AMEREN ILLINOIS COMPANY HEAT PUMP INCENTIVES & PROGRAM DESIGN STUDY

FINAL

JULY 8, 2026

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I. INTRODUCTION AND BACKGROUND

Ameren Illinois Company (AIC) is interested in increasing the adoption of heat pump space and water heating (henceforth, "heat pump technology") within its market rate initiatives. Evaluations in recent years, including interviews and surveys with distributors, contractors, and customers, have raised questions regarding the degree to which current AIC incentives are optimized to effectively encourage adoption of heat pump technologies while maximizing program influence (i.e., incentivize adoption among customers otherwise unlikely to pursue the technology). AIC is also interested in other programmatic design choices beyond incentives that could help encourage participation and heat pump adoption.

In 2021, Opinion Dynamics completed HVAC market characterization research to support AIC's increased focus on heat pumps, coinciding with the introduction of the current midstream model for residential HVAC incentives directed towards market rate customers, which helped set the stage for subsequent evaluation research.[1] As part of our 2024 evaluation, we conducted market research including in-depth interviews with HVAC contractors and a literature review of publicly available materials to follow up on previous findings and address additional topics of interest.[2] The 2024 evaluation of AIC's Retail Products Initiative and Market Rate Single Family Midstream HVAC Channel also gathered feedback from participating customers and market actors regarding their experience with select heat pump technologies in the context of program participation.[3] The 2024 heat pump research highlighted the wide range of installation scenarios, familiarity, and motivations for adopting heat pump technologies, which raised further questions about how motivations compare across different scenarios and how AIC can most effectively promote heat pump adoption for customers in their individual circumstances.

This current Heat Pump Incentives and Program Design Study addresses the following research questions:

- How can AIC residential offerings optimize incentive levels for heat pump technology to increase adoption while maximizing program influence?
- What purchase considerations and program design elements most influence customers' choice of HVAC and water heating equipment (e.g., upfront cost, equipment efficiency, previous equipment type, incentive availability and format, contractor involvement)?
- To what degree are AIC residential customers familiar with and open to adopting heat pump technology? What do customers see as the primary benefits and drawbacks of heat pump technology?
- How do customers typically approach the installation of new heat pump technology, and how do these tendencies vary across different types of equipment or when fuel switching is involved?

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[1] Opinion Dynamics, *Ameren Illinois' Market Effects Pilot: HVAC Market Characterization Report* (September 15, 2021). https://www.ilsag.info/wp-content/uploads/AIC-Market-Effects-2021-HVAC-Market-Characterization-Report-FINAL-2021-09-15.pdf.

[2] Opinion Dynamics, *Ameren Illinois Company Heat Pump Research Study* (September 12, 2025). https://www.ilsag.info/wp-content/uploads/AIC-2024-Heat-Pump-Research-Study-2025-09-12.pdf.

[3] Opinion Dynamics, *AIC 2024 Retail Products Initiative Participant Survey ISR and Process Findings* (January 28, 2025). https://www.ilsag.info/wp-content/uploads/AIC-2024-Retail-Products-Survey-ISR-Process-Memo-FINAL-2025-01-28.pdf; Opinion Dynamics, *AIC 2024 Midstream HVAC Channel Market Effects and Process Research Findings.* (January 28, 2025). https://www.ilsag.info/wp-content/uploads/AIC-2024-Res-Midstream-HVAC-Market-Effects-and-Process-Memo_FINAL_2024-12-16.pdf.

2. KEY FINDINGS

Based on the study findings, we offer the following conclusions and associated recommendations.

- **Key Finding #1: Customers express limited familiarity with heat pump technologies and associated benefits.** Most customers consider themselves only slightly or not at all familiar with various heat pump technologies and report particularly low levels of familiarity with heat pump water heaters (HPWHs). Similarly, many customers indicated uncertainty and conflicting impressions of typical benefits (and challenges) associated with heat pump equipment. Broadly speaking, the lack of familiarity with heat pump technologies and their benefits represents a significant barrier to adoption and limits the effectiveness of incentives.
  - **Recommendation:** Ensure customers receive educational information regarding the benefits and reliability of heat pump technologies as part of program engagement, and explore opportunities to broadly spread awareness of the technology and of any incentives that can help to defray upfront costs, while highlighting benefits of the technology, including energy efficiency and energy cost savings.
- **Key Finding #2: Upfront cost represents the most important factor in customers' selection of new HVAC and water heating equipment.** Unsurprisingly, the cost to purchase and install new equipment stands out as the primary determinant of selections between available HVAC and water heating equipment. The higher cost of heat pump technology relative to available alternatives represents a primary barrier to adoption, based on both self-report and conjoint analysis findings. As a result, incentives represent a critically important tool for promoting the adoption of heat pump technologies.
  - **Recommendation:** Continue offering meaningful incentives for heat pump technologies and ensuring reduced upfront costs are made visible to customers when deciding between available equipment.
- **Key Finding #3: Approximately half of customers are willing to adopt heat pump HVAC technologies if available for prices comparable to less efficient alternatives.** On the one hand, this signals substantial room for market growth beyond the current incidence of heat pump technologies among AIC customers, which ranges from just 3% of water heaters to 6% of primary cooling systems. However, the considerable reluctance to adopt heat pump technologies even at prices comparable to less efficient alternatives highlights the pervasiveness of customers' preferences for more familiar technologies and limited awareness of the benefits of heat pump technology.
  - **Recommendation:** Pairing substantial incentives with ongoing customer education on the benefits and annual savings associated with heat pumps has the potential to raise the ceiling for adoption indicated by conjoint analysis and encourage increased adoption of heat pump technologies while maintaining high levels of program influence.
- **Key Finding #4: Price sensitivity analysis identifies distinct trends associated with central HVAC and water heating replacement scenarios relative to elective ductless heat pump upgrades.** In central HVAC and both water heating replacement scenarios, willingness to adopt heat pump technology steadily increases as price decreases. In contrast, conjoint analyses of ductless heat pump upgrades reveals diminishing returns after an initial surge in interest as price decreases. These price sensitivity trends signal the value and influence of larger incentives in encouraging adoption of heat pump technology in central heat pump and water heater replacement scenarios, while larger incentives for elective ductless heat pump upgrades are likely to have a less significant impact on a dollar-for-dollar basis.
  - **Recommendation:** When incentivizing ducted heat pumps and HPWHs as likely replacements for an existing HVAC or water heating system, consider offering sizeable incentives to promote greater adoption of heat pump equipment and spur heat pump adoption among customers who would otherwise be unlikely to install a heat pump at higher price points (with lower incentive amounts).

