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Study of Influences on Northwest Variable Speed Heat Pump Adoption

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Acronyms Used Throughout This Report

AHPC = Advanced Heat Pump Coalition

DHP = Ductless Heat Pump

NEEA = Northwest Energy Efficiency Alliance

NEEP = Northeast Energy Efficiency Partnerships

NW = Northwest

NWDHPP = Northwest Ductless Heat Pump Project/Program

SES = Socioeconomic scale

VSHP = Variable speed heat pump

Executive Summary

Variable Speed Heat Pumps (VSHPs), also known as variable capacity heat pumps and inverter-driven heat pumps, are heating, ventilation, and air conditioning (HVAC) systems. NEEA's nascent residential ducted/central VSHP program is being created, building on NEEA's now completed Ductless Heat Pump program, called the Northwest Ductless Heat Pump Program (NWDHPP). VSHPs can be ductless, ducted, or both.

Recent research completed by Lieberman Research revealed that market adoption (sales) of VSHPs in 2021 were robust—possibly beyond the early adoption phase of the technology[1]. In light of this, NEEA has an urgent need to clarify if NEEA's prior NWDHPP influenced not only DHP adoption, but also adoption of residential ducted VSHPs.

This research had two key research objectives:

- **Research Objective 1:** Determine influences on central ducted VSHP sales in the Northwest, including direct and indirect influences from NEEA's NWDHPP and other NEEA outreach initiatives
- **Research Objective 2:** Identify specific timing of any such influences on VSHP sales

Research Objective 1 aimed to identify the factors that influenced the uptake of ducted VSHPs in the NW market, based on respondent recollection of key events and potential influences. Respondents' feedback was first captured unaided (from memory), and then was aided via probing and discussion around a list of potential factors based on ingoing hypotheses from a secondary literature review and NEEA staff.

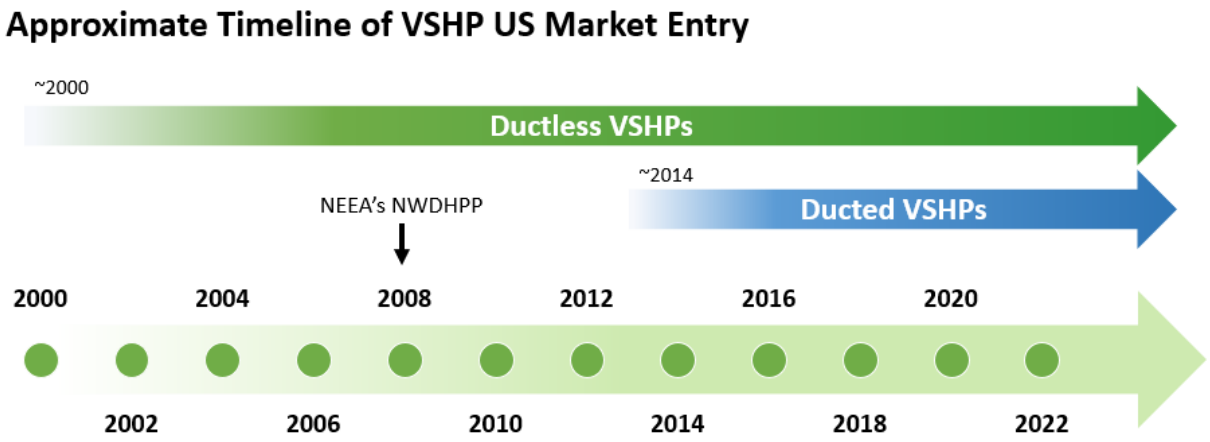
Research Objective 2 explored the timing of both ductless and ducted VSHP adoption. Respondents recalled their experience from when they first noticed the products on the market through the present time. They reflected on how sales have shifted, why, and when each driver was relevant. Each respondent was prompted using a journey map and insights were grouped by time period.

The study employed a mixed-method approach comprising secondary research and knowledge sharing sessions with NEEA, and primary research via interviews with HVAC suppliers in the NW and HVAC experts participating in the Advanced Heat Pump Coalition (AHPC). Respondent feedback relied on recall and thus the findings from this research only offer directional guidance about what influenced ducted VSHP uptake.

Key findings follow overleaf.

[1] Residential HVAC Contractor Market Research

Key Insight 1: Market adoption of ducted VSHPs began around 2014, approximately 10 years after ductless VSHPs came into the market



The majority of respondents reported that ductless VSHPs became available in the early 2000s, approximately 10 years prior to ducted VSHPs (~2014). However, adoption of ductless VSHPs was not prevalent until ~2006-2008 when the NWDHPP was piloted. NEEA may have had its greatest direct influence on the uptake of ductless VSHPs when the NWDHPP was in effect (~2010-2020), and subsequently, its impact may have indirectly driven receptivity towards ducted VSHP adoption.

Receptivity toward ducted VSHPs was reportedly high when they were first introduced. The Early Years of ducted VSHPs (~2014) coincided with the time period when the NWDHPP was well underway (until ~2020). Therefore, respondents believe that some of the NWDHPP initiatives and the program's momentum at this time could have also impacted the uptake of ducted VSHPs. However, sales were gradual until ~2016 when sales and interest reportedly grew. With time, ducted VSHP uptake was believed to be independent of NEEA. Not only did the NWDHPP's efforts lessen, but ducted VSHP uptake was also more strongly related to other drivers (e.g., social, economic, geographic, etc.).

Key Insight 2: NEEA's influence on ducted VSHP uptake is believed to be predominantly indirect through their engagement with market actors during their NWDHPP.

Respondents recalled that during NEEA's NWDHPP, NEEA intervened with market actors including manufacturers, utilities, and contractors to increase ductless VSHP sales. Specific outreach during the NWDHPP such as ductless VSHP training, the coordination of utility incentives, and the facilitation of consumer awareness had a substantial, direct effect on ductless VSHP uptake and perceptions toward variable speed technology overall.

In turn, respondents believed that the NWDHPP's success may have had some indirect influence on the ducted market – typically by means of fostering market acceptance (e.g., knowledge, skills, awareness) of similar variable speed technology and preparing market actors to have a comparable, open mindset towards ducted heat pump technology. As a result, the

NWDHPP may have been a gateway for the entry of ducted VSHP technology by lessening the initial barriers to entry.

More specifically, respondents said that NEEA's NWDHPP may have subsequently impacted the adoption of ducted technology in the following ways:

- **Manufacturer Sales Strategy:** Manufacturer, distributor, and retail engagement efforts to increase sales of ductless VSHPs may have laid the groundwork for supply chain adoption of variable speed technology before the availability of ducted VSHPs
- **Incentives:** Utility engagement and cost containment initiatives during the NWDHPP may have also encouraged the availability of incentives for ducted VSHP technology
- **Contractor Familiarity:** Installer support and training that occurred during the NWDHPP established contractor competency with variable speed technology prior to the launch of ducted VSHPs
    - However, manufacturers did not report NEEA influencing their training for ducted VSHPs
- **Contractor Recommendations:** Having some baseline knowledge and experience with ductless VSHPs via the NWDHPP initiatives may have fostered contractor confidence in the variable speed technology and, therefore, potentially enhanced their acceptance of ducted variable speed technology
- **Customer Interest:** The NWDHPP's marketing and promotional efforts may have raised awareness and created positive perceptions of variable speed/inverter technology before ducted VSHP availability

Key Insight 3: Manufacturers may have played an integral role in driving VSHP uptake by investing in and promoting new technology

Manufacturers appeared to have been a primary, driving influence of VSHP uptake through their introduction of technology and continual innovation in ducted VSHP solutions, contractor training, and promotional activities to customers. Following the success of ductless VSHPs in the US, respondents believed that overseas and domestic manufacturers introduced ducted VSHPs in response to the needs of the ducted, residential market. Manufacturer efforts in advancing VSHP technology and continuing to introduce more models to the product line helped to improve the product's performance and reliability. A few respondents suggested this may have also resulted in an increase in manufacturer competition, leading to a greater variety of options and solutions.

Contractor training not only allowed contractors to become familiar with the products, but also served as a form of engagement between contractors and manufacturers. Through this increased engagement, contractors became more loyal to the brands that they sold. This loyalty was sometimes furthered by additional perks, like lower warranty costs for their customers.

These activities by the manufacturer may have made contractors more likely to offer and sell ducted VSHPs.

Manufacturers' marketing and promotions also helped to entice consumers to purchase a ducted VSHP. Manufacturers were said to have ignited adoption of ducted VSHPs by offering extended warranties and low financing options, which helped cut down consumer upfront costs and increased the likelihood of a purchase.

This research found that NEEA's NWDHPP appeared to have an indirect effect on manufacturers' sales strategies by working with manufacturers to reduce costs, facilitating training for ductless VSHPs, increasing stock, improving technology, and providing manufacturers with marketing support. Due to the NWDHPP's marketing and outreach efforts with manufacturers, there may have been less of a need to educate the market on ducted VSHPs.

Key Insight 4: The biggest drivers of ducted VSHP uptake appear to be incentives, contractor recommendations, and customer interest.

Overall, many respondents recognized the high importance incentives, contractors, and customer receptivity play on driving ducted VSHP uptake. Many respondents said that incentives from manufacturers, governments, and utilities all simultaneously helped to negate the upfront cost barriers for ducted VSHPs while also providing endorsement and awareness for the products. For example, utilities will sometimes offer mail-in and instant rebates to their customers when installing a ducted VSHP. Federal and State governments will offer tax rebates received when filing taxes if a ducted VSHP is purchased. Manufacturers will sometimes offer mail-in rebates, warranty promotions, and special financing on certain products as well.

Respondents interviewed considered contractors to be pivotal market actors because they are needed to install and/or sell the technology. Respondents said contractors directly spread awareness about the technology and are key drivers in recommending ducted VSHPs as a premium option to their clients. Furthermore, contractors and consumers have developed an established level of trust that helps increase consumer confidence in the technology recommended by their contractors. Ducted VSHPs also reportedly have high revenue margins for contractors, further increasing contractor buy-in and motivation to sell.

Lastly, respondents said that customers in the NW were receptive and interested in the technology. The premium features of ducted VSHPs (e.g., comfort, energy efficiency) were appealing despite the high cost associated. Therefore, even customers who were not familiar with the specific VSHP technology, were open to contractors' recommendations and opinions.

This research found that NEEA's NWDHPP appeared to have an indirect effect on incentives, contractor recommendations, and customer interest. NEEA's facilitation of utility incentives for ductless VSHPs may have created a cohesive incentive market that utilities could build upon by adding additional incentives for ducted VSHPs. However, there is no evidence to show NEEA had a direct effect on the decision to introduce incentives.

Through contractor training and education, NEEA's NWDHPP helped to equip contractors with the knowledge and skills needed to confidently install ductless VSHPs. This prior experience may have carried over to their work with ducted VSHPs, potentially increasing contractor confidence and acceptance of ducted VSHPs.

Additionally, the NWDHPP's marketing initiatives may have raised awareness and created positive perceptions of variable speed/inverter technology, thus leading to a potential increase in customer interest when ducted VSHPs became available.

Key Insight 5: The Northwest is characterized by some unique attributes that may make it a "hotbed" for ducted VSHP sales.

The NW market was oftentimes described as a prime market for ducted VSHPs due to the following factors:

- Many said it is more climate conscious compared to other regions of the country, with many consumers having a "green" or environmentally friendly mindset. Consumers were described as willing to pay price premiums for energy efficient products.
- Respondents also reported that the NW has some of the lowest electricity costs in the country, making HVAC solutions that run on electricity more attractive to homeowners.
- The NW is believed to be a more educated market – one that is more aware of variable speed technology because of their proactive interest in energy efficiency, technology, and experience with ductless VSHPs/the NWDHPP.
- More affluent homeowners may be migrating to the Northwest, with both higher budgets for HVAC solutions and premium comfort expectations (e.g., cooling).
- Given many homes in the Northwest have existing ductwork, a ducted VSHP would be an appropriate choice if contractors want to match the current system when working on retrofit projects.

Key Insight 6: Despite there being some hesitancy, respondents were more open to ducted VSHPs when they first found out about them (~2014) compared to ductless

When respondents were first introduced to ductless VSHPs they described hesitancy toward the technology for a couple of reasons. First, it was very different from what they were used to, as they were not familiar with an HVAC system that is mounted on an interior wall, instead of using ducts. There was skepticism that consumers would accept the new technology since it was considered different and required a wall unit. Secondly, since variable speed technology was new to the US, there was skepticism about whether the product could do all that it promised. With time, respondents gained experience with the ductless VSHPs (sometimes due to the impact of the NWDHPP) and they were much more receptive to them. Respondents saw the efficiencies and the cost savings first-hand and exuded more confidence in ductless VSHPs' applications.

Comparatively, ducted VSHPs were met with less hesitation than ductless VSHPs. For one, a ducted VSHP resembled other outdoor non-variable speed heat pumps most contractors installed, so they did not have the same aesthetic issue. More importantly, contractors already had experience with VSHP technology through ductless VSHPs (sometimes attributed to the NWDHPP's engagement and training), so they had already established a high level of confidence the product could reach the reported performance and reliability. It was assumed that ducted VSHPs would be just as reliable as ductless.

Key Insight 7: While ducted VSHPs were met with high levels of openness and receptivity, it took a few years for them to gain sales in the market

Respondents reported that the sales of ducted VSHPs were lower than sales for ductless VSHPs when they were first introduced to the market in 2014. It took more time for contractors and consumers to adopt the technology despite market actors (e.g., distributors and utilities) being extremely open to ducted VSHPs. Of the few respondents who were initially more hesitant towards ductless VSHPs, there was some concern that the ductwork may negatively impact energy efficiency.

While contractors were already familiar with VSHP technology, additional training was needed for contractors to become more familiar with ducted VSHPs. Some may have been concerned about troubleshooting with new technology. Other respondents said that the high-ticket price and more time-consuming, and therefore expensive, installation of ducted VSHPs may have deterred consumers.

Key Insight 8: Technological improvements, contractor receptivity, customer interest, and incentives were key drivers in ducted VSHP sales

During the mid-years, several factors helped increase the uptake of ducted VSHPs. Any reliability or efficiency concerns of contractors and consumers would have been dissipated as manufacturers continued to improve technology. Some "spillover" from the NWDHPP may have also abetted contractor receptivity, customer interest, and incentive offerings to boost sales. As contractors received more training (typically from manufacturers), they may have been more confidence in installing and promoting ducted VSHPs as premium options for their customers.

Key Insight 9: Influences of ducted VSHP uptake may have effects on each other that create a complex "interplay" of influences

The key factors influencing uptake of ducted VSHPs appear to affect one another in various ways, creating an "interplay" of direct and indirect influences leading to greater ducted VSHP uptake. The direct factors that appear to have impacted the greatest number of other factors are advancing technology, incentives, and manufacturer sales strategy.

