</p> <p>“I like DHPs. They are a good solution. In our region the heat works very well until it gets to 40 below.”</p>
Zoning application, not whole home	2	<p>“I think for certain situations they are a great solution. It depends upon what you are looking for and the space. They work best for specific areas rather than an entire home.”</p> <p>“I think in the right circumstances it is a great fit. They are quiet, sleek, look good, great for zoning. The technology is definitely there.”</p>
Retrofit application, not new construction	2	<p>“I think they are a great resource for retrofit, and I don't think they work great for new construction”</p> <p>“I think they are good in a majority of applications. In new construction, ducted are better”</p>
<i>Neutral or Negative Direct Quotes</i>		
Temperature Constraints	1	<p>“The problem with heat pumps in cold climate is that it is really hard to get them to work to their efficiency, so I don't put them in for main source. I suggest forced air instead of heat pumps.</p>
Cost Concerns	2	<p>“They are pretty expensive for what they do.”</p> <p>“I don't like to buy anything foreign made. Put in a high-efficiency furnace instead--whole bunch cheaper for when it gets cold.”</p>
Aesthetic concerns	1	<p>“I think they are okay but could use some work. [Poor] appearance in high end homes”</p>

2020 DHPs in Cold Climates Installer Survey: Question: C6: What is your opinion about DHPs as an HVAC solution? Note: Bolded quotes are from installers that have received NEEA's orientation.

3.2.3. Installer Promotion of DHPs

Nearly half the installers reported frequently recommending DHPs to customers with electric heat, with 31% saying they “always” did this and 17% saying they “often” did (Figure 3).

Figure 3. Percent of HZ3 Installers that Recommend DHPs Systems



Source: Installer Survey Question D1: Would you say you always, often, sometimes, rarely, or never recommend DHPs to customers with electric heat?

Cadmus asked contractors why they “always,” “often,” “sometimes,” “rarely,” or “never” recommend DHPs to customers with electric heat and coded the open-ended responses (n=36). As shown in Table 7, contractors saying they “always” or “often” recommend DHPs were more likely to mention DHP’s lower operation costs.

Installers “sometimes,” “rarely,” or “never” recommended a DHP more often mentioned a home’s layout. These contractors explained they recommended DHPs in homes “where we are unable to install duct work or if it is labor intensive to install duct work.” The one installer who “never” recommended DHPs explained they are expensive to operate in cold temperatures. This non-oriented installer reported his customers need to run back-up heat when the temperatures drop below 44 degrees Fahrenheit, which causes their bills to increase.

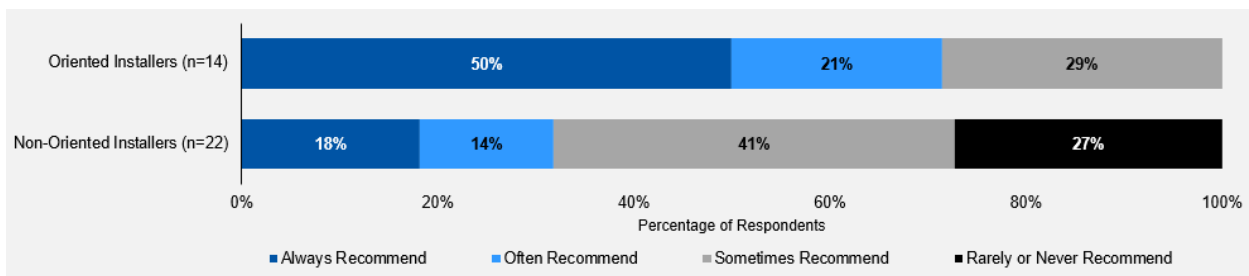
Table 7. Reasons Why HZ3 Installers Recommend DHPs

Reasons Recommend DHPs	Always or Often Recommend (n=17)	Sometimes Recommend (n=16)	Rarely or Never Recommend (n=3)	Total Mentions (n=36)
Layout of the home	2	10	2	14
Less expensive to operate	9	1	0	10
Energy savings	9	0	0	9
Ability to provide both heating and cooling	3	0	0	3
One of many heating and cooling options	0	3	1	4
Ability to install unit in aesthetically pleasing location	0	2	0	2
Increased home comfort	1	0	0	1
Too much customer education	0	1	0	1
More expensive to operate	0	0	1	1

Source: Installer Survey Question D2: What are the main reasons you [always, often, sometimes, rarely or never] recommend DHPs to customers with electric heat?

Fourteen of the 36 installers received orientation. Among these, 71% reported they “always” or “often” recommend DHPs to customers with electric heat compared to 32% of non-oriented installers (Figure 4).

Figure 4. Percent of HZ3 Installers that Recommend DHPs Systems: Oriented Installers Compared to Non-Oriented Installers