- **Recommendation:** When incentivizing ductless heat pumps as a potential added or supplemental cooling source, prioritize relatively smaller incentives that help bring 'most efficient' systems in line with cheaper ductless heat pump alternatives, given larger incentives are likely to show diminishing returns in terms of heat pump adoption among those otherwise unlikely to pursue the technology.

- **Key Finding #5: Warranty duration represents a significant driver of customer decisions, accounting for up to 25% of customer selections between available HVAC and water heating equipment.** When choosing between available HVAC and water heating equipment, customers demonstrate clear hesitance towards options with shorter warranty periods and a strong preference for longer warranties. For each of the four equipment type scenarios tested, customer preferences for high-efficiency heat pump equipment increased steadily when the available warranty increased in five-year increments from 5 to 20 years. Additionally, customers' willingness to adopt increased by at least 50% when the associated warranty was extended from 5 to 10 years.
  - **Recommendation:** Prioritize incentivizing HVAC and water heating equipment with longer manufacturer warranties, particularly any equipment with available warranties extending at least 10 years.
  - **Recommendation:** Explore the possibility of AIC sponsoring an extended warranty or guarantee to offset future repair costs to help relieve customer concerns around reliability and maximize adoption of incentivized heat pump technologies.
- **Key Finding #6: Incentive format is of limited importance to customers choosing between available HVAC and water heating equipment.** Across the various scenarios and equipment types presented, the distinction between post-purchase rebates and point-of-sale discounts ranked lowest in importance among the considerations presented and was not a substantial driver of customer preferences.
  - **Recommendation:** The limited importance of incentive formats for customers' decision-making signals flexibility for program implementers to continue offering incentives in the format most conducive to administrative efficiency and streamlined customer engagement without concern that incentive delivery formats may limit participation or customer interest in pursuing program-targeted equipment.
- **Key Finding #7: Customers replacing a gas water heater may be particularly reluctant to fuel switch and adopt HPWHs.** Findings from the gas water heater replacement conjoint scenario indicate a strong preference for replacing gas water heaters with the same type of equipment (i.e., like-for-like replacement), suggesting AIC efforts to promote HPWHs to these customers may require additional engagement and encouragement. Price sensitivity analysis indicates these customers are particularly unlikely to install an HPWH if the upfront cost exceeds that of the gas alternative.[4]
  - **Recommendation:** Explore opportunities to provide targeted educational materials or guidance for customers with previously installed gas water heaters to help encourage HPWH adoption. Educational materials may highlight performance, reliability, efficiency, and reduced energy cost of HPWH systems to help diffuse customer reluctance towards the less familiar technology. To the degree feasible in the context of future program delivery channels, AIC may also consider offering increased incentives to customers replacing gas water heaters to help compensate for their hesitancy to fuel switch and adopt a less familiar technology.
  - **Recommendation:** Ensure customers with existing gas water heaters are aware of any available incentives for high-efficiency gas water heaters, so that those customers reluctant to fuel switch still have the opportunity to install efficient water heating and contribute to AIC savings goals.

[4] As of late 2025, AIC paused gas water heater incentives until further notice in light of policy stipulations currently in place for the 2026 calendar year.

3. METHODOLOGY

This study consisted of an initial review of current HVAC and water heating market pricing, as well as a survey of qualifying customers.

3.1 MARKET PRICING REVIEW

Before developing the customer survey instrument, the evaluation team thoroughly reviewed existing research and documentation on typical equipment, installation, and annual energy costs associated with heat pump technologies and their alternatives. This review directly informed the survey design and subsequent analysis. We established typical ranges and averages of total project costs (including equipment and installation), as well as the average annual energy costs associated with each type of technology. Additionally, we reviewed information on key factors affecting upfront costs, such as home size and system features, and examined how these factors impact typical pricing options available to customers considering heat pumps in Illinois. This comprehensive review provided valuable context informing the design of each conjoint exercise.

For heat pump HVAC systems, the most common replacement scenario (and, therefore, the premise of the conjoint exercises) is as an efficient alternative to other types of cooling equipment. However, given that heat pumps also provide heating and their efficient heating represents a significant part of their value proposition, we represented HVAC annual energy costs as combined heating and cooling costs. For heat pumps, we estimated annual energy costs representing the use of a heat pump for both primary cooling and heating. For central AC equipment, we included heating costs associated with a typical gas furnace used in conjunction with central AC cooling.

The insights gained from this review directly informed each of the four conjoint exercise designs, helping ensure pricing and costs in the hypothetical scenarios aligned with realistic, typical options available. Additionally, average upfront costs directly informed the conjoint analysis, allowing us to forecast shares of preference for specific options with representative price points similar to realistic averages. For the conjoint simulations, we assigned the closest available price points to those identified by the market pricing review based on the four linearly distributed dollar amounts shown on the actual conjoint exercise.

3.2 CUSTOMER SURVEY

The evaluation team conducted an online survey with AIC residential customers to characterize customer awareness, experience, preferences, and decision-making regarding the purchase and installation of heat pump technologies. We also included separate questions for customers who have completed an HVAC heat pump or HPWH installation in their home to solicit direct feedback about their experience with the process. In addition to traditional self-report questions, the survey included conjoint exercises, which rely on hypothetical scenarios to reveal customers' preferences. The conjoint approach enables researchers to observe and quantify the relative importance of multiple purchase considerations simultaneously, making it a useful method for characterizing not only price sensitivity but also the degree to which other program elements and purchase considerations influence customer decision-making. As part of survey development, we worked closely with AIC staff to refine and clarify individual research questions and solicit input on the draft survey instrument and conjoint exercise design.