Introduction

Research Background

Variable Speed Heat Pumps (VSHPs), also known as variable capacity heat pumps and inverter-driven heat pumps, are a type of heating, ventilation, and air conditioning (HVAC) system, specifically for heating and cooling. NEEA's nascent residential ducted VSHP program is being developed; its current focus is central ducted air source VSHPs for space heating and cooling.

To understand the current VSHP Market landscape and degree of uptake, NEEA contracted Lieberman Research in 2021 to conduct research with HVAC contractors. A key finding of that research, the recently published Residential HVAC Contractor Market Research Study, was that VSHPs have greater adoption in the Northwest than NEEA expected.

NEEA hypothesizes a possible driver of this widespread adoption is their previous program for ductless residential heat pumps, the Northwest Ductless Heat Pump Project (NWDHPP), which existed between 2008 and 2020. NEEA contracted with Lieberman Research again in 2022 to conduct a qualitative follow-up study to both evaluate the validity of this hypothesis and better understand all other influences on VSHP market adoption with data from a broader array of market actors than the original HVAC contractor-based study. Understanding these influences is essential for NEEA to design a VSHP program that fully leverages influences already present in the market and zeroes in on areas that continue to need support, as well as to accurately estimate NEEA's naturally occurring baseline market share adoption curve.

Research Objectives

This study had two objectives:

RO1: Determine influences on VSHP sales in the Northwest, including direct and indirect influences from NEEA's NWDHPP and other NEEA market transformation work.

RO2: Identify specific timing of any such influences on VSHP sales.

The first research objective will inform NEEA's estimates on what degree of influence their previous NWDHPP had on the uptake of central ducted VSHPs, and other possible influences. The second research objective aims to create a timeline of the events and influences identified in the first objective. Both objectives will support NEEA's intervention development to increase market adoption of central ducted VSHPs across the Northwest and clarify influences on the naturally occurring baseline market share adoption curve.

Research Sample

Recruitment was not random. It was conducted using a list of pre-vetted recruits provided by NEEA. These recruits had long-term knowledge of the residential HVAC market and at least some familiarity with NEEA's NWDHPP.

Primary research was conducted with n=7 HVAC suppliers in the NW and n=6 residential HVAC experts participating in the Advanced Heat Pump Coalition (AHPC).

- HVAC suppliers included HVAC manufacturers, distributors, and manufacturer representatives from several different HVAC brands.
- AHPC members interviewed comprised a mix of members from different organizations including a regional energy efficiency organization, energy efficiency program implementation firms, utilities, NEEA staff, and federal government representatives. The AHPC is a group of utility and energy efficiency groups that aligned in their efforts to quicken the adoption of residential heat pumps.
- HVAC suppliers and AHPC members were intended to share both regional and national perspectives about the residential HVAC market dynamics.
- Interviews conducted with NEEA staff intended to gain clarity about NEEA's NWDHPP, and specifically residential HVAC background information.

Lieberman and NEEA jointly created this sample plan to optimize respondent feedback. This sample was developed to overcome a low incidence of individuals with long-term knowledge of the NW residential heat pump market, potentially going back to 2008, and familiarity with NEEA's NWDHPP. While NEEA's contact list dates back to 2008, few still work in the residential HVAC industry. Recruit efforts were also supplemented via an external recruitment service in an attempt to identify and schedule additional HVAC suppliers. However, efforts proved to be unsuccessful using this "cold-calling" method.

Table 1: Market actor self-reported territory coverage

Market Actors' Self-Reported Territory Coverage*						
Market Actor	**Washington**	**Idaho**	**Montana**	**Oregon**	**Area Outside NW**	**National**
Manufacturer/Distributor	5	5	5	7	2	0
Implementer	3	2	2	2	0	0
Regional Energy Efficiency Organization	0	0	0	0	1	0
Utility	0	0	0	0	1	0
Federal Representatives	0	0	0	0	0	1
Total**	**8**	**7**	**7**	**9**	**4**	**1**

*Market actors' location was not captured in this research

** Market actors reported working in multiple regions so total does not equal sample size.

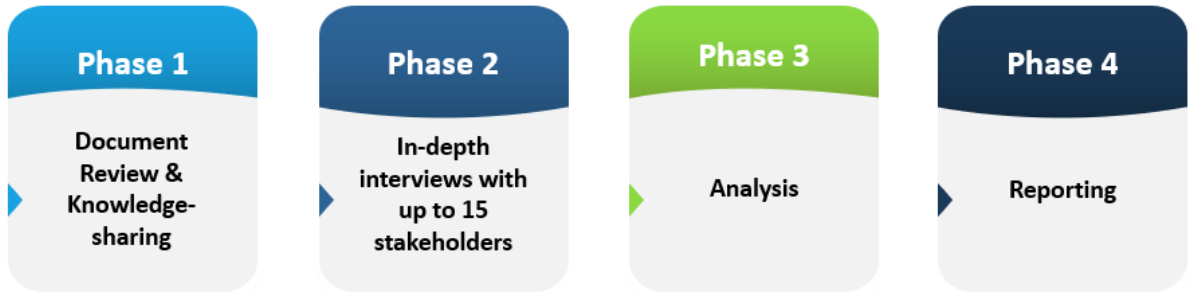
Table 2: Research Sample

Manufacturers and Distributors	Advanced Heat Pump Coalition Members		Total
7	6	***Comprising:*** • *3 implementers* • *1 federal representative working on ENERGY STAR® specifications* • *1 representative from northeast energy efficiency partnerships*	13

Research Methodology

This study employed a mixed-methods approach comprising of knowledge sharing sessions with NEEA's VSHP and NWDHPP program team, secondary research conducted using previous market research progress reports of NEEA's NWDHPP, and qualitative data from interviews with both HVAC suppliers and members of the AHPC. Note that some NEEA staff members who provided knowledge worked on both NEEA's VSHP and NWDHPP program teams. Qualitative in-depth interviews took place between May 17, 2022, and June 23, 2022.

Figure 1: Methodology Overview



PHASE 1: Pre-interview Document Review

Using marketing materials, Market Progress Evaluation Reports of NEEA's NWDHPP, and other relevant reading material, Lieberman conducted secondary research to create ingoing hypotheses of potential influences, and specifically what influences NEEA's NWDHPP may have had on ducted VSHP uptake. The information learned from the secondary research also informed discussion guide creation and topics to probe during in-depth interviews.

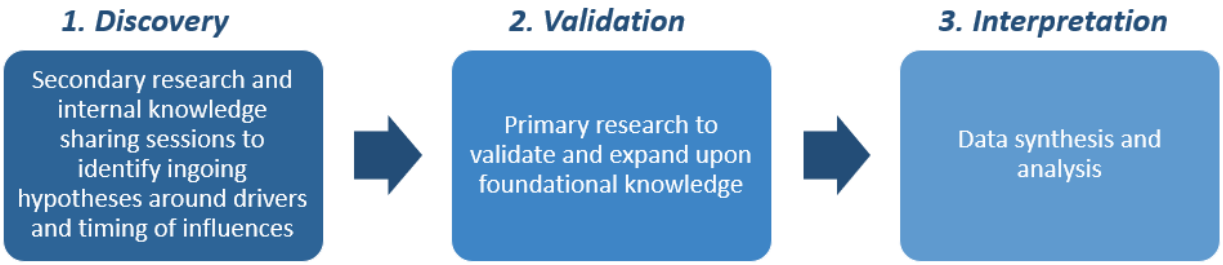
PHASE 2: In-depth Interviews

A total of 13 interviews were conducted with HVAC suppliers and AHPC members. Interviews were 45 minutes in length and were conducted over web-enabled platforms Civicom and ZOOM. All interviews were audio-recorded, and when possible, video-recorded.

PHASE 3: Analysis

Data analysis was iterative and began on the first day of data collection. The approach comprised a continuous process of coding, synthesis, and triangulation from all data sources.

Analysis comprised three phases:



PHASE 4: Reporting

Lieberman Research began preliminary analysis on May 17, 2022. On May 31, 2022, Lieberman Research conducted an Insights Immersion workshop with NEEA staff to share initial findings, discuss learnings, and jointly interpret data. The Workshop occurred after n=7 interviews had been conducted and data collected.

The final iterations of analysis took place upon interview completion, June 23, 2022. This phase involved crafting the final report.

Study Limitations

Due to the retrospective nature of this research, findings are reliant on respondent memory and recall. While respondents were able to recall key events, they often had difficulty remembering specific details. The main data source for this study is qualitative interviews; all findings are thus derived from interviewees' perceptions and perspectives.

Additionally, the sample of study participants was not random but instead composed of individuals deemed to be at least somewhat familiar with NEEA and its work based on records of their past interaction with the NWDHPP. As a result, the findings are derived from Lieberman's inferences and interpretations from the primary and secondary research. Due to this approach and small sample size, the findings from this research only offer directional guidance about what influenced ducted VSHP uptake.

In addition, while Lieberman also collected unaided findings, the majority of the research was based on aided findings to stimulate recall and collect as much data as possible. Given this, we acknowledge that this method could introduce bias. Please see Appendix A for the full list of unaided drivers.

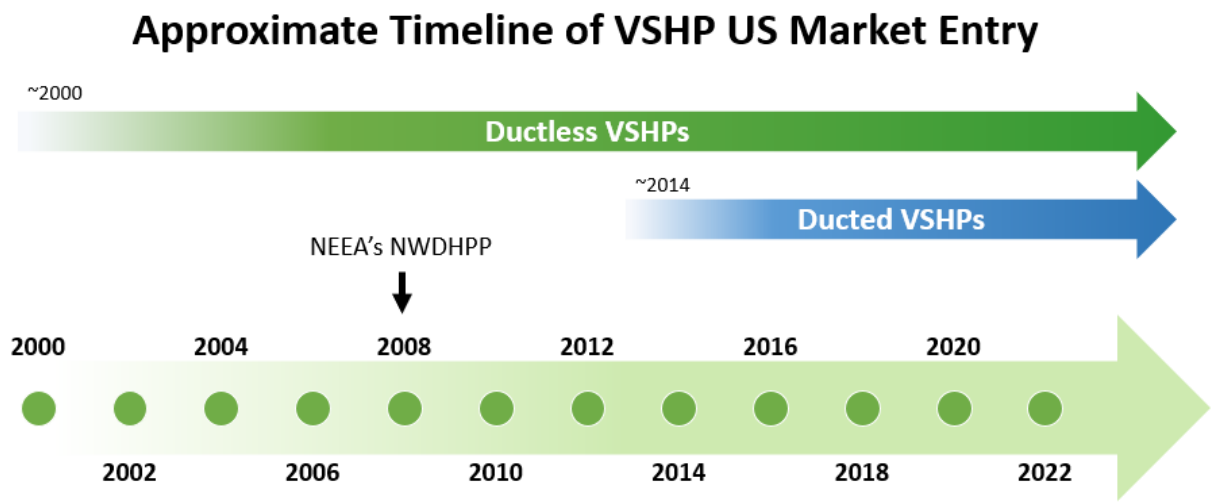
Detailed Research Findings

Introduction

When reflecting on the timing of key influences on VSHP sales, most respondents were able to recall factors and events and their approximate time periods, though were less able to recall specific dates or years. Overall, there was broad consensus that ductless VSHPs launched at least 10 years before central ducted VSHPs, in the early 2000s, but only gained greater market traction around 2006-08, during the time NEEA launched the pilot NWDHPP in 2008.

Central ducted VSHPs first entered market consciousness in around 2014, when manufacturers began launching these products and promoting them to contractors and consumers. Respondents described themselves as being more open to these systems than they were initially toward ductless VSHPs, driven in large part by their positive experiences with ductless VSHPs. However, while receptivity toward ducted VSHPs was high in the beginning, sales were slow and gradual until the midway (2017-19) and recent years (2020-2022).

Figure 2: VSHP Timeline (both ducted and ductless)



Timeline developed via secondary data and validated via respondent interviews

Timeline of Ductless VSHP Uptake

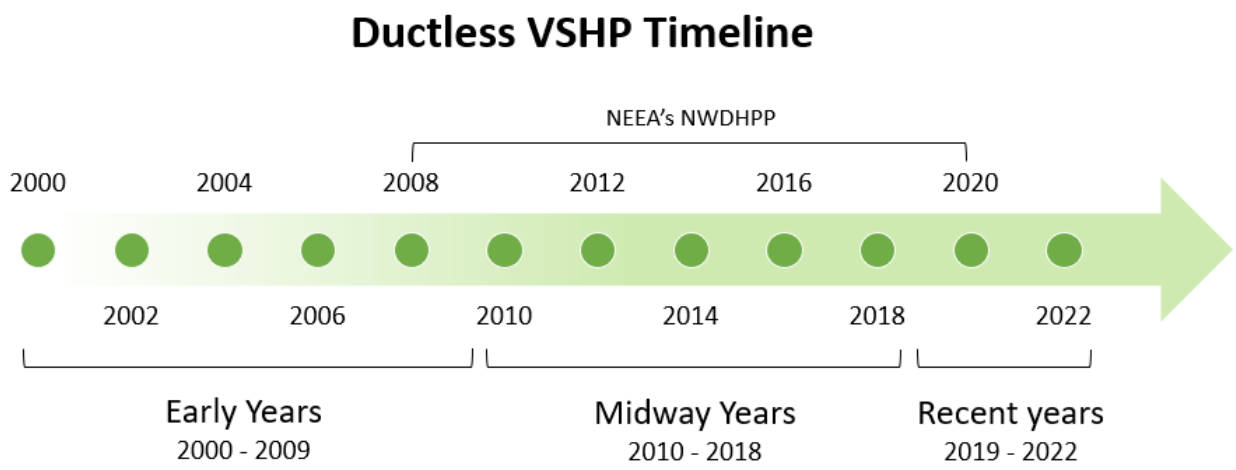
Overview

The timeline of ductless VSHP uptake in the Northwest spans at least two decades. In the beginning, there was modest and gradual market penetration in the residential sector in the early years fueled by the introduction of incentives, increased contractor familiarity, and the technology proving itself with high efficiency. This was followed by a steady increase and widespread adoption in the midway years due to increased involvement from NEEA and its

partner utilities, decreased upfront cost for consumers, higher consumer interest, and technology advancement. In more recent years, sales are organic without involvement from organizations such as NEEA, with ductless VSHPS a standard consideration. When respondents were asked about how sales trends of ductless VSHPs have changed in the last 5 years, there was a broad consensus that sales were steady. However, single-zone ductless VSHPs have decreased, and sales of multi-zone ductless VSHPs have increased. While consumers are still requesting ductless VSHPs, they may opt for multiple zones to increase comfort in their homes.

The following describes the timing of influences that facilitated market uptake of ductless VSHPs since their launch in the US.