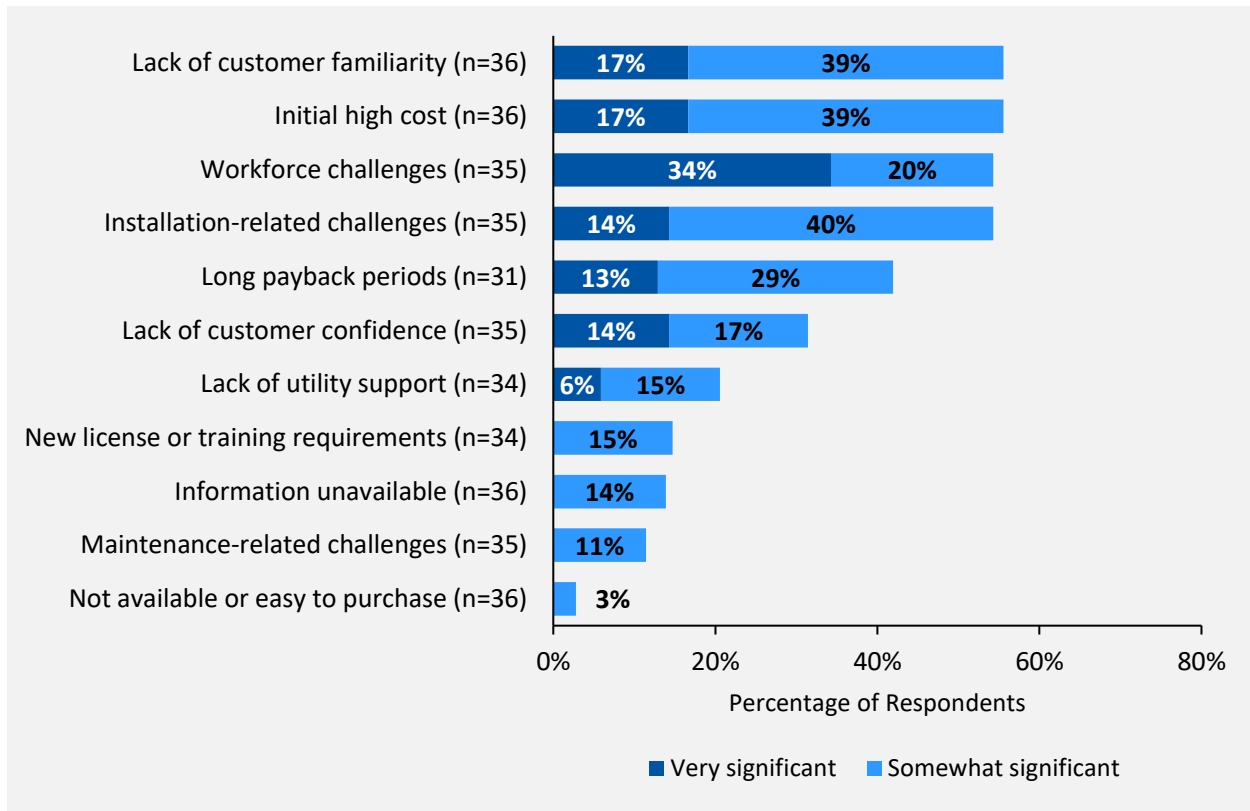
Source: Installer Survey Question D1: Would you say you always, often, sometimes, rarely, or never recommend DHPs to customers with electric heat?

3.3. Prevalence of Market Barriers in HZ3

Cadmus asked installers in HZ3 to review a list of 11 potential market barriers to selling or installing DHPs and asked them to rate how significant the challenge each of these posed to successful operation of their businesses. HZ3 installers identified the most significant market barriers they perceived. These included workforce challenges (e.g., finding sufficient trained installers), DHP’s initial high costs for customers, lack of customer familiarity and confidence in the technology, and installation-related challenges (Figure 5).

Four contractors further elaborated on installation-related challenges, reiterating that DHP placement in cold climates could raise challenges, specifically that “outdoor unit placement is critical to account for snow load.” None of the respondents rated DHP availability, maintenance-related challenges, lack of installation information, or new licensing or training requirements as “very significant” market barriers.

Figure 5. Significance of Market Barriers According to HZ3 Installers



Source: Installer Survey Question C3: Next, I'll read to you a list of potential challenges to selling or installing DHPs. Please rate how significant of a challenge each has posed to the successful operation of your business.

Though 6% of surveyed installers rated lack of utility support as a “very significant” challenge, less than half the contractors said equipment rebates were necessary for sales (43%, n=35). Seventy-three percent of installers reported that electric utilities provided their customers with rebates for DHP equipment or installations, as shown in Table 8.

Table 8. Number of HZ3 Installers that Reported Utilities Provide Their Customers with DHP Rebates by State

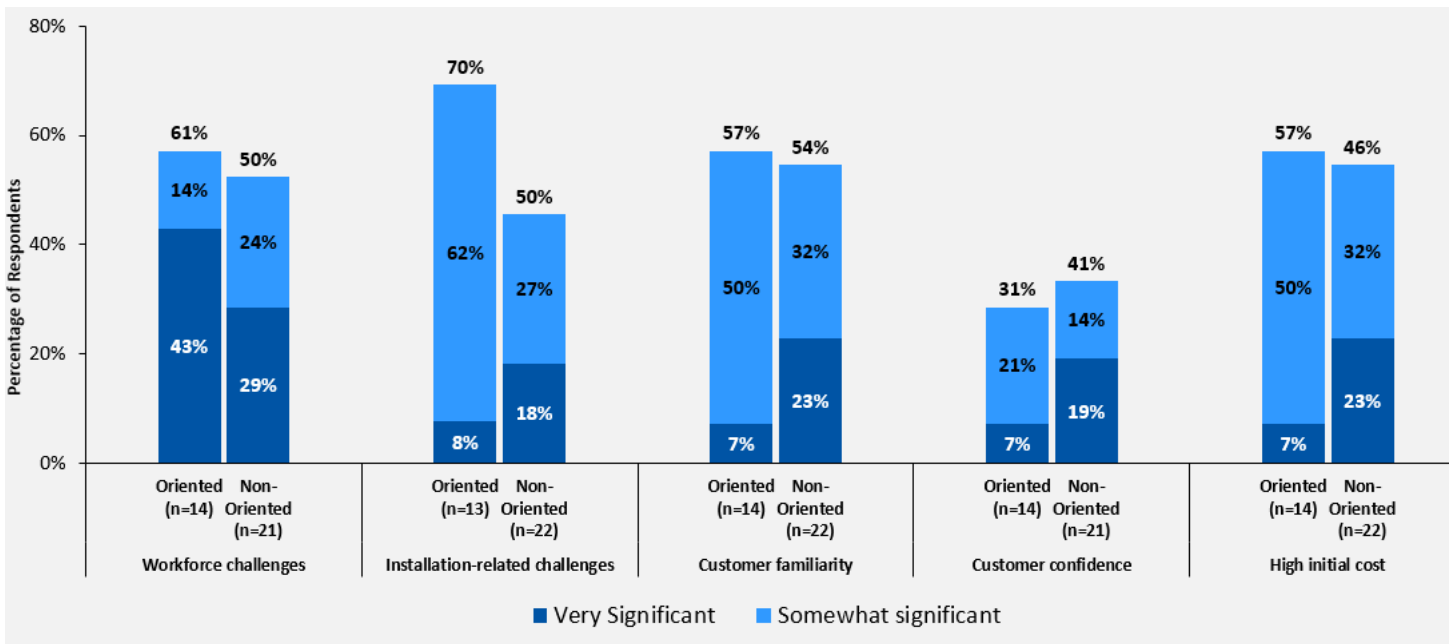
State	Utilities Provide Rebates	Utilities Do Not Provide Rebates	Don't Know	Total
Idaho	12	0	2	14
Montana	13	4	3	20
Oregon	2	0	0	2
Washington	0	1	0	1
Total	27	5	5	37