We invited 60,000 residential customers to participate in the survey via email and offered $10 incentives to eligible customers who completed the survey. We sampled customers with valid email addresses from an extract of customers with recently active AIC electric accounts, provided by AIC staff in July of 2024. We aimed to collect at least 1,200 responses from current AIC electric customers living in single-family homes and responsible for their home's heating or cooling equipment. Ultimately, we received survey responses from 1,469 qualifying customers, representing a yield of 2.4%, as presented in Table 1.

Table 1. Customer Survey Sample Summary

Total Sample	Target Completes	Valid Respondents	Yield
60,000	1,200	1,469	2.4%

Conjoint research consists of hypothetical scenarios in which respondents are asked to make a series of choices between several possible options. On each screen, respondents are presented with several options that vary across a predetermined set of attributes and are asked to select one. They can also select "None" if they realistically would not choose any of the given options. By tracking which combinations of attributes are selected most often, researchers can model relative preferences for individual attributes. These quantified relative importances, sometimes referred to as "utility scores," can then be used to predict customers' likelihood of selecting specific options or the portion of customers who would make a given selection from the specific choices presented to them. We refer to these predicted outcomes as "shares of preference."

On the survey, we asked respondents to imagine they were in the market for a new HVAC system or water heating equipment, and we designed four distinct conjoint exercises representing different HVAC or water heating replacement scenarios for homes with different types of existing equipment:

- **Conjoint Exercise #1 Central AC Replacement:** Replacement of a failing central cooling system (with existing ductwork)
- **Conjoint Exercise #2 Ductless HVAC Upgrade:** Addition of ductless heat pumps to the home without central cooling (no existing ductwork)
- **Conjoint Exercise #3 Gas Water Heater Replacement:** Replacement of a failing gas-fueled water heater
- **Conjoint Exercise #4 Electric Water Heater Replacement:** Replacement of a failing electric water heater

Each respondent was presented with one of the four conjoint exercises, depending on the type of equipment they reported having in their home, to make the exercise as realistic as possible. In cases where customers qualified for two scenarios, we randomly assigned one of the two, prioritizing less common scenarios to help ensure adequate sample sizes for each.

3.2.1 CONJOINT EXERCISE 1: CENTRAL AC REPLACEMENT

Table 2 presents the comprehensive **range of all possible values** associated with each attribute included in the central AC replacement conjoint design. Each screen, or "choice set," presented the respondent with options reflecting randomized combinations of the values shown here.

Table 2. Conjoint Exercise Design Summary (Central AC Replacement)

Attribute	Value 1	Value 2	Value 3	Value 4
Equipment Type	Standard Heat Pump	High-Efficiency Heat Pump	Standard Central AC	High-Efficiency Central AC
Average Annual Energy Cost (LINKED TO EQUIPMENT TYPE)	~$1,570	~$1,130	~$1,760	~$1,720
Installed Price Before Incentive	$3,000	$6,000	$9,000	$12,000
Incentive Amount	No Incentive	$750	$1,500	$2,250
Incentive Type (N/A IF NO INCENTIVE)	Rebate with Proof of Purchase	Discount Applied at Purchase		
Warranty	5 years	10 years	15 years	20 years

Table 3 presents **an example of one possible set of options** that could be shown as part of the central AC replacement conjoint exercise. Before starting the exercise, respondents were provided with context intended to introduce and orient them to the exercise, mirroring the basic information readily available to someone considering these types of equipment.[5] Each respondent completed a series of ten choice sets like the one below, selecting one of the available options from each.

Table 3. Conjoint Exercise Conceptual Example Choice Set (Central AC Replacement)

	Option 1	Option 2	Option 3	Option 4	None
Equipment Type	High-Efficiency Heat Pump *~$1,130 Annual Energy Cost*	High-Efficiency Central AC *~$1,720 Annual Energy Cost*	Standard Central AC *~$1,760 Annual Energy Cost*	Standard Central AC *~$1,760 Annual Energy Cost*	I wouldn't choose any of these options
Installed Price Before Incentive	$6,000	$6,000	$6,000	$9,000	
Incentive Amount	$750	No Incentive	$750	$750	
Incentive Type	Rebate with Proof of Purchase	N/A	Discount Applied at Purchase	Discount Applied at Purchase	
Warranty	15 years	20 years	15 years	10 years	
	○	○	○	○	○

[5] Conjoint exercise introductory text briefly explained the hypothetical scenario and what the exercise entailed before providing a series of definitions for each attribute. The complete introductory text is included in the data collection instrument provided as Appendix A.

3.2.2 CONJOINT EXERCISE 2: DUCTLESS HVAC UPGRADE

Table 4 presents the comprehensive **range of all possible values** associated with each attribute included in the ductless HVAC upgrade conjoint design. Each screen, or "choice set," presented the respondent with options reflecting randomized combinations of the values shown here.

Table 4. Conjoint Exercise Design Summary (Ductless HVAC Upgrade)

Attribute	Value 1	Value 2	Value 3	Value 4
Equipment Type	Standard Ductless Heat Pump	High-Efficiency Ductless Heat Pump		
Average Annual Energy Cost (LINKED TO EQUIPMENT TYPE)	~$950	~$530		
Installed Price Before Incentive	$2,500	$5,000	$7,500	$10,000
Incentive Amount	No Incentive	$750	$1,500	$2,250
Incentive Type (N/A IF NO INCENTIVE)	Rebate with Proof of Purchase	Discount Applied at Purchase		
Warranty	5 years	10 years	15 years	20 years

Table 5 presents an example of one possible set of options that could be shown as part of the ductless HVAC upgrade conjoint exercise. Before starting the exercise, respondents were provided with context intended to introduce and orient them to the exercise, mirroring the basic information readily available to someone considering these types of equipment.[6] Each respondent completed a series of ten choice sets like the one below, selecting one of the available options from each.

