

# May I Have a DHP, Please?

## Understanding Consumer Decision-Making through Market Research

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### Abstract

While the market share of electric heat is declining due to the popularity and increased availability of natural gas, the demand for electricity for space heating remains high in the Northwest and is expected to grow. This is due to the substantial stock of electrically heated existing homes in the region and the continued specification of electric heat in new construction. There are approximately 500,000 zonal electric heated single-family households in the Northwest region.

Additionally residential air conditioning saturation is approaching 40%. Recent technology advancements, namely the use of inverter-driven variable speed compressors and fans, have greatly improved the efficiency of ductless heat pumps. The Ductless Heat Pump Pilot Project (Pilot Project) believes that if a strategy to increase the market adoption of Ductless Heat Pumps (DHPs) can be developed and implemented, they could become the key measure to reduce electricity used for heating in the Northwest. In October 2008, the Northwest Energy Efficiency Alliance (NEEA) launched a region wide pilot implementation project to define the future of DHPs and build an infrastructure to sustain and accelerate growth in the market. In order to better understand the market potential for this technology and support implementation efforts, NEEA sought to develop a detailed characterization of homeowners living in electrically heated homes with high likelihood of adoption. In order to make marketing efforts as effective as possible, it also sought to better understand awareness and perceptions of DHPs, including the most important barriers to adoption of these units, the most compelling benefits of adoption, and the most compelling price point for these units among potential consumers. The paper discusses the key conclusions from the study and how they can be used by the implementation team.

### Introduction

Ductless Heat Pumps (“DHPs”), also known as mini-split heat pumps, have an impressive market presence and track record in Japan, Europe, and to a lesser degree in commercial applications in the US. In fact, sales of DHPs for residential applications in the US are quite modest compared to the size of the overall market.

Recent technology enhancements, most notably the use of inverter-driven variable speed compressors and fans, have greatly increased the efficiency of DHPs. This increased efficiency, coupled with difficulties with the delivered performance of traditional ducted systems, has led to increased interest in the potential of DHPs in the US residential sector.

As a result of the substantial stock of electrically heated existing homes in the Northwest, and the continued specification of electric heat in new construction, the demand for electricity for space heating remains high. In addition, the market share of central air conditioning in the residential sector is growing. And, although cooling is a modest portion of residential electricity use, residential air conditioning is a significant contributor to peak system demands in summer. With the advent of low cost room AC units, the total air conditioning saturation could approach 40% or more in housing of all types.

NEEA expects that DHPs (which are highly efficient zonal units) will become a cost-effective, viable alternative to most existing electric heat systems. Given the market trends with air conditioning,

DHPs would appear to provide a superior approach to the large number of existing and inevitable room AC installations.

NEEA has embarked on an implementation initiative — the Northwest Ductless Heat Pump Pilot (Pilot) on behalf of funding sponsors to market and evaluate inverter-driven ductless mini-split systems to displace electric resistance heat in existing Northwest homes. The Pilot works to pave the way for future ductless heat pump programs by testing program designs and marketing messages, identifying market barriers, and by building an effective infrastructure to sustain and accelerate market growth.

The Pilot has partnered with over 60 utilities, Bonneville Power Administration, Energy Trust of Oregon, and other energy efficiency sponsors to install up to 2500 inverter-driven ductless heat pumps throughout Oregon, Washington, Montana, and Idaho. Through this effort, participating homeowners are eligible for utility incentives. To qualify for the Pilot, homeowners must meet the following prerequisites:

- Homeowners must reside in a single family (four units or less) site built home.
- Homeowners must have lived in the home for at least a year
- The home must have permanently installed electric resistance heat
- Electric heat must be the homeowner's primary heat source. Homes must receive no gas service.

### **Market Research Objectives**

The primary objective of this research initiative was to understand the target market for DHPs in the Northwest. A representative sample of homeowners in the Northwest (meeting the same qualifications as the pilot) was surveyed to determine the characteristics of those with a high likelihood of adoption. The study sought to identify awareness and perceptions of DHPs, and to determine the most compelling value/selling propositions and most significant barriers to adoption of DHPs among potential consumers. The research also looked at other factors that play a part in the consumer purchase decision making process.