Source: Installer Survey Question B3: Do electric utilities servicing your residential customers provide rebates for DHP equipment or installation?

3.3.1. Comparison between Oriented and Non-Oriented Installers

Cadmus compared the most prevalent market barriers, or those that received the highest rating of “very significant,” between installers who received orientation through the NWDHPP and those who had not. Non-oriented installers tended to rate challenges as more significant, with nearly twenty percent or more of non-oriented installers rating each of the five prevalent market barriers as “very significant.” In comparison, only one out of 14 oriented installers rated four of the top five challenges as “very significant”. Notably, however, 43% of oriented installers rated workforce challenges, as “very significant.”

Figure 6. Rating of Most Significant Market Barriers, Oriented Installers Compared to Non-Oriented Installers



Source: Installer Survey Question C3: Next, I'll read to you a list of potential challenges to selling or installing DHPs. Please rate how significant of a challenge each has posed to the successful operation of your business

3.4. Drivers of DHP sales in HZ3

Installers rated DHPs’ ability to provide both heating and cooling, their performance in cold climates, and customer interest in the units as the top three reasons their business began installing DHPs. Installers reported that customer demand for DHPs has grown over the past year. This section further discusses installers’ motivations to sell DHPs as well as customer demand for DHPs within HZ3.

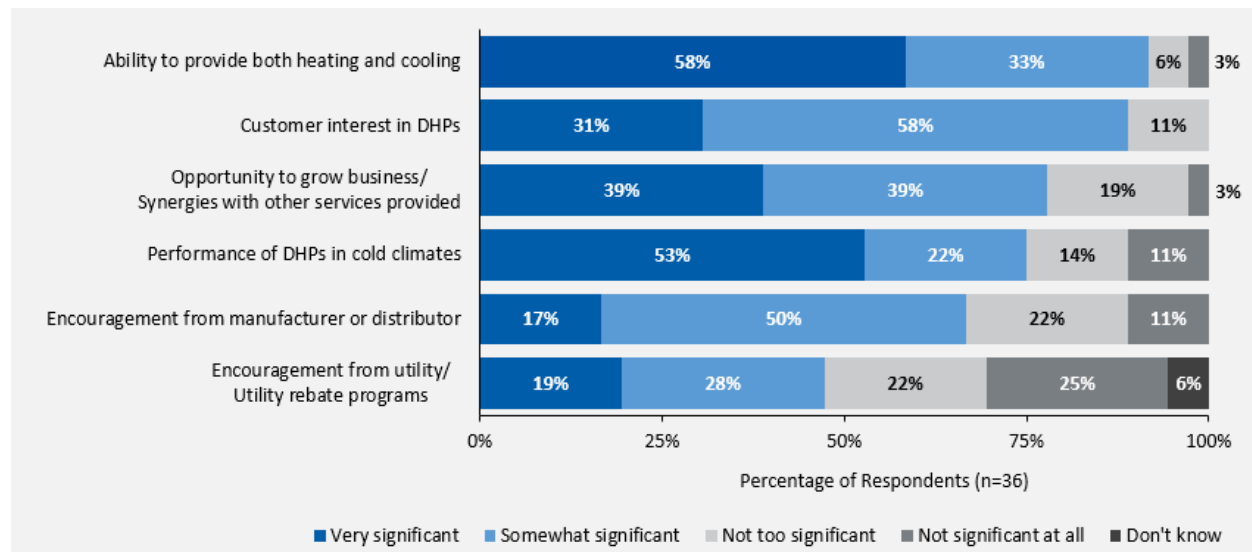
3.4.1. Installer Motivations to Sell DHPs

As shown in Figure 7, Cadmus asked installers to assess a list of six possible reasons their business may have started installing DHPs. More than half of installers rated five of these six reasons as “very” or “somewhat” significant.

Installers cited four primary reasons that motivated them to begin installing DHPs: DHPs’ ability to provide both heating and cooling, their performance in cold climates, customer interest in DHPs, and an opportunity to grow their business services.

Most installers rated DHPs’ ability to provide both heating and cooling and their performance in cold climates as “very significant” reasons—58% and 53%, respectively. In comparison, respondents said customer interest and the opportunity to grow their business were significant motivators, though not as significant as product capabilities and performance.

Figure 7. Reasons to Begin Installing DHPs by Level of Significance



Source: Installer Survey Question C1: I’ll read to you a list of potential reasons why your business may have started installing DHPs. Please rate how significant of a motivator each was for your business.