Table 5. Conjoint Exercise Conceptual Example Choice Set (Ductless HVAC Replacement)

	Option 1	Option 2	Option 3	Option 4	None
Equipment Type	Standard Ductless Heat Pump *~$950 Annual Energy Cost*	Standard Ductless Heat Pump *~$950 Annual Energy Cost*	High-Efficiency Ductless Heat Pump *~$530 Annual Energy Cost*	High-Efficiency Ductless Heat Pump *~$530 Annual Energy Cost*	I wouldn't choose any of these options
Installed Price Before Incentive	$5,000	$5,000	$2,500	$7,500	
Incentive Amount	$2,250	No Incentive	$1,500	$750	
Incentive Type	Rebate with Proof of Purchase	N/A	Rebate with Proof of Purchase	Rebate with Proof of Purchase	
Warranty	10 years	15 years	10 years	15 years	
	○	○	○	○	○

[6] Conjoint exercise introductory text briefly explained the hypothetical scenario and what the exercise entailed before providing a series of definitions for each attribute. The complete introductory text is included in the data collection instrument provided as Appendix A.

3.2.3 CONJOINT EXERCISE 3: GAS WATER HEATER REPLACEMENT

Table 6 presents the comprehensive **range of all possible values** associated with each attribute included in the gas water heater replacement conjoint design. Each screen, or "choice set," presented the respondent with options reflecting randomized combinations of the values shown here.

Table 6. Conjoint Exercise Design Summary (Gas Water Heater Replacement)

Attribute	Value 1	Value 2	Value 3	Value 4
Equipment Type	Natural Gas	Traditional Electric	Heat Pump Water Heater	
Average Annual Energy Cost (LINKED TO EQUIPMENT TYPE)	~$170	~$370	~$100	
Installed Price Before Incentive	$1,500	$2,750	$4,000	$5,250
Incentive Amount	No incentive	$400	$800	$1,200
Incentive Type (N/A IF NO INCENTIVE)	Rebate with Proof of Purchase	Discount Applied at Purchase		
Warranty	5 years	10 years	15 years	20 years

Table 7 presents **an example of one possible set of options** that could be shown as part of the gas water heater replacement conjoint exercise. Before starting the exercise, respondents were provided with context intended to introduce and orient them to the exercise, mirroring the basic information readily available to someone considering these types of equipment.[7] Each respondent completed a series of ten choice sets like the one below, selecting one of the available options from each.

Table 7. Conjoint Exercise Conceptual Example Choice Set (Gas Water Heater Replacement)

	Option 1	Option 2	Option 3	Option 4	None
Equipment Type	Heat Pump Water Heater *~$100 Annual Energy Cost*	Traditional Electric *~$370 Annual Energy Cost*	Natural Gas *~$170 Annual Energy Cost*	Natural Gas *~$170 Annual Energy Cost*	I wouldn't choose any of these options
Installed Price Before Incentive	$1,500	$1,500	$2,750	$4,000	
Incentive Amount	$1,200	$1,200	$400	$1,200	
Incentive Type	Rebate with Proof of Purchase	Rebate with Proof of Purchase	Rebate with Proof of Purchase	Discount Applied at Purchase	
Warranty	5 years	20 years	5 years	20 years	
	○	○	○	○	○

[7] Conjoint exercise introductory text briefly explained the hypothetical scenario and what the exercise entailed before providing a series of definitions for each attribute. The complete introductory text is included in the data collection instrument provided as Appendix A.

3.2.4 Conjoint Exercise 4: Electric Water Heater Replacement

Table 8 presents the comprehensive **range of all possible values** associated with each attribute included in the electric water heater replacement conjoint design. Each screen, or "choice set," presented the respondent with options reflecting randomized combinations of the values shown here.

Table 8. Conjoint Exercise Design Summary (Electric Water Heater Replacement)

Attribute	Value 1	Value 2	Value 3	Value 4
Equipment Type	Traditional Electric	Heat Pump Water Heater		
Average Annual Energy Cost (LINKED TO EQUIPMENT TYPE)	~$370	~$100		
Installed Price Before Incentive	$1,500	$2,750	$4,000	$5,250
Incentive Amount	No incentive	$400	$800	$1,200
Incentive Type (N/A IF NO INCENTIVE)	Rebate with Proof of Purchase	Discount Applied at Purchase		
Warranty	5 years	10 years	15 years	20 years

Table 9 presents **an example of one possible set of options** that could be shown as part of the electric water heater replacement conjoint exercise. Before starting the exercise, respondents were provided with context intended to introduce and orient them to the exercise, mirroring the basic information readily available to someone considering these types of equipment.[8] Each respondent completed a series of ten choice sets like the one below, selecting one of the available options from each.

Table 9. Conjoint Exercise Conceptual Example Choice Set (Electric Water Heater Replacement)

	Option 1	Option 2	Option 3	Option 4	None
Equipment Type	Traditional Electric *~$370 Annual Energy Cost*	Heat Pump Water Heater *~$100 Annual Energy Cost*	Heat Pump Water Heater *~$100 Annual Energy Cost*	Heat Pump Water Heater *~$100 Annual Energy Cost*	I wouldn't choose any of these options
Installed Price Before Incentive	$2,750	$5,250	$5,250	$5,250	
Incentive Amount	No Incentive	$1,200	$800	$800	
Incentive Type	N/A	Discount Applied at Purchase	Rebate with Proof of Purchase	Discount Applied at Purchase	
Warranty	10 years	10 years	10 years	10 years	
	○	○	○	○	○

[8] Conjoint exercise introductory text briefly explained the hypothetical scenario and what the exercise entailed before providing a series of definitions for each attribute. The complete introductory text is included in the data collection instrument provided as Appendix A.

3.3 CONJOINT ANALYSIS

Analysis of survey-based conjoint data involves advanced statistical modeling via specialized software to estimate the relative contribution of each attribute and value to customers' selections. We relied on Hierarchical Bayesian (HB) modeling to produce estimates of the relative importance, or "utility," of each program element for each respondent.[9] These utility scores capture the extent to which customers consider and prioritize each element when making a purchase decision.

In addition to quantifying preferences for each attribute, the utility scores enable predictive simulations of "shares of preference" that forecast the portion of customers that would select a given option out of specific choices available to them. Shares of preference can also be interpreted as the likelihood of a given customer making a given selection. These simulations enable researchers to quantify and compare shares of preference across a range of available options under specific conditions (i.e., preference for each option among specific available options). For example, researchers can simulate shares of preference for two different options available at the same price point or how shares of preference change when the same option is available at different price points.