Figure 3: Ductless VSHP Timeline



Initial market perceptions toward ductless VSHPs

Respondents had mixed views about when ductless VSHPs first appeared in the US market, but most believed they appeared in the early 2000s, and most first learned about their availability in the US through manufacturers. A couple had seen ductless VSHP systems abroad in Asia, in the 1980s and early 1990s, but said it took some time before manufacturers offered the products in the US.

According to respondents, when ductless VSHPs first appeared in the NW, they were generally met with moderate openness from contractors. The technology was new and there was skepticism that US consumers would embrace a wall-mounted system due to their perceived low aesthetic appeal, and the belief that consumers wouldn't be interested in "spot" cooling and heating (versus a whole-house solution).

Additionally, there was some concern that ductless VSHPs wouldn't work in the NW due to the perception that VSHPs were intended for warmer weather climates, versus colder weather climates. Respondents also suggested an underlying, general uncertainty around adopting unfamiliar technology that could prove difficult to work with or find replacement parts for.

> *"We didn't think that it would work in our market…it was always the perception that a heat pump could not work in cold climates." – HVAC Supplier*

> *"The contractors at the time were not real big on what we called the giant [system] up on your wall. They didn't think people would accept them." – HVAC Supplier*

> *"One, I don't understand them, two, who carries them, three, where do I get parts? … So, it's like, 'Great. Here's another product that I can't fix without involving special products, making sure I've got the right thing'." – HVAC Supplier*

The table below lists respondent openness to ductless VSHPs initially when they first heard about them compared to their openness currently. All respondent reported a lower openness when they initially heard about ductless VSHPs compared to now.

Table 3: Ductless VSHP Openness Scores

	Initial Openness *(Out of 7, with 7 being extremely open)*	Current Openness *(Out of 7, with 7 being extremely open)*
ALL	4.7	6.8
AHPC Members	5.0	6.6
Manufacturers/Distributors	4.3	7.0

Earlier years: ~2000-2009

Initially, uptake of ductless VSHPs was slow and gradual. Their perceived applicability was limited to commercial, cooling-only settings, such as in server rooms, or for cell phone companies who were rapidly expanding their cellular sites at the time. However, a few years after their introduction, market uptake of ductless VSHPs in residential settings increased, facilitated by several factors:

- Proven efficiencies
- Contractor familiarity and confidence in product performance
- Customer receptivity
- Incentives and tax rebates
- Government-mandated refrigerant changes

Proven efficiencies

Ductless VSHPs demonstrated energy efficiencies that were higher than expected, and better than promised by manufacturers. Their performance ratings were particularly impressive to contractors as they were higher than anything else on the market at the time.

> *"People stood up and took notice because we were seeing efficiencies during the coldest part of the winter that were beyond, in some cases, what the manufacturers said we should be seeing… When people started hearing that, they were more willing to try it. So, we saw an uptick in sales pretty significantly, right after that." – HVAC Supplier*

Contractor familiarity and confidence in product performance

In the early years, manufacturer investment in training and education was an important facilitator in equipping the industry with the know-how to properly install ductless VSHPs, and the understanding of the product's advantages to help sell them to US consumers. As contractors gained more experience with ductless VSHPs, they saw clear evidence of their efficiency and performance which gave them the confidence to promote ductless VSHPs to consumers and find greater use applications in residential homes. More evidence is needed to determine if this initial familiarity was due to early NEEA involvement before the NWDHPP started.

> *"We felt very confident that the numbers that were being published by the manufacturer were true…And so we went to the market and very confidently told our distribution channel and the installing contractors that they could trust these numbers. And they believed us. They gave it a shot and they came to believe it themselves." – HVAC Supplier*

> *They had proven to be workable and usable in the United States because they were in Asia and Europe for much, much longer, and successful there." – AHPC Member*

> *It was gradual primarily because if there was a ducted solution, and there often were, that was probably reached for just as often as a ductless solution. But then as the suitability and the experience with these products grew, we did more ductless." – AHPC Member*

Customer receptivity

A few years after they first became available, early adopters embraced the product's features and advantages, and contractors were surprised by the residential market's receptivity to ductless VSHPs.

> *"They had some operating characteristics that I think were more beneficial. They were quiet, they were compact, they were easy to put in existing buildings." – AHPC Member*

Incentives and tax rebates

Respondents believed that, during the early years, incentives offered by the government by means of tax credits and rebates from the utilities were highly influential in driving the adoption of ductless VSHPs. Incentives also doubled as a means to raise awareness and attention to ductless VSHPs:

> *"Because of the rebates, contractors became aware and tried to educate their customers. And so, I would say the rebates were big." – HVAC Supplier*

Government-mandated refrigerant changes

In around 2006 it was reported that the EPA changed the refrigerant codes and mandated that refrigerant be changed from the R22 type refrigerant to 410. Because ductless VSHPs were already using this new style of refrigerant, they were already readily available to be sold. These refrigerant changes also forced manufacturers to design their products differently to meet these specifications.

> *"At that time, there was a government mandate for refrigerant changes, and that was the start of the conversion from R22 products to 410. And a lot of the ductless products were... They had made the switch already, that they were leading the industry." – HVAC Supplier*

Midway: 2010 - 2018

During the midway period, sales, and uptake of ductless VSHPs grew substantially thanks to a combination of factors:

- NEEA's NWDHPP
- Technology advancement
- Greater customer interest
- Reduced upfront cost for consumers
- Sales approaches

NEEA's NW Ductless Heat Pump Project

Many respondents believed that NEEA's active pursual of market change through its NWDHPP started to have an impact almost as soon as it began, around 2008-10. NEEA identified key barriers in the market against ductless VSHPs and took steps to reduce them. Through NEEA's many marketing campaigns including the GoingDuctless website, they educated both contractors and consumers on ductless options and their benefits. NEEA facilitated many training sessions for contractors as well. This gave contractors more hands-on experience with ductless technology as well as taught them best installation practices. NEEA also supported partner utilities with their marketing campaigns which also helped spread awareness to consumers.

> *"I think they had a substantial impact. I mean, their programs and their support of the utilities, the member utilities played a huge role in getting the word out about the technology." – HVAC Supplier*

> *"We identified consumer education awareness and installer education awareness as a couple of the major barriers to the market. And so, we were looking out to look at best practices, examples of these kinds of resources and Going Ductless [NEEA's NWDHPP website] stood out one of those early resources that was pretty rare." – AHPC Member*

Technology advancement

Manufacturers' efforts to advance and improve ductless VSHP technology, and their creation of a greater variety of models, drove customer choice and appeal. Ductless VSHP performance

improved over time, helping customers to save more on energy and costs. Ductless VSHPs also were able to operate more efficiently at extremely low temperatures which drove customer interest in the NW.

Greater customer interest

Respondents recalled seeing an increase in consumer interest in ductless VSHPs during this time, driven primarily by their energy efficiency. Consumers were wanting efficient equipment not only to save money, but also to install more environmentally friendly equipment. As the nation's push for solutions to slow climate change heightened, consumers became more thoughtful about their energy choices.

Reduced upfront cost for consumers

Ductless VSHPs became a more viable solution for consumers as they became less expensive to install. Incentives and tax rebates helped many consumers afford the product, and some respondents claimed the price of ductless VSHPs themselves also lowered during this time:

> *"Around 2013-2012 maybe, variable speed ductless became more cost-competitive to single speed ductless. Still more expensive, but no longer quite the same premium. It became a more viable product line." – AHPC Member*

Sales approaches

Contractors had developed strong trust and conviction in ductless VSHPs that led them to recommend ductless VSHPs more often to their customers. Contractors leveraged incentives and tax rebates to help keep the cost down for their customers while also using them to sway customer decisions. Respondents believed contractors also needed to find ways to differentiate themselves during the housing crisis, and ductless VSHPs helped many contractors stay afloat.

> *"One of the bigger drivers is a contractor's point-of-sale presentation of that product. Yes. That is to say to walk into a home or a business and find the suitability of that product to be an ideal fit for a customer's needs. I think that's the strongest driver, in my opinion: their conviction in the product." – AHPC Member*

Recent years: 2019 - 2022

In more recent years, the following factors were said to facilitate ductless VSHP uptake:

- Continual improvements in ductless VSHP technology
- Natural sales growth

Continual improvements in ductless VSHP technology

In recent years, ductless VSHPs have become a standard installation that many consumers continue to choose. There are a greater variety of models today, with options for multi-head

installations that allow greater zonal control for consumers. The aesthetic "look" of ductless VSHPs have also improved driving greater customer appeal.

> *"We've seen it work. We've seen the technology only improve and, in my market, we have seen mini-split heat pumps outpace unitary equipment across all sectors, and that's residential and commercial at the distribution level. And so, it's a very, very accepted way to heat and cool." – HVAC Supplier*

Organic sales growth

Ductless VSHPs continue to remain highly successful. They are recognized as an established player in the HVAC market and sales are driven by more organic growth. Many consumers have confidence in the product, and it is endorsed by many contractors for its efficiency and ease of installation.

Around this time incentives were also lowered as there was less of a need to incentivize consumers. Sales are now less dependent on incentives compared to earlier years when homeowners needed the motivation to try a new and less well-known technology.

Most respondents familiar with NEEA's NWDHPP believed that NEEA's influence in driving ductless VSHP uptake has lessened in recent years as well. For example, consumers were no longer being directed to the GoingDuctless.com website as much as in previous years, and they also believed there were fewer rebates and incentives during this time. NEEA's approach was said to be more hands-off as their efforts from prior years were evidently well underway.

> *"Interestingly, I think it was adopted much more as a mainstream solution for people, and I don't think we were driving people to the GoingDuctless website quite as much." – AHPC Member*

Ductless-ducted hybrid solutions

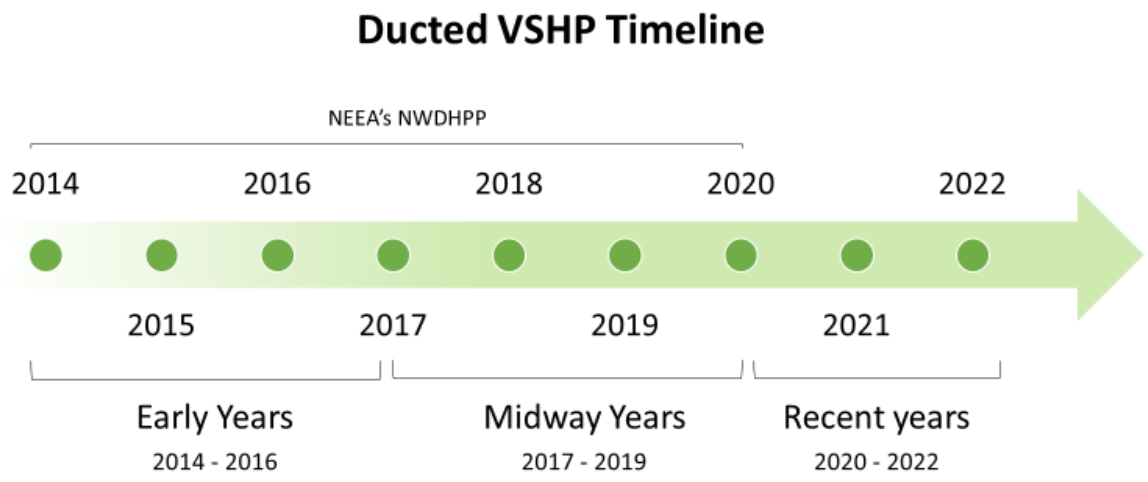
There are additional ductless options that do not require a wall-mounted unit. A few respondents cited a new hybrid solution that combines a traditional ductless VSHP with short runs of ductwork that allow the ductless head to be recessed into the walls or ceiling. One respondent mentioned the use of a ductless VSHP outdoor unit being used with traditional fan coils or furnaces. These new options may add increased flexibility for homeowners considering a ductless unit, which may lead to additional VSHP uptake.

Timeline Overview of Ducted VSHPs

Overview

The timeline of ducted VSHP uptake in the Northwest began around 2014, when respondents said they first became available in the Northwest. The early years were characterized by strong market openness and appreciation of the product which respondents speculate could be the product of NEEA's involvement in the ductless VSHP space as the NWDHPP was still active at this time. There were slow sales and uptake initially due to the high upfront cost. Sales of ducted VSHPs began to grow noticeably in the midway years, due in large part to incentives, advancing technology, and contractor sales efforts. These factors continued to drive sales in recent years with the possible addition of more direct NEEA involvement. When respondents were asked about how sales trends of ducted VSHPs have changed in the last 5 years and there was a broad consensus that sales have increased.

Figure 4: Ducted VSHP Timeline



Initial market perceptions toward ducted VSHPs

Most respondents reported seeing ducted VSHP options appear in the NW market around 2014, with a couple claiming to have seen them as early as 2008. Many recalled learning about ducted VSHPs through manufacturer marketing. Initially, ducted VSHPs were met with greater acceptance from contractors and consumers than when ductless VSHPs were first launched. Contractors were already familiar with the benefits of variable speed technology, and application via a ducted solution simply built on the momentum that was started by ductless VSHPs.

> *"I was extremely open to it at that point because we felt that it had been proven through mini splits." – HVAC Supplier*

While market interest and receptivity to the benefits of ducted VSHPs was strong, sales were slow and gradual initially due to a few factors such as their high upfront cost, the potential learning curve for contractors, and some perception that there may be a drop in capacity in a whole-home ducted system.

The table below lists respondent openness to ducted VSHPs initially when they first heard about them compared to their openness currently. All respondent reported a lower openness when they initially heard about ducted VSHPs compared to now. As seen in the table, they reported higher initial openness similar to their openness to ductless VSHPs.

Table 4: Ducted VSHP Openness Scores

	Initial Openness *(Out of 7, with 7 being extremely open)*	Current Openness *(Out of 7, with 7 being extremely open)*
ALL	5.1	6.0
AHPC Members	5.7	6.0
Manufacturers/Distributors	4.6	6.0

Early On: 2014 – 2016

Despite some initial questions and uncertainties, market adoption during this time was facilitated by:

NEEA's NW Ductless Heat Pump Project

It was widely speculated that NEEA would have had some influence in driving the uptake of ducted VSHPs in the early years of their introduction to the market. Respondents believed that many of NEEA's activities may have had an unintended impact or "spillover" effect into the ducted space. NEEA's efforts in driving market awareness campaigns and engagement with market actors could have created the ideal market conditions for all VSHP types, whereby contractors, consumers, and utilities were primed and ready for ducted VSHP solutions.