When asked for additional motivators, contractors cited the following (in order of most common to least):

- Technology is a good solution for a variety of residential applications (12 responses)
- Superior customer satisfaction, including fewer call-backs from customers (six responses)
- Energy efficient (six responses)
- Relatively easy installation that is less labor intensive (two responses)
- Higher gross profits (two responses)

The residential applications that installers said were a good fit included homes with electric heat rather than gas, homes without ducting, and when a zone or area of a home, such as a mother-in-law suite, needs conditioning.

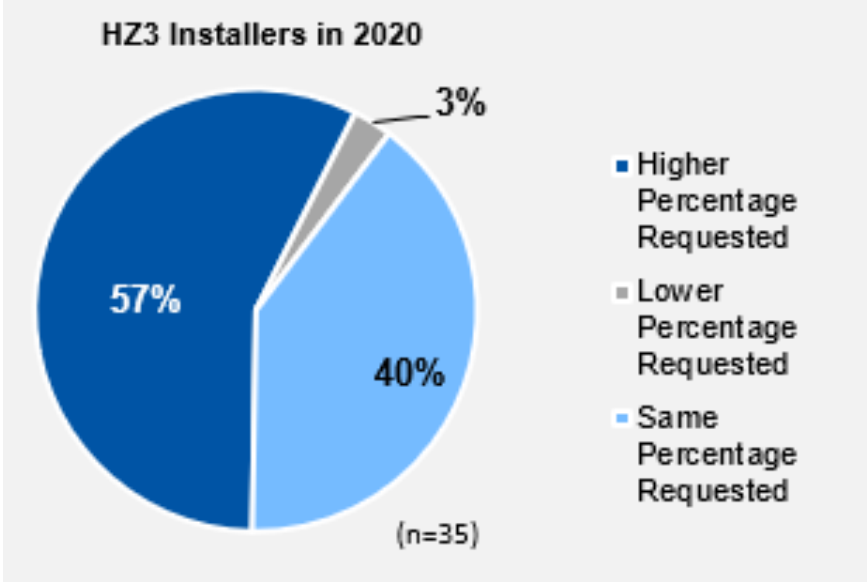
3.4.2. Customer Demand for DHPs in HZ3

Installers reported that customer demand for DHPs has grown over the past year; most installers said a higher percentage of customers requested DHPs than in previous years. Cadmus asked installers what

proportion of their customers specifically requested a DHP and whether the proportion had changed from prior years.

On average, installers (n=35) said 43% of their residential DHP customers specifically requested a DHP in the last year, and 57% (n=35) said this percentage of customers was higher than in prior years. Only one (3%) said the percentage of customers requesting DHPs decreased in the past 12 months. The remainder (40%) said the percentage was approximately the same as the previous years (Figure 8).

Figure 8. Percent of HZ3 Installers Saying a Higher, Lower, or Same Percentage of their Customers Requested a DHP



Source: Installer Survey Question D4: How does this percentage of customers specifically asking for DHPs compare to prior years?

4. Conclusions and Recommendations

Findings from this survey suggest that the DHP market is likely to continue to grow in HZ3. Installers report that DHPs are available, customer demand is increasing, and DHP product capabilities and performance in cold climates were the two primary motivators for installers to begin offering DHPs. That said, oriented installers—those who have participated in DHP orientation through the NWDHPP—are more likely to recommend DHPs to their customers and have a more positive opinion of DHPs than their counterparts who have not participated. In addition, the two groups perceive market barriers differently.

Cadmus presents the following conclusions with respect to installer perceptions of the DHP market in HZ3, along with recommendations to ensure market growth. These conclusions are supported by survey findings. Cadmus completed a telephone survey in 2020 with a representative sample of 37 HVAC installers from HZ3. However, the sample size decreased to 36 for findings related to DHP installation practices given one installer did not install DHPs.

Conclusion 1: DHPs are readily available for purchase in HZ3.

Cadmus found evidence that DHPs and DHPs rated or advertised for cold climates are readily available in HZ3. When Cadmus asked residential HVAC contractors who install DHPs to rate the significance of the challenge posed by DHP availability, 94% said it was “not significant at all” (n=36). Of the 988 residential DHP installations reported by surveyed installers, 72% were reported to be cold climate DHPs. Eighty-six percent of HVAC installers who installed cold climate DHPs reported that cold climate DHPs were typically available and in stock when needed for installation (n=28).

Recommendation: No recommendation associated with this finding.

Conclusion 2: Installers recommend DHPs to customers when they consider the units to be the most appropriate application; however, more than half of HZ3 installers recommend them infrequently.

Installers recommend DHPs when they consider them to be an appropriate HVAC solution for a customer’s home. Cadmus asked installers how often they recommend DHPs to customers with electric heat and why. Forty-seven percent of installers said they “always” or “often” recommend DHPs to their customers. A majority of that group cited lower operating costs or and/or energy savings as the main reasons they recommend DHPs. Most installers who reported “sometimes,” “rarely,” or “never” recommending a DHP cited a home’s layout as the main reason for recommending less frequently. Other less common reasons included aesthetic considerations, customer education, and the belief that DHPs are more expensive to operate in cold climates because of the need for backup heat. One respondent reported recommending a DHP when installing duct work proved impossible or not cost-effective. The one installer who said they “never” recommend DHPs explained they are expensive to operate in cold temperatures. This installer reported his customers need to run back-up heat when the temperatures drop below 44 degrees Fahrenheit, causing their bills to increase.