Conjoint analysis is susceptible to "bad respondents" who may ignore instructions, rush through the exercise, or misunderstand the hypothetical task. Respondents who provide unrealistic answers have the potential to bias or invalidate modeled outcomes. We therefore thoroughly reviewed the responses of each respondent to omit those who did not fully engage with or understand the exercise. We identified these respondents in one of three ways: (1) straight liners, (2) speeders, and (3) respondents who did not understand the exercises:

- Straight liners consist of respondents who selected the same response option across all conjoint questions. We did not omit respondents who reported "none" for all cases, unless they were also speeders, to avoid omitting respondents who were genuinely uninterested in any proposed program offerings.
- Speeders consist of respondents who spent less than 40% of the median time on the full conjoint exercise.
- Respondents who indicated that they did not understand the conjoint exercise (either reported feeling that they could not make an informed decision, were unsure, or that the information presented in the exercise was unclear).

Based on this review, we dropped 125 respondents who met any of these conditions from the conjoint analyses. After omitting potentially invalid responses, we included between 155 and 326 valid respondents in our analysis of each of the four conjoint scenarios.

Table 10. Conjoint Exercise Sample Summary

Conjoint Scenario	Target Completes	Valid Respondents
Conjoint Exercise #1: Central AC Replacement	At least 150	300
Conjoint Exercise #2: Ductless HVAC Upgrade	At least 150	155
Conjoint Exercise #3: Gas Water Heater Replacement	At least 150	326
Conjoint Exercise #4: Electric Water Heater Replacement	At least 150	316

[9] Hierarchical Bayesian modeling refers to a multi-level, regression-based statistical modeling framework designed to account for data with nested structures and multiple levels of variability.

4. DETAILED RESULTS

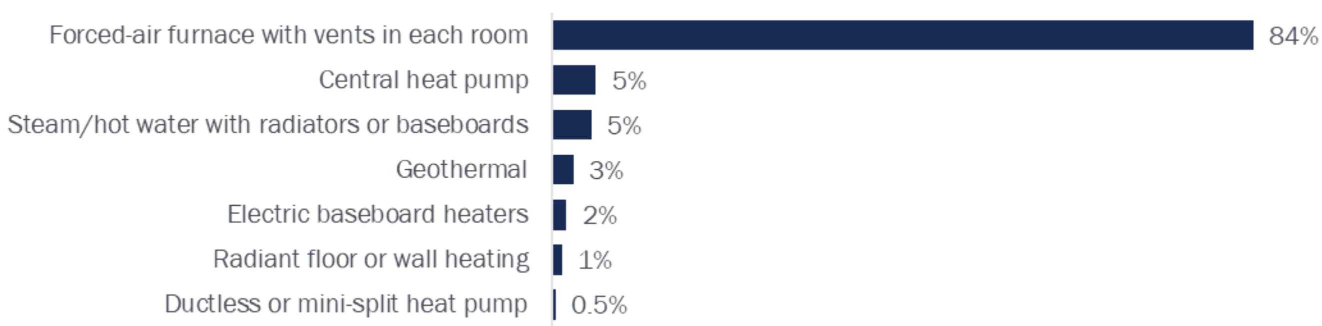
This section presents detailed results, including both self-report and conjoint findings from the customer survey.

4.1 EXISTING EQUIPMENT

Nearly nine in ten respondents reported having a central AC system as their home's primary cooling equipment (89%), and almost as many indicated a forced-air furnace as their primary heating equipment (84%). Heat pumps accounted for just 6% of customers' primary cooling equipment and 5% of their primary heating equipment. Figure 1 and Figure 2 summarize the composition of primary heating and cooling equipment among survey respondents.

Figure 1. Primary Cooling Equipment (n=1,438)

Figure 2. Primary Heating Equipment (n=1,454)



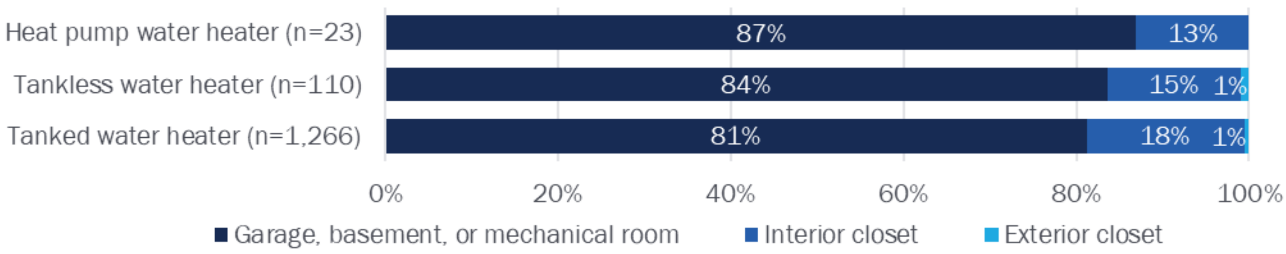
The vast majority of respondents (90%) indicated their homes have traditional tanked water heaters, and just 2% of respondents reported having heat pump water heaters.[10] Figure 3 shows the composition of primary water heating equipment among survey respondents.

Figure 3. Primary Water Heating Equipment (n=1,466)

[10] Nearly two-thirds of respondents (63%) report having gas water heaters, and the incidence of gas water heating is similar for those with traditional tanked and tankless water heaters (64% and 59%, respectively).

Respondents generally reported that their water heating equipment was installed in a garage, basement, or mechanical room (at least 81%), while nearly all remaining respondents had theirs installed in an interior closet. Figure 4 presents the locations of respondents' water heating systems by equipment type.