> *"In those early years from 2016 to 2020… it was probably a lot more of that indirect market development that spilled over into the centrally ducted market, gave all of the confidence and awareness building, and contractor capability infrastructure that they helped to create on the ductless side, I believe did have an indirect influence on the willingness and the, I'd say,*

> *capabilities of installers to move into the ducted market and start installing and applying variable speed technology to ducted systems as well." – AHPC Member*

Midway: 2017 – 2019

The period of 2017-19 was characterized by several factors that drove the uptake of ducted VSHPs:

- Advancing technology allowed for greater use cases of central ducted VSHPs
- Incentives
- Contractor sales push
- Ducted VSHP training
- Consumer receptivity and marketing

Advancing technology allowed for greater use cases of ducted VSHPs

When ducted VSHPs first entered the market, the units had limited applications that they worked well in. They had limited static pressure capabilities and could not be used in long runs of ductwork, and they had lower heating and cooling capacities and could only work within a certain temperature range while remaining efficient or shutting out completely. Over time ducted VSHPs evolved where they could reliably be put in any home as a centrally ducted system.

> *"There has been an evolution of the ducted style product. It took that evolution to get it where it is today. Because the original product, there were limited applications that it really worked well in. So, as it evolved it opened it up to being more acceptable." – HVAC Supplier*

> *"As the manufacturers, they continued to improve, again, they came out with innovations more and more, act into control boards, just an overall, "We've got to get higher efficiencies. That's what everybody wants." – HVAC Supplier*

Incentives

As ducted VSHPs enter the market, utilities begin offering incentives for installing them. Incentives sway consumers by lowering the costs of installation to them. Many consumers who use incentives can already afford a ducted VSHP but want to take advantage of the savings.

> *"Certainly, incentives. That helps. And if somebody was attuned with the incentives that were available, they tried to take advantage of them." – HVAC Supplier*

Contractor sales push

Contractors were a strong force in driving the uptake of ducted VSHPs. They would position the products as a premium option that could solve many of a consumer's HVAC problems. Respondents described the contractor sales process as selling the consumers the highest comfort solution they can. Contractors would also leverage incentives and the energy efficiency of ducted VSHPs similarly to their sales tactics with ductless.

> *"A salesperson sitting across the kitchen table from a consumer wanting something installed. They could help influence that by promoting a higher efficiency system. And if they could prove that it made sense and there was going to be maybe savings over time in fuel and efficiencies, they could help drive that sale in that direction." – HVAC Supplier*

Ducted VSHP training allows contractors to become more familiar with installation

Respondents believed training and education for contractors were another driving force at this time. As contractors attended training, not only did they become more familiar with ducted VSHPs, they also trusted the product's reliability more. Training offered by manufacturers also created a bond between contractor and manufacturer, increasing their loyalty and allegiance to the products.

> *"I think the manufacturers play a key role in supporting the market, but yeah. Finding, building up, and training contractors that are willing to, and maybe preferentially selling heat pumps over other alternatives. Mitsubishi in particular has done that. Fujitsu and Daikin too." – AHPC Member*

Customer receptivity and marketing

According to respondents, consumer awareness and interest was also a large driving force at this time. Northwest consumers wanted to have high-efficiency systems installed in their homes, sometimes asking for ducted VSHPs directly. However most often consumers would not be able to tell contractors what product they wanted, rather, they would list certain features or benchmarks they wanted their system to have. Through both marketing and contractors, consumers became more educated about HVAC systems and what kind of products were available. With the country moving toward more efficient solutions for the climate, consumers are more often requesting their HVAC system use less energy.

> *"More often than not, we were seeing people that were either self-convinced or educated by maybe a distributor salesperson or a little bit of marketing. But I think it was education." – HVAC Supplier*

> *"I think, across the board for heat pumps, there's customer interest for efficiency purposes, for those green purposes." – AHPC Member*

Recent years: 2020 – 2022

Factors that facilitated market adoption during this time:

- Natural sales growth
- New financing options
- Increased NEEA focus on ducted VSHPs

Natural sales growth

Currently, there is a reported upward momentum in ducted VSHP sales, despite a less direct promotional push. All respondents reported positive perceptions of the ducted technology and

see a place for it in the HVAC industry. Sales are increasing with less direct intervention from market actors like manufacturers, utilities, and government agencies, and the effort to sell a ducted VSHP is lower compared to the time periods prior.

Premium comfort expectations are becoming more standard because of hotter summers, progressive mindsets, and motivation to save costs long-term. Homeowners are accepting of the technology and willing to invest, and contractors advocate and recommend the products as they gain experience. Utilities continue to offer incentives, manufacturers continue to better the technology to expand market share, and governmental and legislative agencies are more so encouraging the installation of the technology via codes in reaction to the shift to favor of energy efficiency.

Looking forward, many believe that ducted VSHPs are now a standard option and sales will continue to trend upward.

New financing options through manufacturers, contractors, and utilities

Recently, consumers that do not want to pay high upfront costs have the option of financing their HVAC system through either manufacturers or contractors. One respondent noted that their local utility began to offer financing more recently. Financing serves as a valuable resource for those interested in purchasing a ducted VSHP but prefer breaking down the cost into more manageable payments, ultimately expanding the potential pool of customers.

> *"Financing's a big one. Now up here, we have some utilities that do financing and that is an absolute home run beyond. I wish all the utilities did it because again, it's not a scary bank, it's a utility, and anybody that does utility financing they reduce the rebate off the amount they finance, that has been a driver that's bigger than the rebate, usually." – HVAC Supplier*

Increased NEEA focus on ducted VSHPs

In recent years, respondents said that NEEA's focus on ductless VSHPs has diminished. A couple of respondents suggested their focus may be more strongly on centrally ducted systems, and NEEA's efforts and support may accelerate sales in future years.

> *"This is more recent in terms of the increase in outreach and knowledge development around variable speed. NEEA has been at the forefront of this effort. NEEA has played a role in the information sharing of variable speed technology in general developing resources, around the application, best practices, things like that is a key driver for this technology." – AHPC Member*

Direct & Indirect Influences on Ducted VSHP Sales in the Northwest

This research identified a variety of factors as potential drivers for ducted VSHP adoption, ranging from economic, regulatory, social, and geographic. Respondents noted that each driver's degree of influence varied, and several factors were described as interdependent, creating a complex relationship among the drivers.

Moreover, past research has shown that the Northwest region was a strong adopter of ductless VSHPs[2]; this coupled with the region's experience with NEEA's NWDHPP may have created a prime market for ducted VSHPs and accelerated the rate of adoption.

NEEA's NWDHPP was an important factor in the Northwest's adoption of ductless VSHPs. Their many activities, including intervention in the HVAC supply chain, working with utilities, and extensive marketing all served to increase uptake of ductless VSHPs. However, there is no evidence to suggest the program included any direct intervention on the uptake of ducted VSHPs. Despite this, it was found that the program may have had an indirect influence on ducted VSHP sales through the NWDHPP's activities.

Table 5 lists the indirect and direct influences on ducted VSHP sales and the perceived extent of influence of each on the uptake of ducted VSHPs. These findings were gleaned using a list of potential influences (located in Appendix D) that were predetermined before research using two sources:

1. Firstly, NEEA staff reviewed NWDHPP program materials to identify previously hypothesized market drivers.
2. The Lieberman team then performed secondary analysis of Market Progress Evaluation Reports to identify market drivers previous program evaluators found during their analysis of the NW residential HVAC market.

Factors that were also mentioned unaided are noted with an asterisk in Table 5. A complete list of unaided factors mentioned can be found in Appendix A.

Direct vs. Indirect Influences

Direct influences refer to influences that implicitly connect to increased uptake and sales of ducted VSHPs. Indirect influences do not connect directly to sales, but rather have a secondary impact on sales by means of impacting direct influences.

[2] Northwest Ductless Heat Pump Initiative Market Progress Evaluation Report #8, 2019

Table 5: Influences on NW VSHP Adoption and their Perceived Degree of Influence on VSHP Uptake

	Key Influences	Perceived Level of Influence
DIRECT	**Incentives*** – *Played many roles including increasing customer interest/awareness via promotion, product endorsement, and cost containment*	*High*
DIRECT	**Customer Interest *–** *NW customers were highly interested and willing to invest in the new technology*	*High*
DIRECT	**Contractor Recommendation*** – *Contractors' valued opinions and recommendations for ducted VSHP promoted customer acceptance; recommendations/sales pitches functioned as marketing, raising customer awareness, and shaping positive perceptions*	*High*
DIRECT	**Advancing Technology*–** *Drove competition, offered more solutions, and increased comfort standards*	*High*
DIRECT	**Manufacturer Sales Strategy** – *Manufacturers' decisions to invest in and advertise/promote the new products ignited ducted VSHP uptake*	*High*
DIRECT	**Geographic Factors** – *Accelerated customer acceptance because of the NW's unique characteristics but reportedly little significant differences in terms of manufacturer strategy / ducted VSHP accessibility specific to the region*	*Medium*
DIRECT	**Government Incentives** – *Little overall awareness and impact on purchase decisions*	*Lower*
INDIRECT	**NEEA's NWDHPP** – *Some potential for "spillover" effects but limited evidence of direct impact on ducted VSHPs; initiatives, including marketing and promotions, may have established market knowledge, raised awareness, and shaped positive perceptions of variable speed technology*	*Medium*
INDIRECT	**Contractor Familiarity** – *Contractor buy-in increased as they became more familiar and experienced, which may have increased the likelihood to recommend*	*Medium*
INDIRECT	**Manufacturer Training*** – *Bolstered contractor confidence in the systems and indirectly promoted the new technology*	*Medium*
INDIRECT	**Codes** – *Slight incentive for new construction installation choices*	*Lower*
INDIRECT	**ENERGY STAR®** – *Some recognition, yet believed to be a less important criterion to homeowners/contractors*	*Lower*

Note: The above chart data is derived from a mix of quantitative data (i.e., selection of 'top influencers') and qualitative feedback. * = Driver mentioned unaided

Interplay of Influences

The research found that the key factors influencing uptake of ducted VSHPs do not appear to operate independently and are perceived to affect other factors, creating an "interplay" of direct and indirect influences. The direct factors that appear to have impacted the greatest

number of other factors at play (at least 3 or more) are advancing technology, incentives, and manufacturer sales strategy. Figure 2 below illustrates how the factors appear to be interrelated, affecting each other in various ways. Relationships mostly appear to be one-sided but may also be reciprocal.

Figure 5: Interplay of Ducted VSHP Influences

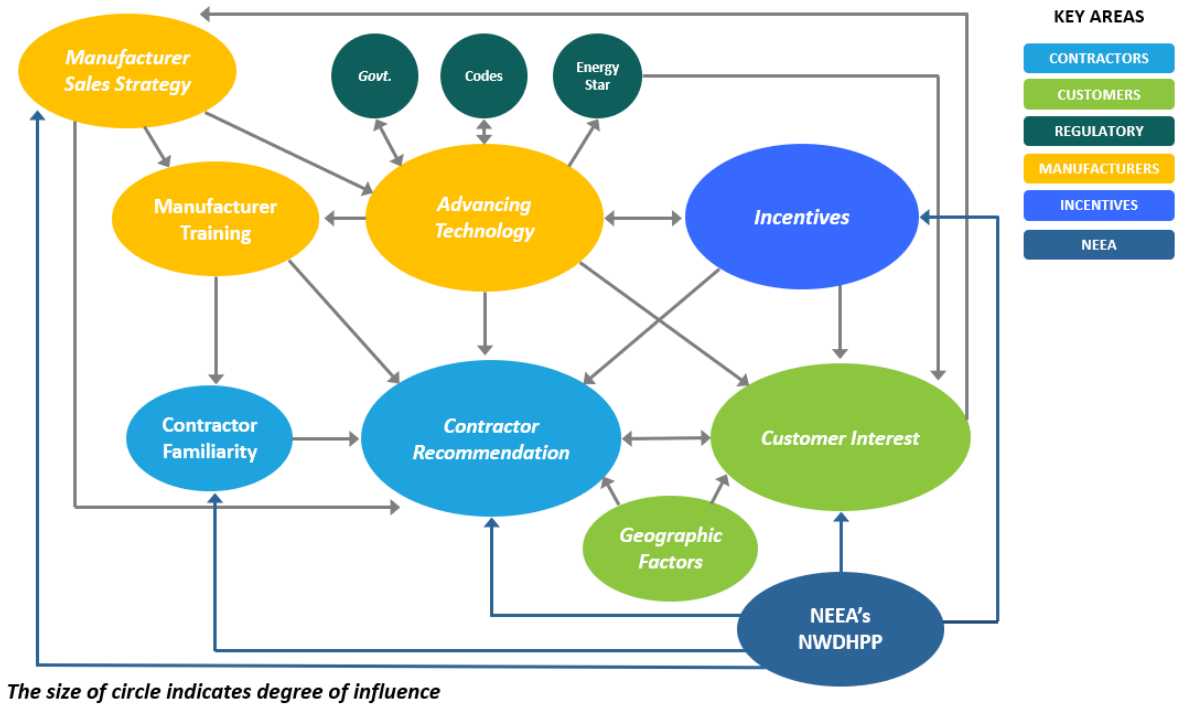


Table 6 explains the interplay of influences in more detail. The "Key Influences" column comprises only those influences that are perceived to cause an impact, versus influences that appear to be affected.