## **Methodology**

### **Sampling & Interview Methods**

This was a quantitative study conducted in November and December 2008 following a previous qualitative phase that was completed earlier in the spring of 2008. The quantitative research was conducted by Russell Research based in New York City. A total of 410 homeowners living in electric resistance heated homes in Oregon, Washington, Idaho, and Montana were interviewed. In order to ensure a representative sample inclusive of rural, elderly and low income consumers that tend to live in electrically heated homes, this study used mixed methodologies. The two survey methods were as follows:

- On-line – Interviewing for this group of respondents was conducted via the Internet. Respondents were contacted via e-mail and asked to go to a secure and pass-coded URL at which the questionnaire was self-administered. A total of 360 individuals completed the survey using this approach.
- Phone-Mail-Phone– Interviewing for this group was conducted via telephone. Respondents were initially recruited via phone. If those contacted agreed to participate, they were sent materials for review via 2-day US Postal mail, and then contacted again via phone for the actual survey. Fifty interviews were completed through this method.

## Analytical Methods

The survey was designed to identify a subgroup of respondents most receptive to the idea of purchasing a DHP, so that this subgroup could then be characterized. NEEA developed a product concept—a brief description and photographs of the indoor and outdoor units that a DHP comprises—and exposed each respondent to the concept (Figure 1). Respondents were then asked to rate the concept appeal and likelihood of consideration, each on a 5-point scale. Respondents who identified themselves as extremely or very likely to consider a DHP were considered to represent the subgroup most receptive to the technology.

The survey was also designed for using the technique of Maximum Difference Scaling (Max-Diff) to determine the relative importance of a pre-identified set of potential benefits/selling propositions as well as a set of potential purchase barriers.

The survey also was designed to incorporate Conjoint Analysis to help understand the relative importance of product price, savings claims, utility rebates, and tax credits in the purchase decision. These techniques will be discussed in further detail in the course of this paper.

## Key Findings

### Overview of Homeowner Characteristics

Respondents were asked about several different characteristics of their homes. The majority (61%) of respondents living in electrical resistance heated homes reported using an electric furnace with forced air ducts. The remaining respondents used various types of non ducted heat systems including wall heaters (16%), baseboard heaters (14%), and cable ceiling heat (6%). Overall, the majority of homeowners said they did not have central air (63%) in their homes. On the other hand, 58% of homeowners with electric forced air systems furnaces had central air. Ten percent of homeowners with this type of heat said they had window units compared to 32% of homeowners with non-ducted heat systems).

More than half the homes in the survey (57%) were single story and averaged approximately 1805 square feet in size, with a mean age of 29.4 years. A typical home had 6.7 rooms on average and less than a quarter of the homes had basements (23%).

Regardless of the type of electric resistance heat used to heat their homes, 48% of respondents surveyed, said they were satisfied with their heating systems. Respondents cited *effectiveness* as the primary reason for satisfaction with their heating system and *price* as the primary reason for dissatisfaction with their heating systems. Those with electric forced air systems were significantly more satisfied and less likely to consider switching their heat systems than those with other types of electric heat. Not surprisingly, 68% of satisfied respondents did not use space heaters in their homes. *Dissatisfied respondents* tended to be younger, with a mean age of 45; were the primary decision makers regarding home repair and finances; had a higher monthly heating bill than those who were satisfied with their heating systems, and had already seriously considered switching to another heating system.

### Profile of Target Homeowners

Respondents were initially tested on their awareness of DHPs. Overall; awareness was low regardless of the type of electric heat used in the home. Only 17% said they were extremely or very familiar with DHPs. Respondents were then exposed to a concept description of a DHP (as seen in Figure 1) and asked to rate the appeal on a 5-point scale from “extremely appealing” to “not at all appealing”. Over one-third of respondents rated DHPs as extremely (7%) or very (28%) appealing, with an additional 47% of respondents rating the concept as “somewhat appealing”. Appeal was significantly

higher among respondents residing in Idaho (44% extremely or very appealing), and among respondents who had previously considered switching their heating system (49%). Appeal was significantly lower for respondents residing in Montana (7%), among those who reported using supplemental gas heat (26%), and among those who had never considered switching their heating system (22%).