Cadmus asked for installers’ opinions of DHPs as HVAC solutions. Approximately one-third offered very positive opinions, saying that DHPs offered a “great” heating and cooling solution or that they recommended them. The rest of the opinions focused primarily on respondents’ views of appropriate technology-use cases. Installers said DHPs were better suited to the following conditions:

- Retrofits of existing homes rather than new construction
- Conditioning a specific area or zone rather than a whole home
- Replacement of electric resistance heating rather than a home with gas
- Homes without ducting or where ducting would prove too expensive to install

There was a mix of opinion regarding DHP performance in cold climates. In general, respondents said they are less effective in temperatures below freezing. One respondent said, in cold climates, it is “hard to get [DHPs] to work to their efficiency.” Another respondent reported needing back-up heat for temperatures 15 to 30 degrees below freezing, and another said the units were less effective in temperatures below freezing. Another respondent said the use of back-up heat during cold weather makes DHPs expensive to operate.

Recommendation: NEEA or utilities and program administrators should consider continuing to offer, or influencing the supply chain to offer, the development and dissemination of training and tools to assist contractors with appropriate DHP product selection, sizing and backup heat control strategy.

Conclusion 3: Installers who have not received DHP orientation through the NWDHPP recommend DHPs less frequently and are less likely to have a favorable opinion of the technology.

Installers who have participated in DHP orientation through the NWDHPP are more likely to recommend DHPs to their customers. Forty-eight percent of HZ3 installers said they frequently recommended DHPs to customers with electric heat. However, the percentage varies significantly when comparing oriented and non-oriented installers. Of 36 installers surveyed who install DHPs, 14 received orientation and 22 did not. More of the oriented installers frequently recommended DHPs to their customers, 71% compared to 32% of non-oriented installers.

Cadmus found qualitative evidence that oriented installers are more likely to have a positive opinion of DHPs than non-oriented installers. Oriented installers are less likely to express an opinion that DHPs are good in certain (but not all) applications or that DHPs can face performance issues in cold temperatures. These differences may explain why oriented installers recommend DHPs more frequently to their customers. When asked for their opinion of DHPs, all oriented and most non-oriented installers provided positive opinions; of the four installers who provided neutral or negative opinions, none had received NWDHPP orientation.

Recommendation: To ensure continued market growth of DHPs in cold climates, installers must perceive DHPs as an appropriate application and recommend this solution to their customers. Because training is key to installers’ perceptions, NEEA or utilities and program administrators should consider

continuing to offer, or influencing the supply chain to offer, cold climate-focused training materials to HZ3 contractors who have not participated in NWDHPP orientation.

Conclusion 4: Installers perceive a variety of challenges to selling and installing DHPs, including installation-related challenges, workforce challenges, customer familiarity, and high first cost.

Cadmus gave installers in HZ3 a list of 11 potential challenges to selling or installing DHPs and asked them to rate these challenges according to how significant each was to successful operation of their businesses. HZ3 installers identified the most significant market barriers they perceived; these included workforce challenges (e.g., finding sufficient trained installers), DHPs' initial high costs for customers, lack of customer familiarity and confidence in the technology, and installation-related challenges. Four contractors further elaborated on installation-related challenges, reiterating that DHP placement in cold climates could be challenging, specifically that "outdoor unit placement is critical to account for snow load." Over half the installers rated lack of customer familiarity as a "very" or "somewhat" significant challenge to selling DHPs. None of the respondents rated DHP availability, maintenance-related challenges, lack of installation information, or new licensing or training requirements as "very significant" market barriers.

Cadmus compared the most prevalent market barriers, or those that received the highest rating of "very significant," between installers who have received orientation through the NWDHPP (oriented installers) and those who have not. A greater proportion of non-oriented installers rated these barriers as "very significant," with one exception. Oriented installers rated workforce challenges as the most significant challenge, with 46% rating it "very significant."

Recommendations:

- Respondents identified workforce challenges as the most significant challenge to selling and installing DHPs, with oriented installers identifying it as their single greatest challenge. NEEA partners should explore working with community partners on workforce training programs.
- The other significant barriers were more common among non-oriented installers, underscoring the continued need for training for HZ3, as noted above.

Conclusion 5: Customer interest in DHPs has encouraged installers to offer DHPs and is growing, but some installers still perceive customer familiarity as a challenge.

Installers reported that customer interest in DHPs was a significant motivator for them to begin offering DHPs, with approximately one-third rating it as a "very significant" motivator, and another 58% rating it as a "somewhat significant" motivator. Installers also report that customer demand for DHPs has grown over the past year. On average, installers reported that 43% of their residential DHP customers specifically requested a DHP in the last year, and 57% said this percentage of customers was higher than in prior years. However, installers also perceived customer familiarity with DHPs and, to a lesser extent,

confidence in DHPs were significant challenges to selling DHPs. Over one-half of installers rated lack of customer familiarity as a “very” or “somewhat” significant challenge to selling DHPs.

Recommendations:

- To continue building customer demand, energy efficiency program administrators, manufacturers, and installers should continue to promote DHPs to consumers as an HVAC solution that can provide a variety of benefits. These benefits include those identified as most motivating based on research conducted for MPER 7: reducing monthly heating costs, providing both cooling and heating, providing more even heating (compared to zonal heat), not requiring duct installation, and coming with a five-to-seven-year warranty.
- To continue building customer demand, program administrators and market actors should ensure that product information and benefits are readily available online. Research conducted for MPER 6 and MPER7 found that consumers most frequently become aware of DHPs via word of mouth and internet advertising and, to a lesser extent, via radio or TV advertising. In addition, most consumers who are considering a DHP purchase first consult with friends, family, or colleagues and conduct internet research.