Table 6: Explanation of Interplay of Ducted VSHP Influences

Key Influence	Apparent Impacts	How it appears to intersect with NEEA's NWDHPP
Advancing Technology	Advancing technology appears to have had multiple impacts in driving VSHP uptake: • **Manufacturer training** – As manufacturers update models, they need to offer additional training to contractors • **Contractor recommendation** – As technology improves, contractors may put more trust in product reliability and applicability	*Not found in this research*

	• **Incentives** – As technology becomes more energy efficient, utilities and governments may offer additional incentives • **Customer interest** – As technology advances and HVAC systems have more features, they may become more attractive to consumers • **Codes** – Federal standards or state codes may change based on more advanced HVAC systems becoming available • **ENERGY STAR®** – ENERGY STAR® may update codes and standards based on what is available in the market as technology advances	
Incentives	Incentives impacted not only the end customers and installers (e.g., contractors and customers), but also manufacturers: • **Contractor recommendation** – Contractors may be more likely to push products with incentives to help increase sales • **Customer interest** – Customers are enticed by incentives to lower upfront costs of equipment • **Advancing technology** – Manufacturers may upgrade their HVAC systems to become eligible for Incentives	**NWDHPP's apparent impact on incentives:** Utility incentive initiatives established via NWDHPP efforts may have continued and driven incentive offerings for ducted technology
Contractor Recommendation	• **Customer interest** – Customers are swayed by their contractors' recommendations and the quality of their installations	**NWDHPP's apparent impact on contractor recommendation:** Contractors may have had a more favorable outlook toward VSHP technology after the success of the NWDHPP
Contractor Familiarity	• **Contractor recommendation** – As contractors became more familiar with the products, they may have become more comfortable recommending them to homeowners	**NWDHPP's apparent impact on contractor familiarity:** Contractors may have become more familiar with VSHPs through their ductless VSHP training
Manufacturer Sales Strategy	• **Manufacturer training** – In an effort to promote their products and increase installers' competencies, manufacturers may have sponsored contractor training • **Advancing technology** – manufacturers may expand their product portfolios as a response to customer wants and needs to win a greater market share • **Contractor recommendation** – Manufacturers encourage their contractors to sell ducted VSHPs by offering perks to those who attend training and sell them	**NWDHPP's apparent impact on manufacturers:** After the successful partnership between manufacturers and NEEA during the NWDHPP, manufacturers may have been more open to engaging with regional organizations. They may have also been more likely

		to invest in ducted VSHP technology given the market's receptivity to ductless VSHPs.
Manufacturer Training	• **Contractor recommendation –** As contractors became more familiar with the products, they may have become more comfortable recommending them to homeowners	*Not found in this research*
ENERGY STAR	• **Advancing technology** – Manufacturers may advance their technology to keep up with ENERGY STAR® requirements to ensure their products receive incentives • **Customer interest** – The potential recognition of ENERGY STAR® may establish credibility in a product	*Not found in this research*
Geographic Factors	• **Customer interest –** Geographic factors (e.g., climate, culture, and local attitudes) may affect what consumers prioritize when looking for an HVAC solution. The importance of factors like energy efficiency, cold climate effectiveness, cost savings, and limited climate impact may vary as a result	*Not found in this research*
Customer Interest	• **Manufacturer sales strategy** – A feedback loop may have been created among manufacturers and consumers. Manufacturers may invest in technology they believe consumers will be interested in. When customer interest was proven, manufacturers may have continued to invest in the products/technology.	**NWDHPP's apparent impact on customer interest:** Through their marketing efforts (e.g., campaigns, Goingductless.com, YouTube channel), some awareness of ductless VSHPs may have spread and affected customer openness towards ducted VSHPs

DIRECT INFLUENCES ON DUCTED VSHP ADOPTION

Incentives

Incentives from manufacturers and utilities were widely reported to be a primary driver of ducted VSHP uptake, motivating both customers and contractors to adopt ducted VSHPs in a variety of ways. Incentives intended to promote sales of ducted VSHPs reportedly came from a range of sources, including utilities, manufacturers, and state and federal government:

- **Utility incentives:** Appear to have been the most impactful incentives offered to customers because they were often more substantial, and the cash-back rebates were often delivered to customers more rapidly than other incentives (e.g., tax rebates).
- **Manufacturer incentives:** Manufacturer incentives existed for both consumers and contractors. Consumer incentives consisted of discounts and promotions like extended

warranties and special financing options. Contractors were incentivized to sell and attend training by being offered additional benefits like less expensive warranty costs.

Incentives drive customer interest and awareness

Respondents noted that incentives not only serve to inform consumers about potential upfront cost savings but also indirectly raise awareness and educate the market about the ducted VSHP product itself. Respondents said that incentives are an important sales tactic for installers/contractors. They serve as an additional tool for marketing and promotion and may function as a segue to information about the new products, their efficiency, and other comfort benefits.

> *"I would point back to the financial incentives available. I think anything that is available to consumers that reduces that upfront cost, that is a big driver in a consumer's mind" – AHPC Member*

Even small incentives are enticing

Some respondents noted that incentives only lower costs minimally and cost remains a barrier for many. Despite this, they indicated that cost savings via discounts and cash-back rebates are generally motivating for consumers and a driver in purchase decisions. However, incentives may be less likely to sway those who are more cost-conscious because the cost reductions offered can be negligible.

Incentives can also serve as an endorsement for ducted VSHPs when they come from credible, independent sources

When incentives are offered by third-party sources like the government and utilities, they may function as an independent "endorsement" of the product, thereby strengthening the product's credibility and perceived value. Respondents noted that incentives from utilities can have a stronger effect on motivating consumers than incentives from manufacturers because it is perceived as unbiased.

> *"Depending on your relationship to the local utility… [but] it serves as that third-party endorsement that this is a good decision to make." – AHPC Member*

> *"Utilities have third-party credibility that manufacturers never have. When the utility, or your state energy office says, "You should do this, and we've got a few nickels to help you do it." That third-party credibility is way better than coming from a manufacturer. At least in terms of education, trust, and all that stuff." – HVAC Supplier*

Customer Interest

Respondents believed that interest and/or demand from customers may have been a key factor in helping to drive ducted VSHP sales, particularly from environmentally conscious "early adopters" who were willing and able to invest in a more premium HVAC solution to meet their comfort and energy efficiency needs.

There are several factors and market trends that may have helped to drive ducted VSHP interest and receptivity among customers:

- **Cooling and comfort needs:** With hotter summers in the NW, consumers are said to have increasingly higher standards for cooling, and greater comfort (e.g., consistent temperature, better air quality) expectations as technology advances.
- **Energy savings to save on costs:** Many consumers are looking for HVAC systems that lower their monthly energy costs. While ducted VSHPs may not have the lowest upfront cost, consumers are attracted to being able to heat/cool their home for less over time, and ducted VSHPs will save consumers the most in monthly energy costs compared to other ducted options.
- **Aesthetics:** Ducted VSHPs may have captured the interest of customers who wanted the benefits of inverter technology without the poor aesthetic of a wall-mounted unit.
- **Ducted replacement market:** Given a large portion of homes in the NW have existing ducts, the entrance of ducted VSHPs may have introduced an option for the customer who desired the benefits of variable speed technology but had existing ductwork.
- **Rise of customer VSHP education:** It is believed that as consumers in the NW become more educated about VSHPs, they are increasingly willing and interested in investing in higher-quality ducted VSHPs for their homes.

Geographic factors specific to consumers of the NW

Customer interest is often a byproduct of regional differences as well. Many respondents believed that the adoption rate of ducted VSHPs may have been quicker in the NW compared to other regions of the country, driven by the following key factors:

- **"Green mindset":** One of the most cited NW-specific drivers was the cultural interest in environmentally friendly lifestyles and the prioritization of energy efficiency. In states like Washington and Oregon in particular, environmentally conscious consumer values would have likely fostered greater receptivity and increased willingness to invest in ducted VSHPs.
- **Climate change:** Respondents often noted that the Northwest climate has been trending warmer, and recent summer "heat waves" have led many customers to seek out HVAC solutions that both heat and cool their homes in an efficient way. A couple also cited poor air quality from forest fires in the summer as a driver of interest in ducted VSHPs which can filter air in homes.
- **Energy costs:** Some respondents said the Northwest has an advantage in having lower electricity rates compared to other regions of the country. The pairing of low electricity rates with an extremely energy efficient system (e.g., a ducted VSHP) could help to incentivize customers to opt for ducted VSHPs over gas-source solutions.

- **Northwest home structure:** Many homes in the Northwest already have ductwork so replacing a consumer's current HVAC system with another ducted option, is often considered most logical. Customers who wanted to benefit from VSHP technology, yet recycle their existing ductwork, could have been likely to opt for a ducted VSHP once available.
- **Migration trends:** A couple of respondents believed that changing migration patterns in the NW may be another possible influence on ducted VSHP uptake. There is some perception that more affluent populations are moving to the NW in recent years, with a higher budget for HVAC solutions. Others noted that increased migration from southern states (such as California and Texas) may have brought consumers with high standards for cooling to the NW, although they believed the influence of such migration factors would be minor.

Contractor Recommendation

Most respondents believe that contractors serve a vital role in the uptake of ducted VSHPs as they interface directly with consumers and have an important influence on consumer purchase decisions. Their influence in driving sales of ducted VSHPs was described in several ways:

Sales tactics drive customer interest

Contractors were said to have become increasingly tactical in their sales approaches for ducted VSHPs, and have, in turn, educated and spread awareness about them to consumers. Reported sales tactics include showcasing incentives to customers, emphasizing the product's energy savings potential, and in some cases, citing climate change (e.g., rising temperatures or low air quality from forest fires) to show how ducted VSHPs are an optimal solution to invest in. Since contractors can have so much influence over customer purchase decisions, these sales tactics are likely to have driven ducted VSHP sales.

> *"I still believe it's the salespeople that drive the adoption more than anything else, and that's a coordinated effort between a distributor and a sales force. And of course, customer demand, yeah, if there's interest. "What's the best system for my home?" might be the question. And if a contractor is willing to put those offers out there and not be afraid that he's going to lose a sale by coming in at a high price, then there's definitely a better reception by the market." – AHPC Member*

Potential revenue incentive

Respondents speculated that contractors may also consider the revenue associated with VSHPs when selling them, making cost an incentive to sell as much as a barrier to buy. Depending on a contractor's business model, some may be motivated to sell more higher-cost items. While ductless systems may have a higher profit margin, they are lower cost jobs and require more sales to compete with higher priced products. Ducted VSHPs involve more labor, but are much more expensive (e.g., $25,000 vs. $7,000) so may require fewer units sold to make a similar profit.

Advancing Technology

According to respondents, the advancement of ducted VSHP technology may be one of the largest drivers of the uptake of ducted VSHPs. As ducted VSHP technology advances with improvements, like better cold-climate performance and efficiency, they become more appealing to customers and their use cases increase. Respondents did not identify NEEA as an influencing factor in manufacturers' ducted technology advancement.

Advancing technology expands applicability

Specific technology advancements that may have impacted the uptake of ducted VSHPs include:

- **Greater cold climate performance:** Earlier models of ducted VSHPs had limited use in colder climates because they would have a large drop in efficiency at low temperatures. However, according to respondents, as the technology advanced, ducted VSHPs became better able to operate in temperatures as low as 0 degrees, while remaining energy efficient. This increase in cold climate performance allowed greater applicability of ducted VSHPs in more homes (e.g., those in colder climates), thus possibly increasing uptake.
- **Increased static pressure capabilities:** Some respondents interviewed stated that when ducted VSHPs were first introduced they had limited static pressure capabilities, meaning they could not support long runs of ductwork. However, respondents noted that ducted VSHPs evolved to the point where they can now support larger homes with longer stretches of ductwork.
- **Improved energy efficiency with premium comfort:** While ducted VSHPs have historically been an efficient technology, they have become more efficient with higher SEER and HSPF ratings. Respondents noted that ducted VSHPs now also meet higher consumer comfort standards like keeping their home at a comfortable temperature and also better air quality.
- **Additional features like wireless controls and Bluetooth:** Ducted VSHPs have additional features that consumers and contractors find appealing. Consumers have the option to control their HVAC system wirelessly through Wi-Fi or Bluetooth. Contractors are able to connect to the system wirelessly as well and are able to perform diagnostics when servicing the machine.

Advancing technology increases accessibility

Advancing technology also brings with it more models, greater availability, and more competition. Consumers now have more models and brands to choose from, which may further enhance their appeal and customer interest levels. Two AHPC members and one supplier believed that as ducted VSHP technology advanced, products became cheaper for manufacturers to build, and competition increased leading to a decreased price point.

However, other respondents believe the advancement of technology has not led to a decreased upfront cost for consumers, and ducted VSHPs are still considered the premium ducted heat pump offering compared to other HVAC options. Some noted that labor costs associated with

installing a ducted VSHP contributed to the high costs. Others also said the recent Covid-19 pandemic impacted the availability of more premium models and increased prices.

Manufacturer Sales Strategy

Manufacturers played a fundamental role in the uptake of ducted VSHPs according to respondents. Motivated to increase their market share and revenue, manufacturers worked to increase interest and demand for ducted VSHPs.

Initial technology development

By nature, the manufacturers' roles were to develop the new technology. Given this, they have control over what is offered on the market. Manufacturers may have wanted to leverage the interest in VSHP technology and create ducted VSHPs to increase their market share.

> *"A lot of the ductless manufacturers introduced ductless options and then continued that trend and continued to expand the product offering to where all the manufacturers now offer some form of inverter driven all home ducted solutions." – HVAC Supplier*

> *"Manufacturers naturally invested training programs, incentives, what they could do because it's not just selling equipment. It's also increasing market share. If the northwest says we like variable speed, then any manufacturer making variable speed should say, we want to grow our market share of variable speed in the northwest market because that will create sales for years to come, not just today." – HVAC Supplier*

Contractor training, engagement, and marketing

Manufacturers considered contractors an integral part of the HVAC supply chain since they are a key source of information for homeowners. Therefore, manufacturers sponsored ducted VSHP training so contractors could familiarize themselves with the technology. The training also served a dual purpose – a time to engage and foster a relationship with contractors, which ultimately may persuade them to sell their products. Lastly, manufacturers offered incentives to further encourage sales and incentivize recommendations.

> *"Manufacturers typically market through their dealers, through their contractors. When I see incentives, that's a manufacturer marketing through the contractor. The manufacturer creates incentives for the contractor selling it. If you sell variable speed, you get all these additional benefits as opposed to not." – HVAC Supplier*

Technology advancement

Manufacturers are constantly advancing their technology to keep current with regulations and increase the usability of their products. As their technology advances, it typically became a viable solution for more consumers.

Government Incentives

There was low awareness of the existence of federal incentives to install ducted VSHPs among respondents. Some speculated that tax credits may be available but were not sure of the amount or their impact on promoting the uptake of ducted VSHPs. A couple believed that some

state governments (e.g., Oregon, Washington) may be offering incentives and a couple were aware that Oregon offered tax credits at one point in the past.

> *"Between tax credits and especially in Washington State with the incentives there and utility incentives, they were essentially free for a while… You're starting to see states offer $10,000 to fuel switch. That's a big incentive." – AHPC Member*

INDIRECT INFLUENCES ON DUCTED VSHP ADOPTION

Not all influences on the sales and uptake of ducted VSHPs were direct. Some influences operate indirectly, affecting other factors that ultimately lead to increased ducted VSHP uptake. In the case of NEEA, because there are no direct interventions reported by respondents for centrally ducted VSHPs, any observed effects of the NWDHPP appear to be the result of their influence on other market actors. In the ductless space, the NWDHPP influenced distributors to increase their product stock and offer training and incentives, manufacturers to increase investment in the NW and advance technology, and contractors to attend training and teach sales skills to contractors. These market actors could then apply their knowledge and experience in ductless VSHPs to centrally ducted VSHPs.