**Figure 1**  
**DHP Concept viewed by all consumers**

Electric ductless heating and cooling systems provide energy-efficient heating and air conditioning for your home. A single-zone system, which includes an indoor and an outdoor unit, delivers heating and cooling for approximately 1,500 – 2,000 square feet of living space. The sleek indoor unit is designed with a flat front panel that provides a wide air flow. The indoor unit, pictured to the right, can also feature an anti-allergy filter system.

The outdoor unit, pictured below right, is quiet enough to be placed under any window. Multi-zone systems are available for larger spaces.

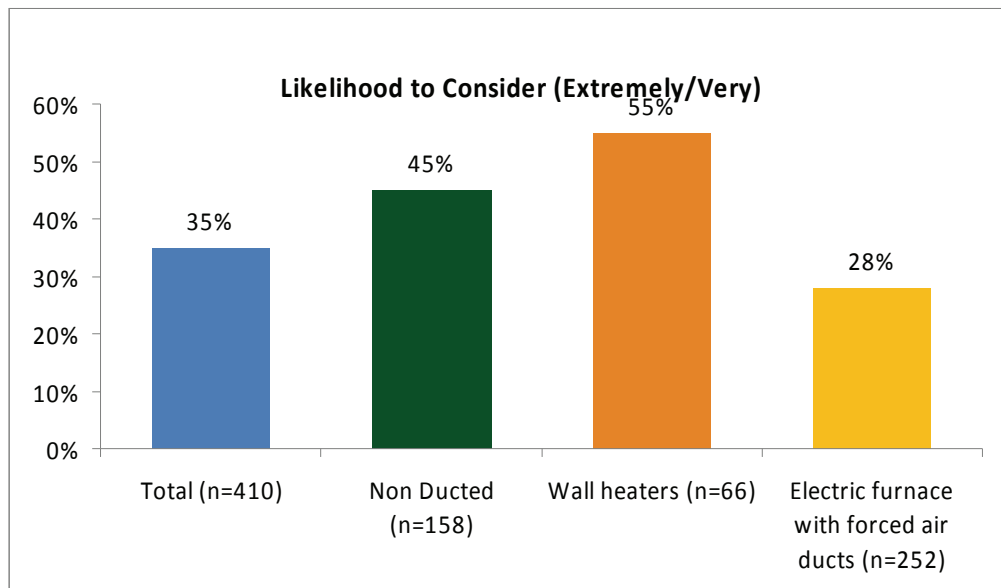
All systems are equipped with a remote control, and will save money on your utility bill and provide increased comfort at the same time.

Finally, because they don't require messy ductwork these units can easily be installed in your home in less than a day.



Respondents were also asked how likely they would be to consider purchasing a DHP for their home. Results were very similar to the concept appeal, with 35% rating themselves as extremely or very likely to consider a DHP system. Likelihood to consider a DHP system was significantly higher among respondents with non-ducted heat systems (45%) vs. those with forced air systems (28%). Likelihood to consider was particularly high (55%) among respondents with wall heaters (Figure 2).

**Figure 2**  
**Likelihood to Consider Purchasing a DHP**



Respondents with the greatest likelihood to consider DHPs (Figure 3) were equally split between male and female, and their homes were of similar size and age as those unlikely to consider DHPs. They were, however, significantly younger on average (45 vs. 49 years old), and had lived in their home for a shorter period of time (9 years vs. 12 years, on average).

Although likelihood to consider a DHP system was highest among respondents with non-ducted systems, 50% of those respondents most likely to consider a DHP had ducted forced air heating systems. 25% of the “likely” group had wall heaters—more than double the percent of respondents who were unlikely to consider a DHP. It is also notable that only 27% of this group had central air conditioning, 49% reported using space heaters, and 64% had considered switching to another heating system.