Figure 4. Water Heating Equipment Location

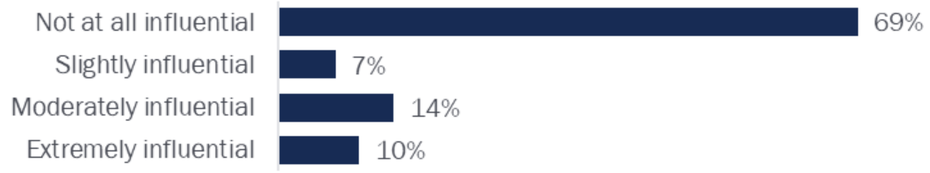


4.2 HEAT PUMP INSTALLATION EXPERIENCE

For those with heat pump technology in their homes, we asked a series of follow-up questions about their experience installing the equipment.

Among respondents familiar with the installation of their heat pump HVAC systems (n=75), more than three-quarters (81%) discussed their heat pump installation with a contractor before installing the heat pump, but more than two-thirds (69%) suggested their contractor's input was not at all influential on their decision to install a heat pump (including the 19% who did not work with a contractor). Among those who worked with a contractor, 61% had already decided to install a heat pump before speaking with the contractor, and their choice to install a heat pump was therefore not at all influenced by their contractor. Notably, these findings only characterize the experience of those who opted to install a heat pump, and do not capture the frequency with which HVAC contractors recommend the technology (e.g., it may be that heat pumps are mainly installed by self-motivated customers because contractors very rarely recommend them). Figure 5 summarizes the influence of contractor recommendations among all those with heat pumps installed.

Figure 5. Influence of Contractor Recommendation on Heat Pump Install Decision (n=72)

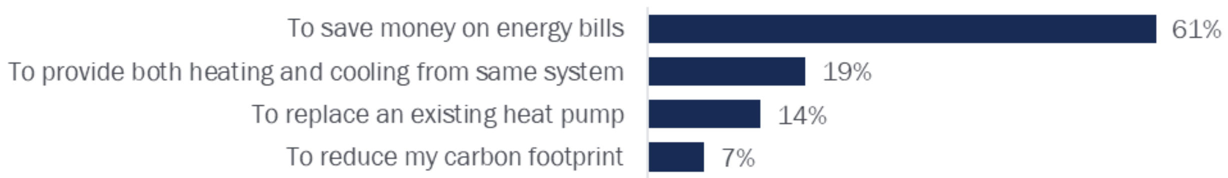


Note: excludes three respondents who were unsure whether they spoke to a contractor before installing.

Respondents with heat pump HVAC equipment reported a range of different scenarios that prompted them to install their current system. For those with central heat pumps, 63% replaced a working but old or inefficient system, and 21% were purchased for a new or remodeled home. Among those with ductless heat pumps, 54% replaced a working but old or inefficient system, and nearly half (46%) installed the equipment to add cooling beyond a window AC or fan.

Heat pump owners most commonly cited saving money on energy bills as their primary motivation for choosing a heat pump (61%) over alternative types of equipment. Less than 20% pointed to the ability to provide both heating and cooling, replacement of an existing heat pump, or reduction of their carbon footprint. Figure 6 shows the customers' primary motivations for selecting a heat pump.

Figure 6. Primary Motivation for Choosing a Heat Pump (n=74)

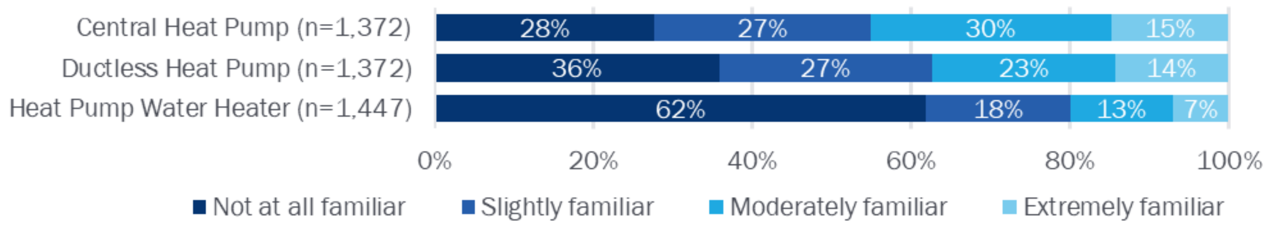


Customers with HPWHs also typically worked with a contractor to install the equipment. Among respondents familiar with the installation of their HPWH, nearly two-thirds (62%) reported having it installed by a contractor, while the remaining 38% installed it themselves.

4.3 CUSTOMER FAMILIARITY AND INTEREST

Limited customer familiarity with heat pump technologies represents a significant barrier to adoption of the technology. Fewer than half of customers consider themselves more than slightly familiar with either central heat pumps (45%) or ductless heat pumps (37%). Substantially fewer customers more than slightly familiar with heat pump water heaters (20%), while nearly two-thirds (62%) considered themselves not at all familiar with the technology. Figure 7 presents respondents' self-reported familiarity with each type of heat pump technology.

Figure 7. Familiarity with Heat Pump Equipment



Respondents often indicated uncertainty about the benefits or challenges of heat pump technology. Even among those reporting some familiarity with heat pump HVAC equipment, as many as 43% of respondents were unsure about specific benefits of the technology, while as many as 56% were unsure about specific challenges. Nonetheless, majorities of respondents at least somewhat agreed the systems provide effective heating in cold weather (60%) or improve home comfort (50%). Less than half of respondents at least somewhat agreed with any of the perceived challenges of HVAC heat pumps, but upwards of one-third suggested they at least somewhat agree the technology can have higher upfront costs (43%), operating issues when temperatures are below freezing (38%), and difficulty keeping homes warm in winter (37%). Figure 8 and Figure 9 summarize respondents' perceived benefits and barriers associated with heat pump HVAC equipment.