Appendix A. Survey Instrument

NEEA DHP Installer Survey in Cold Climates

NEEA’s Northwest Ductless Heat Pump Initiative: Market Progress Evaluation #8 determined that although it is likely that the market for ductless heat pumps (DHPs) will continue to grow across the region, some gaps remain in NEEA’s understanding of installers in heating zone 3 (HZ3), including these installers’ familiarity with, opinion of, and sales and promotion of DHPs in cold climates.

This following table shows a list of researchable questions and how they map to our research objectives and to the questions in the survey.

Research Objectives and Researchable Questions	Survey Questions
Investigate the availability of cold climate DHPs in HZ3 and DHPs in HZ3	
1. Are cold climate DHPs readily available?	G6
2. Are DHPs readily available?	C3, E1
Assess installer familiarity, opinion of and promotion of DHPs in cold climates	
3. Installations: Does the HVAC company install DHPs?	B2
4. Installations: Why do companies install DHPs? And, why don’t they?	C1, C2, E1, E2
5. Installations: How many DHP and cold climate DHPs have contractors installed in the past year?	G1, G4
6. Familiarity: What DHP brands do installers offer their customers?	Section F
7. Familiarity: Are installers familiar with DHPs that are advertised as working better in cold climates?	
8. Familiarity: What cold climate DHP product lines are installers familiar with?	
9. Installations: What cold climate DHP product lines do installers install?	G5
10. Installations: What criteria do installers use to choose a DHP for installation in cold climates?	G7
11. Opinion: What are installers opinion of DHPs as an HVAC solution?	C5, C6, E3
12. Promotion: Do installers promote DHPs to their customers? Why or why not?	D1, D2
Gauge the prevalence of cold climate specific market barriers to DHP adoption	
13. What are the challenges to selling or installing DHPs?	C3, C4
14. Do electric utilities provide rebates for DHP equipment or installation?	B3
Gauge the drivers of DHP sales in HZ3	
15. What percentage of customers have asked for a DHP? Are more, less, or similar number of customers requesting DHPs in comparison to previous years?	D3, D4
16. What need are customers trying to meet by installing a DHP?	G2, G3
17. Does customer interest motivate installers to start selling DHPs?	C1, C2
18. Are customer related barriers (e.g. customer familiarity with DHPs) a challenge to selling or installing DHPs?	C3, C4, E1, E2

* Denotes the question is the same as the 2019 installer survey fielded as part of MPER #8.

Target Quota = 35 completes with the following distribution:

State	Target Quota
Idaho	14
Montana	18
Oregon	2
Washington	1
Total	35

General Instructions

- Interviewer instructions are in green **[LIKE THIS]**
- CATI programming instructions are in red **[LIKE THIS]**
- Items that should not be read by the interviewer are in parentheses like this ().

Variables to be Pulled into Survey

- **[STATE]** where installer’s company is located
- **[TRUSTED PARTNER]** where installer’s company is located

A. Phone Introduction

A1. Hello, I’m **[NAME]** calling on behalf of the Northwest Energy Efficiency Alliance or “NEEA” and **[TRUSTED PARTNER]**. We are surveying residential HVAC equipment **experts** in **[STATE]** to better understand local installation practices. We would like to include your perspective in our research. We are offering a \$50 Amazon gift card to qualifying contractors who complete the survey. Would you be willing to participate and answer a few questions for me today?

1. Yes
2. No or not a convenient time **[ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME OR IF YOU CAN LEAVE A MESSAGE FOR A MORE APPROPRIATE PERSON]**
3. (Don’t know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
4. (Refused) **[THANK AND TERMINATE]**

A2. Are you the correct person to speak to about your company’s sales and installation practices of residential HVAC equipment?

1. Yes
2. No, person is able to come to phone **[ASK FOR PERSON WHO IS AND START AGAIN]**
3. No, person is not able to come to phone **[GET NAME AND PHONE NUMBER, SCHEDULE CALL BACK]**
4. (Don’t know) **[ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]**
5. (Refused) **[THANK AND TERMINATE]**

[IF RESPONDENT ASKS HOW LONG, SAY “APPROXIMATELY 15 MINUTES.”]

[IF NEEDED, STATE “THIS SURVEY IS FOR RESEARCH PURPOSES ONLY. ALL RESPONSES WILL BE KEPT CONFIDENTIAL. THIS IS NOT A MARKETING CALL.”]

B. Screeners

First, let me ask you a couple questions to see if you qualify for the survey.

B1. Does your company install residential HVAC equipment?

1. Yes
2. No **[THANK AND TERMINATE]**
3. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO WOULD KNOW AND START AGAIN. IF NO ONE, THEN THANK AND TERMINATE]**
4. (Refused) **[THANK AND TERMINATE]**

B2. *Does your company install ductless heat pumps, also known as DHPs or mini-splits in residential homes?

1. Yes
2. No
3. (Don't know) **[ASK TO SPEAK WITH SOMEONE WHO WOULD KNOW AND START AGAIN AT A1. IF NO ONE, THEN [THANK AND TERMINATE]**
4. (Refused) **[THANK AND TERMINATE]**

B3. Do electric utilities servicing your residential customers provide rebates for DHP equipment or installation?

1. Yes
2. No
3. (Don't know)
4. (Refused)

[TERMINATION LANGUAGE IF NEEDED, “THANK YOU FOR YOUR TIME TODAY.”]

C. DHP Installer Perceptions, Motivations and Challenges

Great, you qualify for the survey. Our first questions ask about why your company installs residential DHPs, any challenges you face to selling or installing them, and your opinion of DHPs.