**Figure 3**

**Respondent Profile: Likely vs. Unlikely to Consider a DHP System**

<b>Respondent Characteristics</b>	<b>% Likely to Consider DHP</b>	<b>%Not Likely to Consider DHP</b>
Male	49	51
Female	51	49
Age (Mean)	45.3*	49.1
Years Lived in Home (mean)	8.9*	11.8
Avg Monthly Electric Bill	\$119.60*	\$134.30
Sq Footage of Home (mean)	1738	1841
Age of Home (mean)	31	29
<b>TYPE OF HEAT</b>		
Electric Forced Air	50*	68
Wall Heaters	25*	10
Base board Heaters	13	15
Radiant Heat	4	3
Cable Ceiling Heat	8	4
Have Space Heaters	49*	37
Central Air	27*	43
Window A/C	22	17

\* Significantly different at the 95% confidence level.

This group of respondents was also more likely to agree that DHPs were attractive, would heat the house more effectively than their current systems, save money on their electric bills and cost less than the electric heating systems they were currently using.

**Purchase Behavior of Target Homeowners**

Respondents were asked a series of questions pertaining to their purchase behavior. When asked which of a list of sources they would rely upon for more information about DHPs, 92% of homeowners most likely to purchase DHPs said they would rely on the internet. The next most common information source was home improvement centers (68%). Other less frequently cited information sources included HVAC contractors (38%) and local utilities (36%).

When asked where they would most likely go to purchase a DHP system, nearly half (49%) of respondents most likely to consider a DHP system said they would go to a home improvement center, such as Lowe's or Home Depot. The next most common place they would go to purchase was an HVAC contractor (19%). It seems clear that the retail home improvement channel is a critical one if market transformation is to occur in the DHP market.

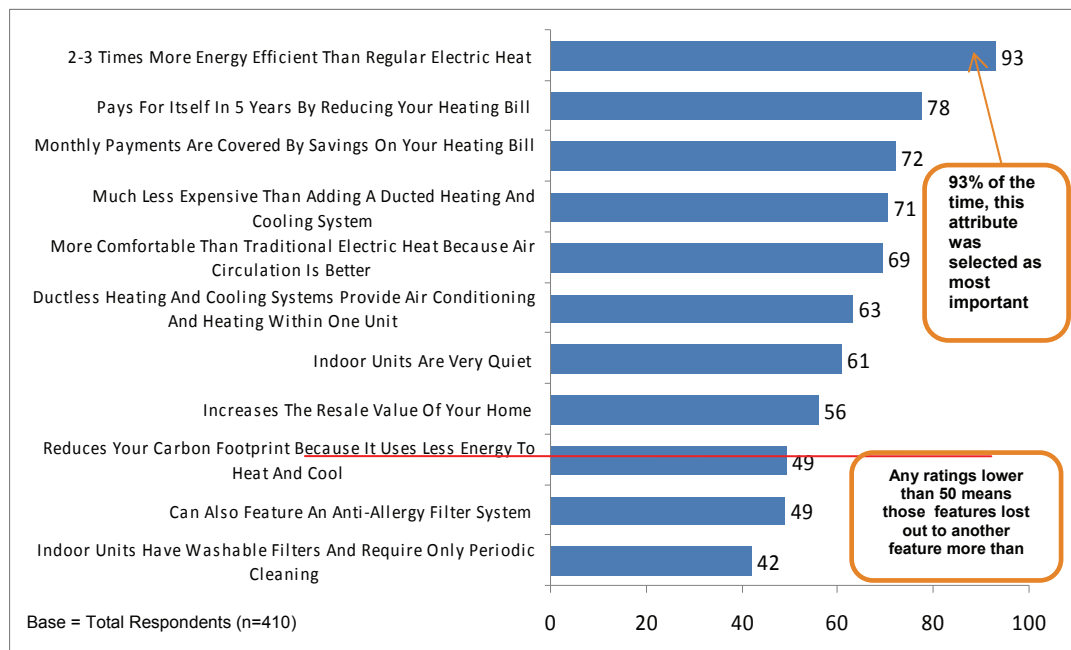
Respondents were also asked how important the brand of equipment would be. Forty-six percent said that product brand would be extremely or very important part in choosing a DHP. When asked which of a list of brands they would consider purchasing a DHP from, the most popular responses were General Electric (59%), Trane (49%), LG (33%), Panasonic (28%), Mitsubishi (23%), Sanyo (17%), Hitachi (17%), and Fujitsu (11%). However it should be noted that awareness of key manufacturers of DHPs is relatively low.