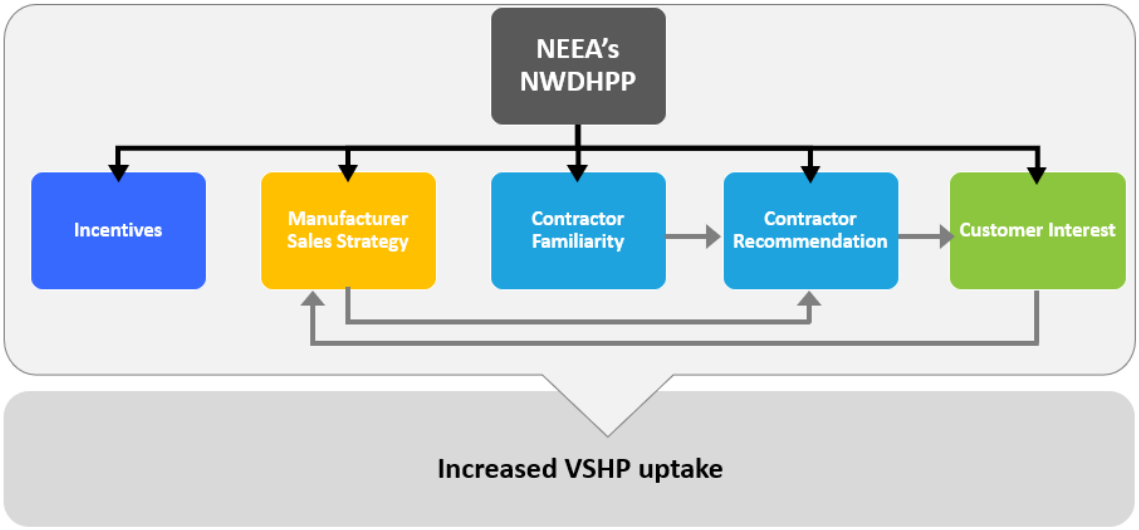
Other influences also operate indirectly because they do not directly lead to sales. For example, contractor education and familiarity may increase contractors' knowledge of an HVAC system, but it may not necessarily lead them to push for more sales. Similarly, ENERGY STAR® and codes may sway the market toward more energy-efficient choices, but they may not directly result in increased sales of ducted VSHPs.

NEEA's NWDHPP

Most respondents believed that NEEA's NWDHPP was highly influential in supporting the uptake of ductless VSHPs in the NW since the program's inception in 2008. NEEA's efforts to drive awareness and foster linkages between supply chain market actors were believed to have had positive, unintended "spillover" effects on ducted VSHP uptake. NEEA and the NWDHPP's influence on ducted VSHPs were reportedly high-level and indirect only. The following section describes NEEA's NWDHPP activities and their presumed effect on the uptake of ducted VSHPs.

> *"NEEA works at high-level. They work with manufacturers and distributors. My guess is that the average salesperson and homeowner doesn't know who NEEA is, which is okay. That's not their purpose. Their purpose isn't to be a brand name. Their purpose is to help try to steer the market in the right direction." – AHPC Member*

Figure 6: NEEA's NWDHPP indirect influences



NWDHPP's Apparent Effect on Incentives

The NWDHPP aimed to gain utility support for ductless VSHPs through engagement efforts; they encouraged utilities to coordinate and offer incentives for ductless VSHPs.

NEEA facilitated utility incentives that not only aimed to minimize cost barriers, but also endorsed the products. The alliance also created a more cohesive incentive market that allowed consumers of various utilities to become eligible for the same incentives.

Incentives also disseminated awareness of ductless VSHPs and their benefits, which is notable because consumers had little knowledge of variable speed technology prior. When ducted VSHPs were introduced, contractors and customers may have been more familiar, and utilities may have been more willing to incentivize the installation of similar, ducted technology.

However, while there is some connection between NEEA and utility incentives in general, there is no information to definitively say NEEA influenced utilities' decisions to create incentives for specifically for ducted VSHPs. It may be the utilities' push for more efficient equipment that drove this business decision. The extent of NEEA's influence on their decision to prioritize ducted VSHPs may only be small.

> *"I think they did a good job of creating a consistent marketplace of incentive programs and available support networks across the entirety of the territory, that followed similar enough rules. And they brought enough utilities on board to offer incentives and to try to nudge the market through incentives. I think that's probably the biggest place where they made an impact." – AHPC Member*

NWDHPP's Apparent Effect on Contractor Familiarity

The NWDHPP's VSHP training for contractors was perceived to be a key influencer in indirectly equipping contractors with the skills and knowledge of ductless VSHP technology. NEEA sponsored contractor training for ductless VSHPs, which focused on explaining the technology, the benefits, and proper installation. Conducting inspections of ductless VSHP installations helped NEEA uncover common installation mistakes and, through training, proactively correct and mitigate errors.

The skills that contractors learned through the NWDHPP's ductless VSHP training programs could have prepared them for the introduction of ducted VSHPs since the units involve similar technology, despite different (yet familiar) delivery systems. For example, contractors learned how to work with complex proprietary control systems when working with ductless VSHPs, which is knowledge that may have been applicable to ducted VSHPs.

> *"How they install that type of thing was all carryover from the ductless style units. It was just really the only thing that came into play as the ducted products came to market was just making sure contractors understood the nuances of limited static capabilities." – HVAC Supplier*

NWDHPP's Apparent Effect on Contractor Recommendation

Through NEEA's efforts in supporting ductless VSHPs, variable speed technology became a well-established and well-known technology. NEEA offered marketing materials and support to manufacturers and utilities, and contractors to be used in their contractor and consumer marketing efforts. These efforts led to many consumers and contractors being aware of ductless VSHPs and their benefits. As a result, when ducted VSHPs entered the market, most contractors and consumers would have already been aware of VSHPs and their benefits compared to non-variable speed systems.

Contractors were highly receptive to ducted VSHPs when they were first introduced because they had seen first-hand the benefits of inverter technology through experience with ductless VSHPs. Their application via a ducted system meant that a new residential customer base could now enjoy the advantages of VSHP heating and cooling as a whole-house solution. As contractors became increasingly familiar and more confident with selling and installing ducted VSHPs and started to see the potential, they became increasingly likely to recommend them to consumers as an ideal solution to achieve energy savings and overall comfort.

> *"I mean, I remember GoingDuctless was a big campaign that NEEA had, and website and consumer education installers. I remember that was a big... That was a resource that we thought, "Oh, we should have something like that in the Northeast." – AHPC Member*

> *"I think the tie-in was that people became aware of a variable-speed product through the marketing efforts on the ductless side. And then on the ducted unitary side, they said, "Well, we've seen it already," or "We've heard about it already." And so, I think there was a pull-along effect." – HVAC Supplier*

NWDHPP's Apparent Effect on Customer Interest

Part of NEEA's NWDHPP activities included the creation of marketing materials that can be used by utilities and the supply chain to better inform consumers about ductless VSHPs. NEEA conducted major marketing campaigns that included PSAs, sweepstakes, and a website called GoingDuctless.com. These marketing tactics were successful in creating consumer awareness and demand for ductless VSHPs and led to stronger supply-chain adoption.

Respondents believed NEEA's ductless marketing efforts may have lessened a major barrier to acceptance: lack of awareness/knowledge. The NWDHPP marketing campaigns may have introduced consumers to ductless VSHP technology, ultimately making them more open and receptive to other kinds of VSHP technology, like ducted VSHPs.

> *"Somebody's got to take credit for it, right? It's not the consumers, it is not even really the contractors. If somebody didn't huddle and say, "This is where we're going, folks." I think it would be a much harder sell to start now and do variable speed." – HVAC Supplier*

> *"I mean, at the end of the day, when a homeowner or a consumer is educated to what variable speed is and why, and they're investing in their situation, they would not want anything else. It's just a matter of if they know it's as an option." – HVAC Supplier*

Contractor training was likely to have improved ductless installation practices and, therefore, may have shaped positive attitudes towards the new technology. More error-free installations reinforced not only contractor perceptions of VSHP technology, but also satisfied homeowners who experienced a simple installation process. Given this, the established confidence in ductless VSHP technology may have led consumers to welcome ducted technology with similar acceptance and positivity.

> *"In the ductless space, NEEA was a facilitator of training for ductless heat pumps and their suitability, which I think was helpful in the proliferation of the ductless systems. And then also as a result of that, the adoption of the variable-capacity ducted systems was probably better received." – AHPC Member*

NWDHPP's Apparent Effect on Manufacturer Sales Strategy

NEEA engaged with the HVAC supply chain at multiple levels to encourage the adoption of ductless VSHPs. NEEA's efforts focused on working with manufacturers to reduce costs, facilitating training for ductless VSHPs, increasing stock, improving technology, and providing manufacturers with marketing support.

Manufacturers may have perceived ducted VSHPs as less of a risk given the proven success of the ductless market. There may have been less of a need to educate the market on ducted VSHPs since customers were already somewhat familiar with the technology due to the NWDHPP's marketing and outreach activities. Following the market momentum of ductless variable speed technology, manufacturers may have wanted to further expand market share by developing a ducted VSHP option.

> *"There was feedback from the front lines, from the contracting groups, from the sales teams and groups. So, because of that, manufacturers, most of them, I can't speak to all, they invested*

> *more resources in capitalizing on the market demand. So, if you look at the northwest and say, if we invest in this situation, we're going to increase our sales and sell more variable speed and be more successful as opposed to some other market." – HVAC Supplier*

Manufacturers may have also been more willing to engage with regional organizations, such as utilities or energy efficiency groups because of the success of the ductless market and the NWDHPP. Given the market accepted a new and different technology due to the support of other organizations, manufacturers may have acknowledged the benefits of utility and regional organization engagement.

> *"I'd say just the level of engagement from manufacturers, couple years ago I think they were, even 2, 3, 4 years ago, were kind of less interested in listening and engaging with regional organizations. And I think that has shifted, that's sort of an anecdotal piece of evidence that they want to engage, they see the opportunity, they want to invest in this market." – AHPC Member*

Non-NWDHPP Indirect Influences

Contractor Familiarity with VSHPs/Skills Transfer

Another key factor that may have driven ducted VSHP sales is contractor familiarity with the technology, and specifically, the technical skills and knowledge that transferred over from their previous experiences with both ductless VSHPs and other ducted solutions.

Ductless VSHPs may have served as a "pilot" for variable-speed technology

Contractors' initial experiences with ductless VSHPs allowed for an experimental period in which they learned about the technicalities of variable speed technology. Attending training on ductless VSHP and gaining hands-on experience with installing ductless systems was key in helping contractors to gain comfort with variable speed technology. Specific skills learned from ductless variable speed heat pumps that respondents said they were able to transfer over to ducted VSHPs include the intricacies of a variable speed system such as servicing/maintenance techniques and proprietary controls that would need to be integrated for the system to work properly. Prior experience in these areas could have lessened knowledge gaps once ducted VSHPs became available.

The requirement for contractor duct experience may have impacted the rate of ducted VSHP adoption

Respondents caveated that learning how to install a centrally ducted system is a specialized skill that did not carry over from experience with ductless VSHPs. If a contractor only had experience installing ductless systems, the design and installation of ducted solutions may have been too much of a steep learning curve to be willing to adopt and sell ducted VSHP products. Adoption rates were said to be much higher among contractors with prior duct experience (e.g., completing duct calculations) as the learning curve would not have been as significant.

Manufacturer Training for Contractors

Respondents said manufacturer training and education to contractors was an influential factor in equipping the contractor workforce with the skills, know-how, and familiarity needed to sell and install ducted VSHPs across the NW. Manufacturer training not only kept contractors up-to-date and knowledgeable but may have also served a secondary purpose of product marketing and cultivating brand loyalty. Manufacturer education may have primed contractor sales tactics by indirectly managing how they describe and position ducted VSHPs to customers, while also helping to ensure the products are sized and installed correctly. Manufacturer training may have also helped to build their relationships with contractors by offering support as well as incentives via perks such as lower warranty costs.

Codes

Historically, codes have reportedly not done much to advance the uptake of energy efficient HVAC systems given they are typically written to set a minimum standard for efficiency and would not mandate premium options. However, with the growing trend toward energy efficient heating and cooling solutions, new codes are increasingly being introduced to give more explicit credit for installing efficient HVAC systems (e.g., in Washington and Oregon). For example, in Washington, installing more efficient HVAC equipment allows for more energy credits, allowing builders to save costs elsewhere in the construction. While these states cannot mandate the installation of ducted VSHPs in new construction homes, codes incentivize their installation to builders who want to reach code compliance.

> *"Generally, code's been an impediment. It's treated historically, until these changes in the Washington code in the last couple of years, they've given very little credit to variable speed heat pumps in terms of their energy improvement." – AHPC Member*

> *"Lately, especially in Washington, the codes have been a huge influence. It's not retrofit, but that helps the whole market of nudging toward heat pumps in new construction. That's within the last like year and a half, two years. That's kind of pivoted." – AHPC Member*

> *"Codes are driving the new construction industry's use of heat pumps… Washington state for new construction homes has an energy points program. Depending on the size of the house, you have to get so many energy credits. And there are certainly some advantages of using ductless and then there's an advantage if you're going whole-home ducted solution, then there are more advantages for the higher efficiency systems" – HVAC Supplier*

ENERGY STAR® Specifications

There were mixed views regarding ENERGY STAR®'s influence on ducted VSHP uptake. Most respondents did not believe ENERGY STAR® specifications had much bearing on consumer purchasing decisions, while a few believed ENERGY STAR® may have had a slight impact, for example, to qualify for certain government incentives or to serve as a third-party product endorsement of ducted VSHPs.

Conclusion

Primary research interviews identified a range of factors that may have influenced the rising sales of ducted VSHPs in the Northwest. Economic, regulatory, social, and geographic factors were said to have played a role in the uptake of ducted VSHP technology. The degree of impact of each factor varied, and all factors interacted with each other in some way, resulting in a causal "interplay" of influences that appeared to have led to greater ducted VSHP uptake.

In terms of the timing of these key influences, respondents were typically able to recall major events and their approximate timing, though specific details and dates were less memorable. Overall, there was broad consensus that ductless VSHPs entered the US market in the early 2000s, at least 10 years before central ducted VSHPs first appeared, but only gained greater market traction in around 2006-08, during the time NEEA launched the pilot NWDHPP in 2008.

It was not until approximately 2014 that ducted VSHPs were said to have become available. Upon the launch of ducted VSHPs, respondents believed that the market was already primed for ducted VSHP adoption due to experience with ductless VSHPs. The various economic, regulatory, social, and geographic influences that led to greater ductless VSHP uptake may have laid the groundwork for organic market interest in ducted VSHPs. Respondents described themselves as being more open to these systems than they were initially toward ductless VSHPs, driven in large part by their positive experiences with ductless VSHPs.

According to respondents familiar with NEEA's NWDHPP, it was widely believed that the NWDHPP had an important, direct influence on driving market adoption of ductless VSHPs through market education, utility engagement, and consumer incentivization initiatives during the period of 2008-2020.

The progress made during the NWDHPP era appeared to have had an indirect "spillover" on the uptake of the ducted VSHPs, whereby the market's experience, knowledge, and positive perceptions towards VSHPs had an indirect effect on the uptake of ducted VSHPs. The precedent set by ductless VSHPs may have influenced the market to embrace ducted VSHP technology more readily and rapidly.