[IF NEEDED: I'LL REFER TO DUCTLESS HEAT PUMPS ALSO KNOWN AS MINI-SPLITS AS DHPs GOING FORWARD]

[ASK SECTION IF B2=1]

C1. I'll read to you a list of potential reasons why your business may have started installing DHPs. Please rate how significant of a **motivator** each was for your business. Tell me if it was very significant, somewhat significant, not too significant, or not significant at all as a motivator for your business. **[READ LIST; REPEAT RATING SCALE IF NEEDED] [RANDOMIZE ORDER OF STATEMENTS]**

Rating			
Very significant	Somewhat significant	Not too significant	Not significant at all

1. Customer interest in DHPs
2. Performance of DHPs in cold climates
3. Opportunity to grow business/Synergies with other services provided
4. Encouragement from utility/Utility rebate programs
5. Encouragement from manufacturer or distributor
6. Ability to provide both heating and cooling

C2. Are there any other reasons your business was motivated to start installing DHPs? **[PROGRAM TO ALLOW FOR UP TO THREE "OTHER" VERBATIMS]**

1. (NO)
2. (YES) **[RECORD UP TO THREE REASONS]**
3. (REFUSED)

C3. Next, I'll read to you a list of potential **challenges** to selling or installing DHPs. Please rate how significant of a challenge each has posed to the successful operation of your business. Tell me if it has been very significant, somewhat significant, not too significant, or not significant at all as a challenge for your business. **[READ LIST; REPEAT RATING SCALE IF NEEDED] [RANDOMIZE ORDER OF STATEMENTS]**

Rating			
Very significant	Somewhat significant	Not too significant	Not significant at all

1. Lack of customer familiarity with the technology
2. Lack of customer confidence in technology
3. Workforce challenges (e.g. finding sufficient trained installers)
4. Maintenance-related challenges (e.g. technology not performing as expected)
5. Installation-related challenges (e.g. placement of DHP)
6. Information about DHP performance and installation practices is not available
7. DHPs are not readily available or easy to purchase
8. New license, certification, or training requirements
9. Lack of utility rebates or inability to access rebate program benefits
10. Long payback periods due to customers with low natural gas prices compared to the cost of electricity

11. Initial high cost of DHP for customers in comparison to cheaper, alternative solutions
- C4. Has your company encountered any other challenges related to selling or installing DHPs?
[PROGRAM TO ALLOW FOR UP TO THREE "OTHER" VERBATIMS]
1. (NO)
 2. (YES) **[RECORD UP TO THREE REASONS]**
 3. (REFUSED)
- C5. For each of the following statements, please tell me if you...**[READ RATING SCALE] [RANDOMIZE ORDER OF STATEMENTS]**

Rating			
Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree

1. DHPs can be used as a primary source of heat in cold climates when back-up heat is available.
 2. Equipment rebates are necessary to generate customer sales of DHPs.
 3. I do not promote DHPs to customers whose heating costs might increase if they get one (i.e. due to having low heating prices and high electricity rates).
 4. DHPs are an effective solution that meet my customer's heating and cooling needs.
- C6. What is your opinion about DHPs as an HVAC solution?
1. **[RECORD VERBATIM RESPONSE]**
 2. (Don't know)
 3. (Refused)

D. DHP Promotion and Sales

The next few questions are about when you recommend and how you sell DHPs.
[ASK SECTION IF B2=1]

- D1. *Would you say you always, often, sometimes, rarely, or never recommend DHPs to customers with electric heat?
1. (Always)
 2. (Often)
 3. (Sometimes)
 4. (Rarely)
 5. (Never)
 6. (Don't know)
 7. (Refused)

D2. **[ASK IF D1=1-5]** *What are the main reasons you **[D1 RESPONSE]** recommend DHPs to customers with electric heat?

1. **[RECORD VERBATIM RESPONSE]**
2. (Don't know)
3. (Refused)

D3. *In the past 12 months, about what percentage of your residential DHP customers came to you specifically seeking a DHP? As opposed to customers who were trying to improve their heating or cooling in general, but didn't specifically request a DHP.

1. **[RECORD PERCENTAGE]**
2. (Don't know)
3. (Refused)

D4. *How does this percentage of customers specifically asking for DHPs compare to prior years?

[READ LIST]

1. A higher percentage specifically requested a DHP in the past 12 months compared to prior years
2. A lower percentage specifically requested a DHP in the past 12 months
3. Approximately the same percentage specifically requested a DHP in the past 12 months compared to prior years
4. (Don't know)
5. (Refused)

E. Perceptions and Challenges of Installers that DO NOT install DHPs

Great, you qualify for the survey. First we'll ask why your company doesn't install DHPs and then ask about your opinion of DHPs.

[ASK SECTION IF B2=2]

E1. I'll read to you a list of reasons that may or may not have contributed to your business deciding not to install DHPs. Please rate how significant of a reason each was in your business' decision not to install DHPs. Tell me if it was very significant, somewhat significant, not too significant, or not significant. **[READ LIST; REPEATING SCALE IF NEEDED] [RANDOMIZE ORDER OF STATEMENTS]**

Rating			
Very significant	Somewhat significant	Not too significant	Not significant at all

1. Not part of our core business
2. Wasn't aware of DHPs
3. Lack of customer familiarity with the technology
4. Lack of customer confidence in technology
5. Lack of confidence in DHPs performance
6. Workforce challenges (e.g. finding sufficient trained installers)
7. Information about DHP performance and installation practices is not available
8. DHPs are not readily available or easy to purchase
9. New license, certification, or training requirements
10. Lack of utility rebates or inability to access rebate program benefits
11. Long payback periods due to customers with low natural gas prices compared to the cost of electricity
12. Initial high cost of DHP for customers in comparison to cheaper, alternative solutions

E2. Are there any other reasons why your business does not offer DHPs to residential customers?

[PROGRAM TO ALLOW FOR UP TO THREE "OTHER" VERBATIMS AND RATINGS].