## Motivating Benefits

The survey instrument was designed so that Russell Research could perform Maximum Difference Scaling (Max-Diff) to identify the relative importance of potential benefits associated with DHPs. NEEA identified 21 potential motivating benefits associated with DHPs, based on the findings from focus groups conducted in December 2008. Using the Max-Diff technique, each respondent was presented with 25 combinations of four benefit statements and asked to identify the statements that they found most and least important. Figure 4 shows the percent of responses for which each benefit statement “won out” over another benefit statement.

Respondents selected DHPs being “2-3 times more energy efficiency than regular electric heat” as the most important benefit 93% of the time. The next most compelling benefits pertained to the cost-effectiveness of DHPs, specifically that a DHP “pays for itself in 5 years by reducing your heating bill” (selected as most important 78% of the time), “monthly payments are covered by savings on your heating bill” (most important 72% of the time), and “much less expensive than adding a ducted heating and cooling system” (71%). Other relatively motivating benefits included comfort (69%), air conditioning and heating in one unit (63%), quiet operation (61%), and increasing home resale value (56%). The analysis also identified benefits that are relatively less important considerations including those related to installation and aesthetics. There were very few significant differences between respondents who identified themselves as likely vs. unlikely to consider a DHP.

**Figure 4**  
**Reasons to Consider a DHP in Your Home**



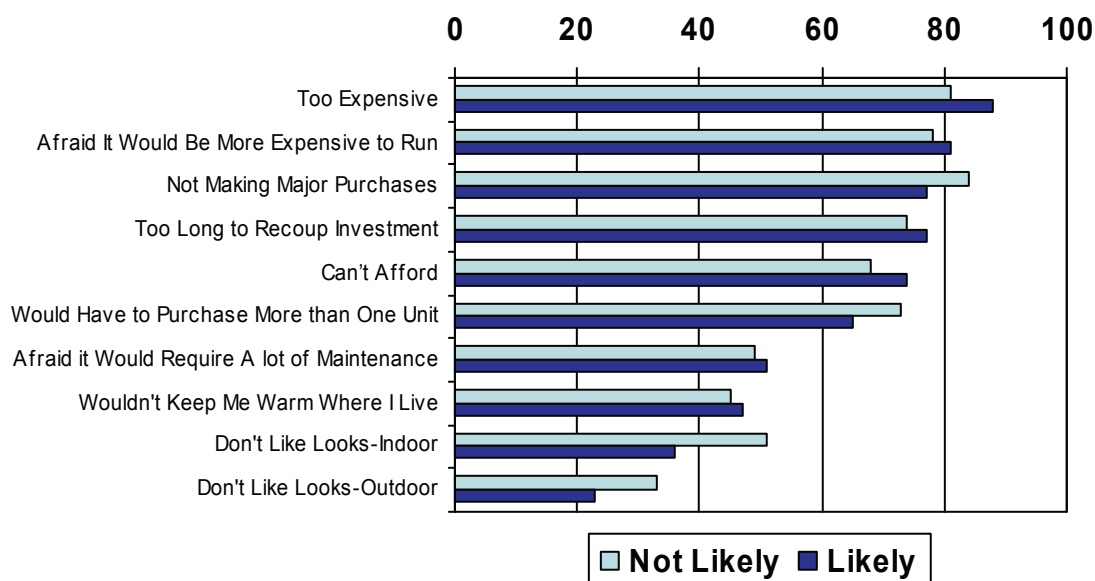
## Potential Barriers

Russell Research also performed Max-Diff to identify the most important barriers to purchasing a DHP. NEEA identified 21 potential purchase barriers to the purchase of DHPs, based on the focus groups noted above. As illustrated in Figure 5, the most significant potential barriers to purchase all

related to cost. The salience of cost-related barriers was slightly more pronounced among respondents who reported they were extremely or very likely to consider purchasing a DHP. It is unclear to what extent, if any, the timing of this survey (Fall 2008) may have contributed to the importance of this barrier.