Figure 8. Perceived Benefits of HVAC Heat Pump Equipment (n=1,214)

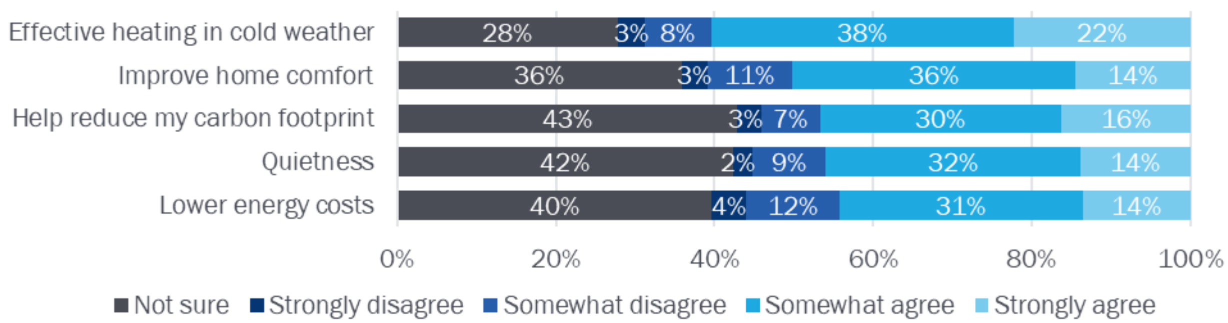
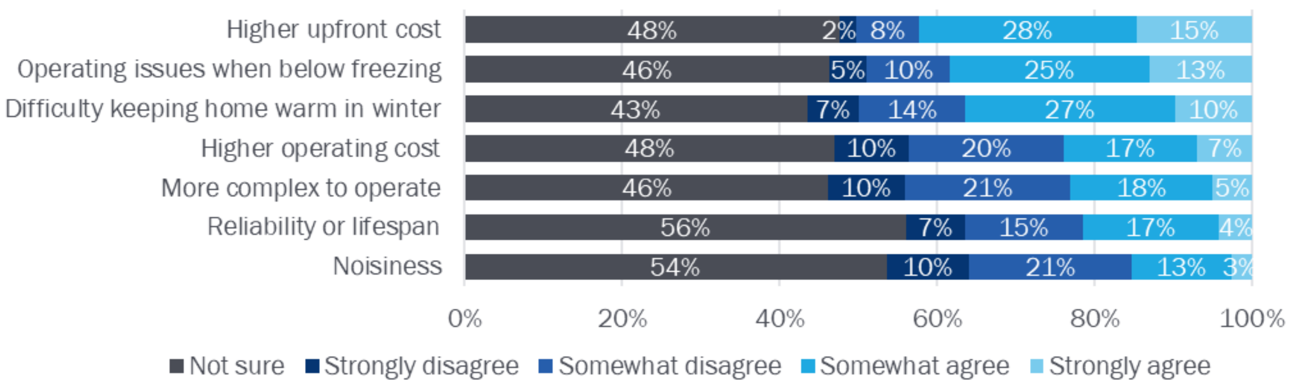


Figure 9. Perceived Challenges with HVAC Heat Pump Equipment (n=1,214)



Respondents similarly demonstrated uncertainty regarding the potential benefits and challenges of HPWH technology. At least two-fifths (40%) of respondents were unsure about each of the potential benefits, and as many as half (50%) expressed uncertainty regarding challenges. Respondents most frequently agreed that HPWHs can help reduce their carbon footprint (49% at least somewhat agreed) and result in lower energy costs (45%). Opinions were generally divided across most potential barriers, with relatively few respondents strongly agreeing or strongly disagreeing. Figure 10 and Figure 11 summarize respondents' perceived benefits and challenges associated with HPWH technology.

Figure 10. Perceived Benefits of Heat Pump Water Heaters (n=573)

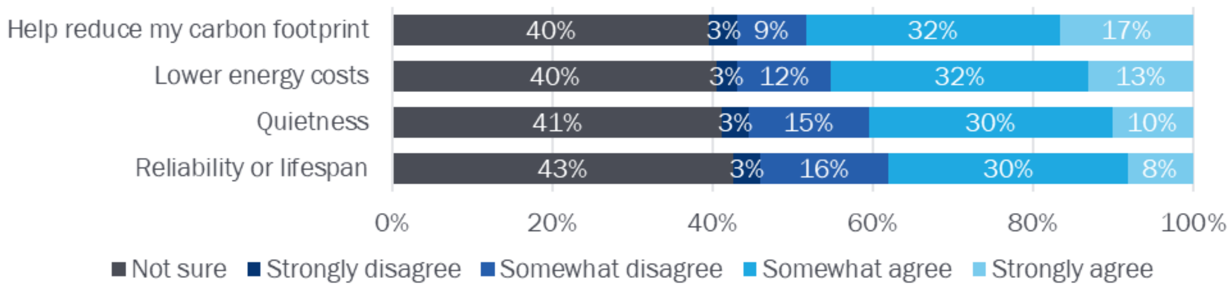
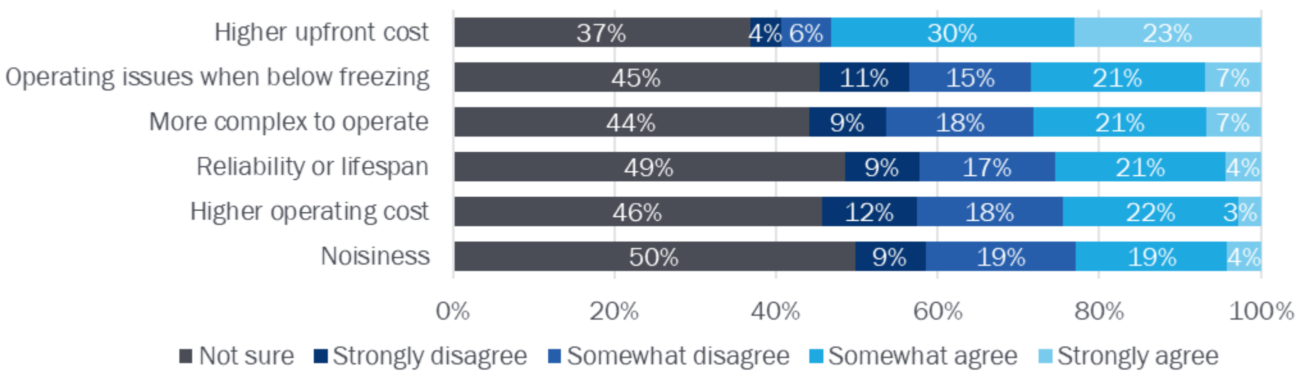


Figure 11. Perceived Challenges with Heat Pump Water Heaters (n=573)



4.4 CONJOINT RELATIVE IMPORTANCE SCORES

Based on responses to each conjoint exercise, we modeled the relative importance associated with each attribute included. These relative importances represent the contribution of each attribute to customer decision-making as a percentage (i.e., the degree to which the given attribute drives customers' selections).[11]

4.4.1 CENTRAL AC REPLACEMENT

For central AC replacements, the price to install before incentive accounts for nearly one-third (30%) of customer decision-making. Equipment type (and annual energy cost) represents another quarter (25%) of relative importance, followed by warranty duration (19%). Figure 12 shows the relative importance of each attribute in determining central AC replacement selections.