1. **(NO)**
2. **(YES), [RECORD VERBATIM RESPONSE]**
3. **(REFUSED)**

E3. What is your opinion about DHPs as an HVAC solution?

1. **[RECORD VERBATIM RESPONSE]**
2. (Don't know)
3. (Refused)

F. Familiarity with DHP Brands and Cold Climate DHPs

Our next questions ask about your familiarity with various DHP brands.

[ASK SECTION IF B2=1]

F1. *Which DHP brands does your company currently offer to customers? **[MULTIPLE RESPONSES**

ALLOWED. READ BRAND NAMES IF NECESSARY]

1. Comfort Aire
2. Carrier (including Bryant, Midea, Payne)
3. Daikin
4. Friedrich
5. Fujitsu
6. Lennox
7. LG
8. Mitsubishi (including Trane/Mitsubishi, American Standard Mitsubishi)
9. Panasonic
10. Quietside
11. Samsung

12. Sanyo
13. York
14. Haier/GE
15. Other **[RECORD VERBATIM RESPONSE]**

F2. Are you familiar with DHPs that are advertised as working better in ***cold climates***? **[IF NEEDED: THE TERM “COLD CLIMATE” IS A GENERAL TERM USED TO DESCRIBE ANY LOCATION THAT EXPERIENCES EXTENDED PERIODS OF BELOW FREEZING TEMPERATURES. THESE DHPs ARE SOMETIMES CALLED “EXTENDED CAPACITY”, COLD CLIMATE, “LOW TEMPERATURE” OR OTHER NAMES FOR SYSTEMS THAT CLAIM TO MAINTAIN INTERIOR TEMPERATURES AT MORE EXTREME LOW AMBIENT TEMPERATURES. A COLD CLIMATE DHP CAN DELIVER 80% OF ITS RATED CAPACITY AT 5 DEGREES FAHRENHEIT]**

1. Yes
2. No
3. (Refused)

F3. **[IF F2=1]** Which of the following ***cold climate DHP*** product lines are you familiar with...? **[MULTIPLE RESPONSES ALLOWED. READ LIST AND MARK ALL THAT APPLY]**

1. Carrier Performance and Infinity Series
2. Daikin Aurora
3. Fujitsu Halcyon XLTH (Extra Low Temperature Heating)
4. LG Art Cool Premier and LG Red
5. Lennox MLA/MPB Series
6. Mitsubishi Hyper Heat
7. Panasonic Xterios XE
8. Samsung Max Heat
9. None of the brands listed, I’m familiar with...**[RECORD VERBATIM RESPONSE]**

G. Document DHP and Cold Climate DHP Installations

[ASK SECTION IF B2=1]

The next questions are about the number of DHP installations you performed this year, we do not need exact numbers –we are just looking for your best estimates.

G1. *In the past 12 months, approximately how many residential DHPs did you install (this includes installations in the single family, multifamily and manufactured homes)? Your best estimate is fine.

1. [RECORD NUMBER GREATER THAN 0]
2. None, I did not install any DHPs during the past 12 months
3. (Don't know)
4. (Refused)

G2. [IF G1=1] Of the [INSERT NUMBER FROM G1] DHPs you installed, what percentage of the installations replaced a customer's existing equipment in order to heat and cool their primary living space? And what percentage were installed in a newly heated area of the home such as a new addition, garage or bonus room?

Description	Percentage of DHP Installations
Installed to replace existing equipment in primary living space	a. [RECORD %]
Installed in newly heated areas of single-family home – like new additions, garages or bonus room	b. [RECORD %]

G3. Would you say most of your customers are interested in installing a DHP in order to improve either their heating or their cooling or ***both*** their heating and cooling? [DO NOT READ LIST, MARK ALL THAT APPLY]

1. (Just heating)
2. (Just cooling)
3. (Heating and cooling)
4. (Don't know)
5. (Refused)

G4. *[IF G1=1] Of the [INSERT NUMBER FROM G1] residential DHP installations you performed in the past 12 months, approximately how many were ***cold climate DHPs***?

1. [RECORD NUMBER GREATER THAN 0]
2. None, I did not install any cold climate DHPs during the past 12 months
3. (Don't know)
4. (Refused)

G5. **[IF G4=1]** Which *cold climate DHP* product lines do you install? **[DO NOT READ LIST, MARK ALL THAT APPLY]**

1. (Carrier Performance and Infinity Series)
2. (Daikin Aurora)
3. (Fujitsu Halcyon XLTH (Extra Low Temperature Heating))
4. (LG Art Cool Premier and LG Red)
5. (Lennox MLA/MPB Series)
6. (Mitsubishi Hyper Heat)
7. (Panasonic Xterios XE)
8. (Samsung Max Heat)
9. None of these brands, I install...**[RECORD VERBATIM RESPONSE]**

G6. **[IF G4=1]** Are *cold climate DHPs* typically available and in stock when you need them for installation?

1. Yes
2. No
3. (Don't know)
4. (Refused)

G7. **[IF G4=1]** What criteria do you use to choose a DHP for installation in *cold climates*?

1. Yes
2. No
3. (Don't know)
4. (Refused)

H. Closing

H1. Thank you for answering our questions! Before you go, can I get your name and email to send you the \$50 Amazon gift card? Your information will only be used to email you the gift card. We will not use your information for marketing. **[FILL IN FORM IF YES TO THE GIFT CARD]**

First and Last Name:

Email:

[IF RESPONDENT EXPRESSES INTEREST OR HAS QUESTIONS ABOUT NEEA: FOR MORE INFORMATION ABOUT THE NORTHWEST ENERGY EFFICIENCY ALLIANCE AND ITS WORK ON PROMOTING DHPS PLEASE VISIT NEEA'S WEBSITE AT WWW.NEEA.ORG]