Other barriers that respondents identified as important included concerns about the need to purchase more than one unit (65% of respondents likely to consider), maintenance (50%), and that the system would not be able to keep them warm where they live (46%). Interestingly, respondents likely to consider purchasing a DHP were substantially less likely to consider aesthetics a purchase barrier—perhaps because they tend to have visible systems (e.g., wall units) already.

**Figure 5**  
**Purchase Barriers: Those Likely vs. Not Likely to Consider a DHP**



### Conjoint/Pricing

In order to understand the relative importance to potential consumers of price, energy savings and financial incentives, the survey was designed for performing a conjoint analysis on these factors. Figure 6 summarizes the decision factors and values used in the conjoint section of the survey.

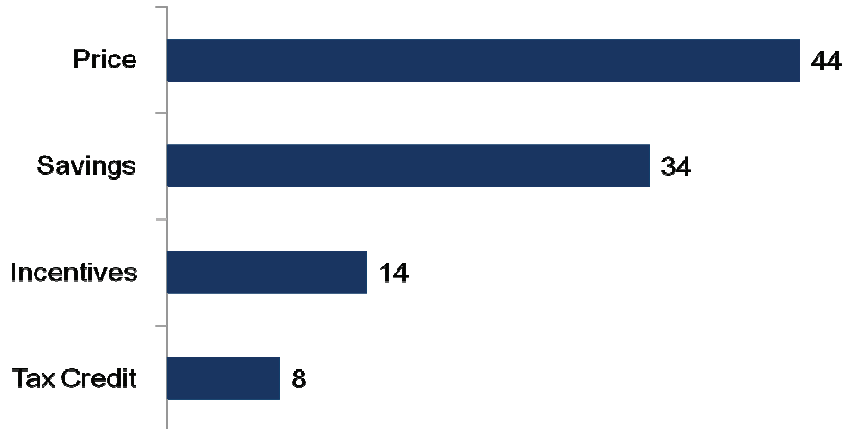


**Figure 6**  
**Attributes and Levels used in Conjoint Analysis**

Savings	Incentives	Price	Tax Credit
Save 20% off your heating bill	Receive a \$1500 rebate from your utility	Unit cost \$3,000 including installation	\$400 tax credit
Save 30% off your heating bill	Receive a \$1000 rebate from your utility	Unit costs \$4,000 including installation	No tax credit
Save 40% off your heating bill	Receive a \$500 rebate from your utility	Unit costs \$5,000 including installation	
Save 50% off your heating bill	Receive a \$200 rebate from your utility	Unit costs \$6,000 including installation	
		Unit costs including installation \$100/month for 5 years	
		Unit costs including installation \$83/month for 5 years	
		Unit costs including installation \$67/month for 5 years	
		Unit costs including installation \$50/month for 5 years	