Recommendations

Strategic Recommendations

Based on the research findings, the following key actions are recommended:

1. Encourage the breadth (availability) and depth (higher cost savings) of incentives, and consider promoting a greater variety of options, e.g., financing from contractors and manufacturers.

- Given incentives are pivotal in endorsing VSHPs, spreading consumer awareness, and attracting consumers by cutting upfront costs, NEEA should consider increasing the quantity and quality of incentives.
- Initiatives to encourage consumer incentives should ensure they are also focused on utility-offered incentives, given utilities are widely perceived as a trusted, independent source of VSHP validation (their incentives are perceived to give VSHPs a "seal of approval" in the eyes of consumers).
- Beyond traditional incentives, consider focusing on alternative incentives such as manufacturer promotions (e.g., discounts) and/or financing options to further boost the adoption of ducted VSHPs.

2. Support contractors and reinforce their motivation to sell VSHPs by creating targeted educational initiatives to maintain competence.

- Acknowledge that contractors play an important role as the intermediary between upstream market actors (e.g., manufacturers, distributors, and utilities) and homeowners. While most contractors no longer need to be persuaded of the benefits of ducted VSHPs or educated about the basics of variable speed technology, keeping contractors up to date, and informed about new technology is paramount in shaping and maintaining both positive perceptions of the products and contractor competence.
- Continue to build on the training conducted during the NWDHPP and offer education opportunities to ensure contractors are equipped with the most current and accurate information about the ducted VSHPs so they can speak adequately about them to homeowners. The more educated and trained contractors are, the more confident they may be in selling ducted VSHPs. Quality training may lead to more efficient and effective installations, fewer issues, and therefore, continued, positive opinions of the technology.
- As an expanded offering, consider providing contractors with sales support such as:
- Strategies and tactics (e.g., how to best explain the benefits of a ducted VSHP to homeowners, the variety of use applications, how to troubleshoot, frequently asked questions and/or problems)

- Unbranded materials about VSHP benefits and incentive opportunities that they can pass along to customers

3. Leverage the qualities specific to the Northwest. Tailor marketing initiatives to best appeal to the NW's geographic factors and social values to maximize their effectiveness

- Ensure marketing and promotions are relevant to consumers in the NW by focusing on cold climate effectiveness, low electricity costs, and the ability to match existing ducts, which are common in NW homes.
- Tout the benefits of ducted VSHPs that align with the values and beliefs of the "progressive" NW demographic, because the market appears ripe for learning about VSHPs and are perceived as willing to invest in premium HVAC solutions (especially if customers are made to feel that they are making a climate-conscious and forward-thinking decision).
- Focus on ducted VSHP attributes such as their quality air filtering, benefits to the environment, energy efficiency, and technological ease and conveniences (e.g., Bluetooth-enabled controls). There is a broad appetite for not only improved comfort, but also for smarter options, and positioning the ducted VSHP as the right solution for this may help to further boost VSHP sales.

4. Engage with manufacturers to advance technology in a way that expands ducted VSHP applicability and keeps costs from rising.

- Advocate for ducted VSHP products to have wide applicability and use cases, and possibly with an expanded set of features to appeal to a broader customer base in years to come.
- Support the advancement of technology to maintain ducted VSHPs' established "best-in-class" reputation of maximum quality and maximum energy efficiency.
- However, as technology evolves, manufacturer engagement may be necessary to ensure upfront costs are contained. This way, VSHPs can become more accessible to a broader customer base so that they will eventually be perceived as an accessible, yet high-quality option.

5. Support the implementation of energy efficient codes that encourage the installation of ducted VSHPs.

- Specifically, expand upon the work being done in Washington over the last couple of years that more strongly incentivizes the installation of ducted VSHPs for new construction projects.
- Consider strategizing how to initiate change in different NW states. Montana and Idaho may require more effort in this space than in Washington and Oregon; Montana and Idaho currently do not have any policies that push for electrification or decarbonization.

6. Continue to leverage NEEA's trusted reputation and research efforts as a credible driver of change.

- NEEA appears to be widely perceived by respondents as a credible and trusted authority in the HVAC industry. Continue to sponsor events (e.g., training) because the NEEA name appears to be widely recognized and respected.

Areas to Investigate in Future Research

This research identified some continued knowledge gaps and additional areas worthy of exploration in future research:

- **Research with consumers** to better understand their perspectives and fill in knowledge gaps, for example around drivers and barriers to investing in ducted VSHPs, evolving attitudes and beliefs around energy efficient HVAC systems, and attitudes and behaviors around incentives.
    - Further investigation into the impact of ENERGY STAR® and government incentives on consumer purchase decisions may be needed given respondents in this research had limited knowledge and/or experience in these areas.
- **Research with contractors and/or manufacturers** to better understand the unmet needs of VSHP technology and how ducted VSHP technology can best evolve in the future to expand use applications.
    - Consider investigating the types of new technology in the pipeline (e.g., hybrid solutions).
    - Consider research with a greater focus on market actors in Montana and Idaho because this research garnered limited discussion about uptake in these territories where different geographic, regulatory, and social drivers and barriers appear to be in play.

Appendix A. Unaided Perceptions of Influence

In the interviews, respondents were asked what they perceived to be the key drivers of ducted VSHPs uptake without any assisted probing or exposure to stimuli. Based on unaided recall, the most frequently cited drivers were believed to be the advancement of ducted VSHP technology, customer receptivity, and contractor receptivity.

Only one respondent mentioned NEEA unaided; the one respondent described NEEA's influences as indirect, being a result of their ductless efforts, more specifically their awareness building and contractor capability infrastructure efforts. The table below is in order from most to least mentioned.

Table 7: Unaided Influences in NW VSHP Adoption

Unaided Driver Mentioned	Perceived Significance
Advancement of Ducted VSHP Technology	• More ducted VSHPs options are becoming increasingly available and accessible to consumers • Models that can better meet US consumer needs and expectations (i.e., centrally ducted) • Greater applications for ducted VSHPs enable them to be installed in more homes
Customer Receptivity/demand	• Customers desire energy efficient HVAC solutions for both cost savings and climate consciousness • Customers want both heating and cooling in their homes
Contractor Receptivity/sales	• VSHPs have high installation costs, increasing contractors' revenue when selling ducted VSHPs. Contractors are incentivized to sell more due to the higher profits from ducted VSHPs • Contractors strongly believe in the benefits and value of ducted VSHP systems • Manufacturers' training and engagement with contractors create a sense of loyalty between contractors and manufacturers. As a result, these contractors are more likely to sell any products the manufacturer puts out
Contractor Training/education	• Contractors are more familiar with the benefits of ducted VSHPs, and the technical skills associated with them because of both ducted and ductless training sessions

Incentives	• Utilities and manufacturers offer various incentives for ducted VSHP installation. Utilities offer rebates, while manufacturers have special promotions and financing • Incentives motivate customers' purchase decisions because they want to save money • Incentives motivate contractors to offer qualifying products so their customers can save money
Economy & Housing Market	• The economic recession in 2007-2009 significantly impacted the construction industry, leaving contractors looking for new ways/products to boost sales • Following the recession, discretionary income increased and more premium options, like ducted VSHPs, were purchased • Rising home values may have been an indicator of sales; homeowners may have been more likely to invest and install premium equipment

Appendix B. Recruitment Screener

83-07 VSHP Uptake Baseline Research

FINAL RESPONDENT SCREENER

April 20, 2022

Name: _____

Phone: _____

Email Address: _____

Interview Time / Date: _____

METHODOLOGY

- 45-min Web-Enabled Telephone Interviews using an online platform (Civicom)

INTRODUCTION:

Hello, I'm _____, calling on behalf of Lieberman Research, a marketing research company. We received your contact details from the Northwest Energy Efficiency Alliance, or NEEA, who is conducting research exploring market and technical drivers of heat pumps in the Northwest over the past 10 years. We are especially interested in whole home solutions that use inverter driven compressors and fans commonly called variable speed or variable capacity heat pumps.

We understand NEEA has been in touch with you to gain your consent to participate in this research. Is this **[insert name]**? Do you have 5 minutes now for us to ask you a few questions to see if we can include you in this research?

If you were to participate, we would schedule a time for the full 45 minutes interview to ask you about variable speed heat pump trends. To compensate you for your time, we are offering an honorarium of $**200** (IF NEEDED: Please be assured this call does not involve sales of any kind. The information gathered will remain confidential and be used for research purposes only.)

For Advanced Heat Pump Coalition members

Q1. We understand you are involved with the Advanced Heat Pump Coalition; Can you tell us about your role in this coalition, and in what ways you are involved with it? **[Record Verbatim]**

_____

Q2. Which best describes your parent organization?

1	NEEA	**CONTINUE**
2	Regional Energy Efficiency Organization	**CONTINUE**
3	HVAC manufacturer or distributor	**CONTINUE**
4	Federal government representative	**CONTINUE**
5	Heat pump program implementer	**CONTINUE**
6	Other (please specify) _____	**CONTINUE**

Recruit at least 2 Federal representatives (#4); 2 Implementers (#5); 1 NEEP representative (#2)

Q3. Which of the following best describes your knowledge of **VSHP** sales trends over the last 5 years?

1	I have substantial knowledge of VSHP sales trends	**CONTINUE**
2	I have some knowledge of VSHP sales trends	**CONTINUE**
3	I have a little knowledge of VSHP sales trends	**CONTINUE**
5	I have no knowledge of sales trends	**TERMINATE**

Q4. **ASK FEDERAL REPRESENTATIVE ONLY**

To what extent do you have experience with the Coalition's initiatives on Federal ENERGYSTAR specifications for heat pumps? Please select one from the following that best describes your experience:

1	I have personally worked on the ENERGYSTAR specifications	**CONTINUE**
2	I have not personally worked on the ENERGYSTAR specifications but I have some understanding of them	**CONTINUE**
3	I have limited to no experience with the ENERGYSTAR specifications	**TERMINATE**

For HVAC Manufacturers/ Distributors

Q5. What is your title at your organization? [**Record Verbatim]**

_____

Q6. Thinking about your organization, which types of **heat pumps** does your company develop and/or manufacture? ***Select all that apply***

a)	Unitary, Ducted variable speed heat pumps (VSHPs)	**CONTINUE**
b)	Ductless heat pumps AKA mini-splits, including short-ducted and multi-zone ductless (DHPS)	**CONTINUE**
c)	Ducted single-speed and multi-stage heat pumps	**TERMINATE IF ONLY SELECT**
d)	Other (Please Specify: _____)	

MUST SELECT A AND B TO CONTINUE

Q7. Which of the following describes your level of involvement with your company's ductless and ducted VSHP sales trend tracking?

1	I am responsible for managing and tracking sales trends and/or data	**CONTINUE**
2	I have had some exposure or have some understanding of my company's sales trends and/or data	**CONTINUE**
3	I have no exposure or involvement with my company's sales trends and/or data	**TERMINATE**

Q8. Based on your best estimate, between which years did your organization first begin selling **ductless heat pumps in the United States**? [**OPEN ENDED]**

_____ [TERMINATE IF AFTER 2019 OR DOESNT SELL]

Q9. Based on your best estimate, between which years did your organization first begin selling unitary, ducted **VSHPs in the United States**? [**OPEN ENDED]**

_____ [TERMINATE IF AFTER 2019 OR DOESNT SELL]

Q10. Thinking about any internal initiatives your company has developed to encourage uptake of **ductless and/or ducted variable speed heat pumps,** for example internal training or promotional materials, to what extent are you aware of any such internal initiatives?

1	Strong awareness - I have personally helped to create internal initiatives	**CONTINUE**
2	Some awareness - I have participated in internal initiatives or have heard of but did not participate in internal initiatives	**CONTINUE**
3	Limited or no awareness – I have very little or no awareness of internal initiatives to encourage uptake of VSHPs	**TERMINATE**

TECHNOLOGY REQUIREMENT [ASK ALL]

For this interview, **you will be required to use a desktop computer or full-sized laptop with webcam**. A smartphone, Chromebook, or tablet screen will not suffice. Will you have access to both a telephone and a full-size computer (with webcam) at the same time at the location where we will contact you for the interview?

1	Yes	**CONTINUE**
2	No	**HOLD – (PHONE ONLY)**

RECRUITER NOTE: PRIORITIZE ELIGIBLE RESPONDENTS WHO HAVE WEBCAM ACCESS

We are inviting a select group of people like you to participate in a 45-minute online interview about heat pump sales trends.

To compensate for the 45 min interview, you will receive **$200**

Would you be interested in taking part in this 45-minute online interview?

Yes () **CONTINUE**

No () **TERMINATE**

We are excited that you will be participating! For the interview, you will receive a confirmation /

reminder the day before the interview. We are counting on your participation. If you should have an emergency, be sure to contact us at (phone number) because we will need to find a replacement

Thank you, we look forward to speaking with you on (DATE) _____at (TIME) _____.

PLEASE REMIND ALL RESPONDENTS

- You will also be using a telephone, to call via a toll-free number for the discussion
- You will be contacted by an operator from Civicom before your scheduled interview to perform a technology check and review the process for logging in to the platform.

Appendix C. Discussion Guide

NEEA Study of Influence on NW VSHP Adoption

Discussion Guide for Video Telephone Depth Interviews with Industry Representatives and Advanced Heat Pump Coalition (AHPC) Members

45-minutes

May 18, 2022

DISCUSSION FLOW

I.	Moderator Introductions	2 mins
II.	About you, your role and understanding of VSHP trends	5 mins
III.	Evolution of VSHP uptake – Overview	18 mins
IV.	Influences Deep Dive	20 mins
V.	Wrap up and close	

I. Moderator Introductions 2 mins

- Hello, my name is Michelle. I am an independent researcher moderator. I work for a research company called Lieberman, specializing in market research. We are conducting this research for the purposes of market research for NEEA to understand influences on residential heat pump sales, especially influences on central/ducted heat pump sales and how those compare to influences for ductless heat pumps. This information will be used by NEEA to design its Variable Speed Heat Pump program.
- I do not work for the company, NEEA, who has asked me to interview you today, so because I'm independent, I hope you will feel free and comfortable expressing your honest perspectives with me. **There are no right or wrong answers today, you're the expert – I'm here to learn from you!**
- With your permission, we'd like to record this conversation. Are you okay with that? This is all for note-taking purposes only, and the recordings will be kept solely for research purposes.
- I also **have a few colleagues listening in** – both from my independent research team and NEEA. Are you okay with NEEA staff listening into our discussion? This is all again for market research purposes. Yet, if you would prefer NEEA staff not listen in, they will exit the interview now.
- Please know that your **responses are confidential** and will not be associated with you by name. We will not include the name of your current or former employer(s) in any reports. Everything we learn from these interviews is reported in summary form, with no links whatsoever to the individuals who took part. The only people who will have access to this confidential information will be **those involved in this research project**.
- Today we will be talking about heat pumps, and I'm particularly interested to learn how the **sales of variable speed heat pumps** have evolved over time in your area.