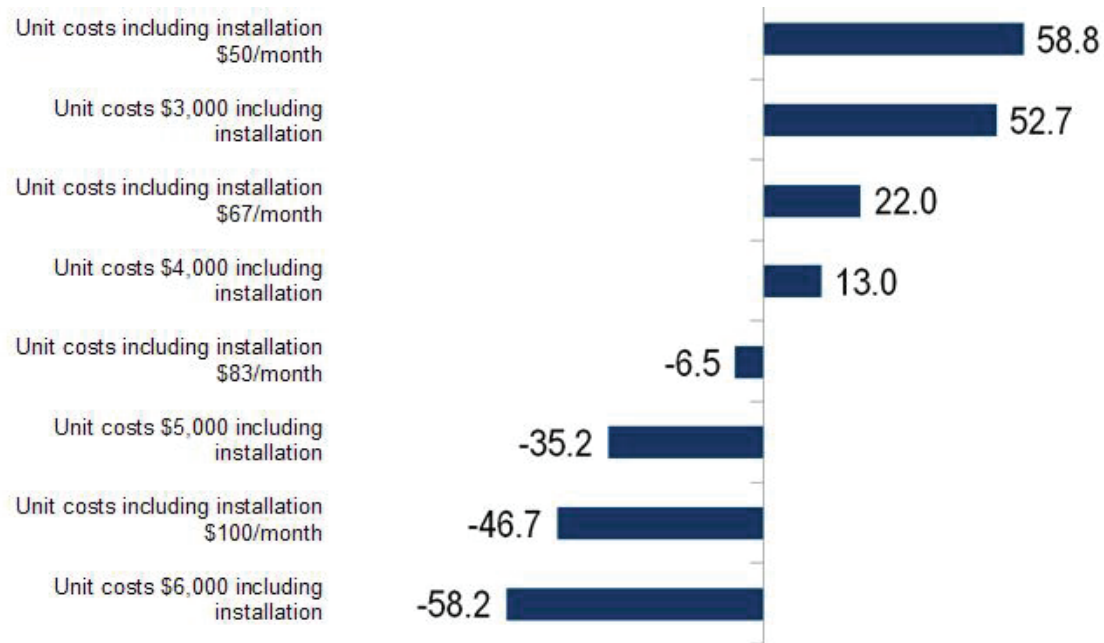
As seen in Figure 7, price had the highest relative importance followed fairly closely by savings. Incentives and tax credits rated comparatively low on relative importance. The low relative importance of incentives and tax credits are not surprising given their low dollar value relative to overall price. What is notable, however, is the relatively high importance of claimed electric bill savings. This result suggests there is significant marketing leverage in emphasizing electric bill savings to overcome price concerns, and is consistent with the results of the Max-Diff analysis.

**Figure 7**  
**Relative Importance**



Not surprisingly, installed units costing \$50 per month had the highest utility value for price, followed closely by installed units costing \$3,000—these were the lowest prices presented to respondents (Figure 8). It is interesting to note that respondents had a consistently higher utility value for monthly pricing. A preference for monthly payments could indicate that in order to make this more feasible, access to financing is required. The results also indicate a sharp drop in the utility value of the product at the pricing thresholds of \$5,000 and \$100/month. Currently, DHPs through the Pilot cost approximately \$4,000 - \$4,500 per unit.

**Figure 8**



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## Conclusions

The research indicates that the target market most likely to consider purchasing a DHP is homeowners living with non-ducted electric heat systems. These homeowners tended to be dissatisfied with their existing systems and to have considered switching to another type of heat. However, the high cost and disruption associated with such a switch had historically proved to be a barrier for this group. While respondents with non-ducted electric systems represent the key target for a DHP initiative, it is important to note that 50% of respondents who said they would be likely to consider a DHP had an electric furnace with forced air ducts and thus should not be ignored.

One of the primary objectives of the research was to identify the most compelling messages/selling propositions for DHPs. The claim that DHPs are “2-3 times more energy efficient than regular electric heat” was the most compelling message among survey respondents. Messages related to system cost-effectiveness, “less expensive than a ducted heating and cooling system” and comfort were also very compelling.

On the flip side, it is clear that concerns over price/cost are the primary purchase barriers that need to be overcome in order to achieve widespread adoption of DHPs. Conjoint analysis confirmed that unit price is the most important purchase consideration, but that savings is a close second. Additionally, consumers appear to interpret incentives/rebates as effectively reducing the price of the unit by the incentive amount. The conjoint analysis also suggests that potential buyers are more receptive to a price per month than a lump sum, implying that a financing option will be important to encourage market adoption of DHPs. In addition, the analysis showed that \$5,000 and \$100/month are steep drop-off points, suggesting that installed units will need to be available at less than those thresholds.

The study also uncovered useful information about likely consumer purchase behavior of DHPs. Receptive homeowners reported that they would be most likely to consult the internet and home improvement stores for more information about DHPs. In addition, home improvement stores were identified by nearly half of respondents as the place they would go to purchase a DHP, stressing the importance of figuring out how to make DHPs available through that channel.

This research identified the key characteristics of homeowners who are most likely to consider purchasing a DHP system for their home. It also provided insight into several aspects of those homeowners’ decision-making and purchase behavior. These findings will help NEEA and northwest utilities develop effective marketing strategy and tactics in an effort to transform the market for ductless heat pump systems. Although this study was representative of electrically-heated homes in the northwest, some of the findings related to target market and purchase behavior may be relevant to other regions as well.