- NOTES:
    - I'm curious **how do you define a variable speed heat pump**? What types of heat systems do you think of? [Note: some might only think of them as unitary split systems and others might think of them as both mini-split and traditional unitary split systems]
    - In today's research when we are referring to variable speed heat pumps, we are referring to a class of inverter driven heat pumps such as mini-split, ductless, and central forced air source heat pumps, but we know this product may go by different names. **How do you refer to this class of heat pumps? How do you refer to them when they are in a ductless system vs. a central, ducted system?**
    - Given ducted variable speed heat pumps (and ductless VSHPs) have been around for some time now, some of these questions will rely on your memory. I know some of this might be tricky to remember, so even your best estimates will be helpful to me. [Note: inverter-driven mini-splits were introduced to the US in 2006]

- This discussion should last **45 minutes.** I do have a lot of questions for you, so I will sometimes try to **keep up the pace** to make sure we get through everything, and we finish on time for you.
- Do you have any questions at all? Ok let's get started!

II. About you, your role and understanding of VSHP trends 5 mins

1. Firstly, I'd like to **learn a little about you**. Without sharing identifying information and just speaking generally, can you please tell me:
    a. Your first name only (no last names)
    b. Which states do you work in currently?
    c. Overview of your current role and your responsibilities
2. As mentioned, for this study we are exploring **how the uptake/sales of VSHPs has evolved over time**, and I'd like to get a sense of your understanding and experience with ducted variable speed heat pumps:

MODERATOR TO EXPOSE HVAC BREAKDOWN

- With regards to general sales trends, I'd like to get an approximate sense of **the different types of heat pumps** your organization sells/stocks/distributes for residential homes and the estimated share for each type currently.
- How would you divide up the pie thinking about your sales/stocking/distribution **currently vs. 5 years ago**? Just your best guess is fine.

Heat Pump	Current	5 Years Ago
a. Single zone mini splits (AKA ductless heat pumps)	%	%
b. Multi zone Mini split (more than one indoor Unit)	%	%

c. Unitary Ducted Variable Speed Heat pumps (AKA Variable Capacity heat pumps and inverter-driven heat pumps)	%	%

a. **AHPC MEMBERS:** In what ways, if any, are you or have you been involved in helping to plan for or implement initiatives to **promote the sales of** inverter driven heat pumps? **(Probe: ducted and/or ductless)**

- When were you involved in this, and in what capacity? [Listen/probe for years, time period, and in which capacity they were involved]

III. Evolution of VSHP uptake – Overview 18 min

3. I now want to discuss in more detail how the **uptake/sales of variable speed heat pumps have evolved over time in your geographic area**. I'd like to get your thoughts on the key factors that led to this. To help us visualize this, I'd like to think about it as a timeline or a "journey."

MODERATOR TO EXPOSE JOURNEY/TIMELINE STIMULI

DUCTLESS VARIABLE SPEED HEAT PUMP JOURNEY

4. First, we will focus on ductless variable speed heat pumps. Thinking right back to the beginning, when did you **first notice ductless variable speed heat pumps enter the market**? **Which year** was it, approximately?
   a. **How** did you first learn about them? [Probe: From colleagues, word of mouth, marketing, manufacturers, other, etc.]
   b. What were your first **perceptions of them**?
   c. How would you describe your **attitudes or level of enthusiasm** towards **ductless variable speed systems** at the beginning? Using a 1-7 scale, where 1 is extremely hesitant and 7 is extremely interested in DHPs, how open were you to ductless variable speed heat pumps at the very beginning? Why?
   d. **FOR HVAC SUPPLIERS:** At what point did your organization **first start [manufacturing or distributing] ductless variable speed heat pumps**? What exactly triggered this? What was happening at or around that time?
      a. What else, if anything, influenced your organization's decision to manufacture/sell/stock ductless variable speed systems?
   e. **FOR AHPC MEMBERS:** At what point did your organization **first start promoting/working with ductless variable speed heat pumps**? What exactly triggered this? What was happening at or around that time?
      a. What else, if anything, influenced your organization's decision to promote/work with ductless variable speed systems?

5. **UPTAKE OVER TIME, UNAIDED:** How has the prevalence of **ductless variable speed heat pumps** in the market evolved over time? How common were they at the start [insert when first noticed]? How common are they now?

6. **PRESENT DAY ATTITUDES:** How would you describe your current **attitudes or level of enthusiasm** towards ductless variable speed heat systems currently? Using a 1-7 scale, where 1 is extremely hesitant and 7 is extremely interested, how open are you to ductless variable speed heat pumps now? Why?

DUCTED VARIABLE SPEED HEAT PUMP JOURNEY

7. Now, I'd like to focus on ducted variable speed heat pump journey. Thinking right back to the beginning, when did you **first notice ducted variable speed heat pumps enter the market**? **Which year** was it, approximately? [If needed, probe: some trends indicate they entered the market around **2010**, or even a few years prior. Do you recall anything from around this time?]

    a. **How** did you first learn about them? [Probe: From colleagues, word of mouth, marketing, manufacturers, other, etc.]

    e. How would you describe your **attitudes or level of enthusiasm** towards ducted variable speed heat systems at the beginning? Using a 1-7 scale, where 1 is extremely hesitant and 7 is extremely interested, how open were you to ducted variable speed heat pumps at the very beginning? Why?

    f. **FOR HVAC SUPPLIERS:** At what point did your organization first **start [manufacturing or distributing] ducted variable speed heat pumps**? What exactly triggered this? What was happening at or around that time?

        a. What else, if anything, influenced your organization's decision to manufacture/sell/stock ducted variable speed heat pumps?

    g. **FOR AHPC MEMBERS:** At what point did your organization first **start promoting/working with ducted variable speed heat pumps**? What exactly triggered this? What was happening at or around that time?

        a. What else, if anything, influenced your organization's decision to promote/work with ducted variable speed heat pumps?

8. **UPTAKE OVER TIME, UNAIDED:** How has the prevalence of **ducted variable speed heat pumps** in the market evolved over time? How common were they at the start [insert when first noticed]? How common are they now?
Please slowly walk me through **the timeline of events -- the evolution and the primary factors that you believe led to the increase in uptake/sales.**

9. **PRESENT DAY ATTITUDES:** How would you describe your current **attitudes or level of enthusiasm** towards ducted variable speed heat systems currently? Using a 1-7 scale, where 1 is extremely hesitant and 7 is extremely interested, how open are you to ducted variable speed heat pumps now? Why?

IV. Influences Deep Dive 20 min

I now want to discuss a few potential drivers of uptake in more detail, to see whether you believe any of these have helped to increase ducted variable speed heat pump uptake.

10. What, if anything, was **learned from ductless variable speed heat pumps (e.g., knowledge, skills, sales) that carried over to ducted variable speed heat pumps (e.g., knowledge, skills, sales)**, or vice versa?
    a. What **similarities**, if any, do ducted variable speed heat pumps and ductless variable speed heat pumps have in terms of benefits, knowledge, skills needed, or sales tactics?
        - In what way/for who did these similarities make it easier/more feasible to understand ducted variable speed heat systems?
    b. **ONLY FOR HVAC SUPPLIERS:** What **technical knowledge and skills, if any,** did contractors learn from ductless variable speed heat pumps that translated over to ducted variable speed heat pumps?
        - How, if at all, did that positively or negatively influence the sales of ducted variable speed heat pumps?
    c. **ONLY FOR IMPLEMENTERS:** What **knowledge or skills**, if any, did you learn from **designing and providing contractor training** for ductless variable speed heat pumps that translated over to ducted variable speed heat pumps?
        - How, if at all, did that positively or negatively influence the sales of ducted variable speed heat pumps?
    d. What, if any, kind of **training did your organization or team** have when rolling out new ASHPs?
        - To what extent did **knowledge/skills and sales tactics** from ductless variable speed heat pumps remain relevant for ducted variable speed heat pumps?
11. **FOR HVAC SUPPLIERS:** Let's talk about **customer interest**. What role, if any, did customers/contractor inquiries about ductless variable speed heat pumps play in your decision to sell/stock/install ductless variable speed heat pumps?
    a. What potential events triggered a change in customer interest? (e.g., changes in climate, global financial crisis in 2008/2009, greater competition for new housing/new construction, etc.)
12. **FOR HVAC SUPPLIERS:** How about ducted systems? What role, if any, did **customers/contractor inquiries about ducted variable speed heat pump**s play in your decision to sell/stock/install ducted variable speed heat pumps?
    a. What was the situation in terms of customer requests when you first introduced ducted variable speed heat pumps, to now? How has it changed over time?

b. What potential events triggered a change in customer interest? (e.g., changes in climate, global financial crisis in 2008/2009, greater competition for new housing/new construction, etc.)

13. **FOR HVAC SUPPLIERS:** How, if at all, did customer **interest in ductless variable speed heat pumps influence customer interest in ducted** variable speed heat pumps? How so?
14. **FOR HVAC SUPPLIERS:** Now let's talk about **geographic factors.** What factors, if any, specifically pertaining to your region or location have influenced ducted variable speed heat pump sales, in any way? How? Why?

    a. How does **weather or climate** affect impact the adoption of ducted variable speed heat pumps? (Probe: Wildfires?)

    b. How do the **ducted variable speed heat pump models and brands available** in the NW compare to those available in other areas of country?

    c. How do the **culture/attitudes** of your region and its customer base impact the rate of ducted variable speed heat pump adoption, if at all?

    d. How have **state or local policies** such as carbon goals or electrification efforts influenced the sales of ducted variable speed heat pumps?

15. What about **marketing and promotional activities**? What marketing materials, promotional campaigns, events, or sales initiatives about ducted variable speed heat pumps were you aware of/did you engage with, if any?

    a. Which promotions were most impactful on driving ducted variable speed heat pump uptake? Why?

16. How about marketing and **promotional activities for ductless variable speed heat pumps**? What marketing materials, promotional campaigns, events, or sales initiatives about ductless variable speed heat pumps were you aware of/did you engage with, if any?
    [Moderator to show examples of promotional material to jog memory, as needed]

    - How, if at all, did your engagement with marketing and promotions for ductless variable speed heat pumps **impact your knowledge, skills, or sales of ducted variable speed heat pumps**? How so?

17. How familiar are you with the **Northwest Energy Efficiency Alliance's (NEEA) Ductless Heat Pump Initiative (called the Northwest Ductless Heat Pump Project)**? What, if anything, do you know about it? [Moderator to describe some examples of the program's initiatives and/or expose stimuli about the program to help jog memory, as needed]

    a. What were your **impressions** of that program?

    b. In your opinion, to what extent did the program **act as a gateway for ducted variable speed heat pumps'** market entry and adoption?

    c. Do you think the Ductless Heat Pump Initiative had any **impact on your organization's sales/distribution/work with ducted variable speed heat pumps**, in any way?

18. Now, let's think about **government funded initiatives** (e.g., tax credits) and their potential impact on ducted variable speed heat pump sales/uptake. What kinds of government funded initiatives were you aware of/did you participate in for ducted variable speed heat pumps?
    a. When did you first hear about these programs? How did you learn about them?
    b. How did it impact the sales/distribution of ducted variable speed heat pumps at your organization, in any way?
    c. As far as you're aware, is there any connection between incentives for ductless variable speed heat pumps and ducted variable speed heat pumps? In what way did one impact the other, if at all?
19. I'm also curious about **utility funded incentives,** and their potential impact on ducted variable speed heat pump sales/uptake. Which utility funded incentives in the geographic areas you've worked in are you aware of/did you participate in for ducted variable speed heat pumps?
    a. When and how did you first hear about these incentives?
    b. How did it impact the sales/distribution of ducted variable speed heat pumps at your organization, in any way?
    c. As far as you're aware, is there any connection between utility funded incentives for ductless variable speed heat pumps and ducted variable speed heat pumps? In what way did one impact the other, if at all?
    d. (If not mentioned) Are you aware of **Bonneville Power Administration's Performance Tested Comfort Systems program** that is intended to improve HVAC system installations? If yes, what impact do you think that had on the sales of ducted variable speed heat pumps?
20. How have the **options or range of ducted variable speed heat pump models** changed over time? In what ways, if any, did the expansion of ducted variable speed heat pump models over time help to drive sales/uptake?
21. Thinking about **Energy Star Specifications,** what influence, if any, do you think the existence of an Energy Star specification has had on how frequently ducted variable speed heat pumps are sold/stocked/installed? [Moderator note: Many anticipate 6.1 coming soon]

IV. Wrap up and close

That's all the questions I have for you today, but before we conclude, ***is there anyone that comes to mind that might be able to add valuable input to this discussion***? If any referrals come to mind later, please do reach out to Elizabeth from Lieberman, who you've been in contact with over email.

Thank you so much for participating in this research!

Appendix D. Key Stimuli Used In This Research

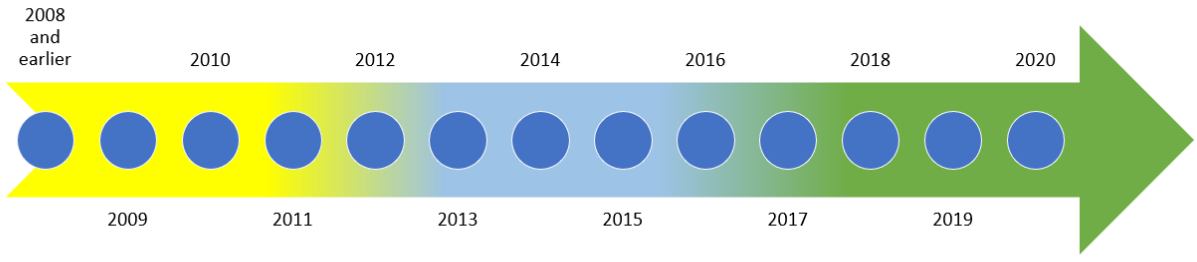
Factor List Stimuli

Key drivers of uptake of **DUCTED** variable speed heat pumps in the Northwest

- Geographic factors (climate, cultural attitudes and norms)
- Customer interest and demand
- Incentives (utility, manufacturer)
- Government funded initiatives
- Marketing and promotion
- Northwest Energy Efficiency Alliance (NEEA) initiatives
- Code changes
- EnergyStar Specifications
- Advancing technology and greater VSHP heat pump options and models
- Similarities and skills/knowledge transfer between **ductless** VSHPs and **ducted** VSHPs
- ***Anything else?***

Timeline Stimuli

Key factors that led to uptake over time



Early on | Mid way | More recent