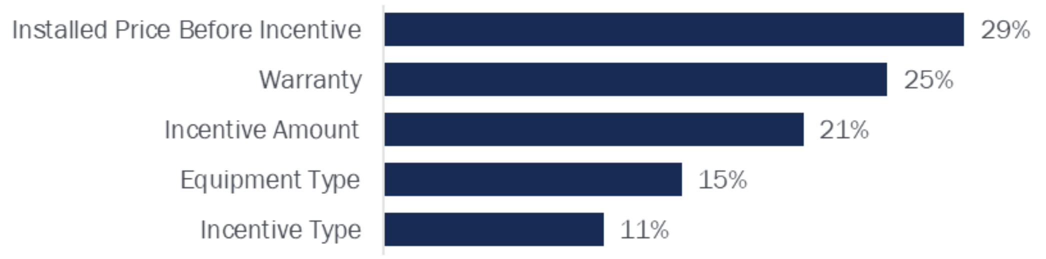
Figure 12. Conjoint Attribute Relative Importance (Central AC Replacement, n=300)

Note: values shown here reflect the relative contribution of each attribute to respondents' decision-making out of a total of 100%.

4.4.2 DUCTLESS HVAC UPGRADE

For ductless HVAC upgrades, the price to install before incentive accounts for 29% of customer decision-making, followed by warranty duration, which represents another quarter (25%) of relative importance, suggesting warranty length plays a substantial role in driving customer selections of ductless heat pumps. Figure 13 shows the relative importance of each attribute in determining ductless HVAC upgrade selections.

Figure 13. Conjoint Attribute Relative Importance (Ductless HVAC Upgrade, n=155)



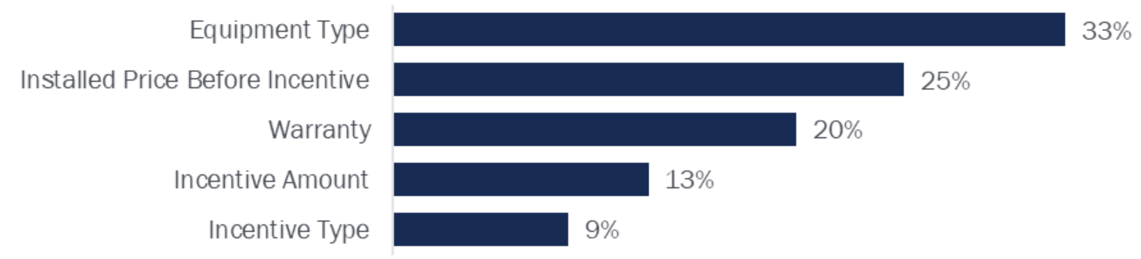
Note: values shown here reflect the relative contribution of each attribute to respondents' decision-making out of a total of 100%.

[11] Note that "installed price before incentive" and "incentive amount" each represent dollar amounts that in combination represent the upfront cost to the customer. The difference in relative importance between these two attributes is therefore partially reflective of the difference in dollar amounts where "installed price before incentive" represents a larger range of possible dollar amounts than "incentive amount."

4.4.3 GAS WATER HEATER REPLACEMENT

When choosing replacements for a gas water heater, the equipment type (inclusive of associated annual energy costs) drives one-third (33%) of customer decision-making, reflecting a general preference for like-for-like replacements (i.e., customers replacing gas water heaters prefer to stick with gas water heating). The installed price represents another quarter (25%) of relative importance, followed by warranty duration (20%). Figure 14 shows the relative importance of each attribute in determining gas water heater replacement selections.

Figure 14. Conjoint Attribute Relative Importance (Gas Water Heater Replacement, n=326)

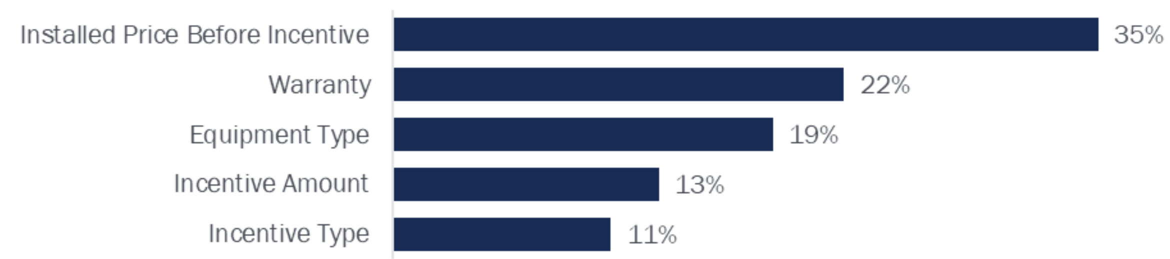


Note: values shown here reflect the relative contribution of each attribute to respondents' decision-making out of a total of 100%.

4.4.4 ELECTRIC WATER HEATER REPLACEMENT

For electric water heater replacements, the price to install before incentive accounts for more than one-third (35%) of customer decision-making, followed by warranty duration (22%). As with scenarios for other equipment types, warranty plays a substantial role in determining customer choices of electric water heaters. Figure 15 shows the relative importance of each attribute in determining electric water heater replacement selections.

Figure 15. Conjoint Attribute Relative Importance (Electric Water Heater Replacement, n=316)



Note: values shown here reflect the relative contribution of each attribute to respondents' decision-making out of a total of 100%.

4.5 CONJOINT PREDICTED SHARES OF PREFERENCE

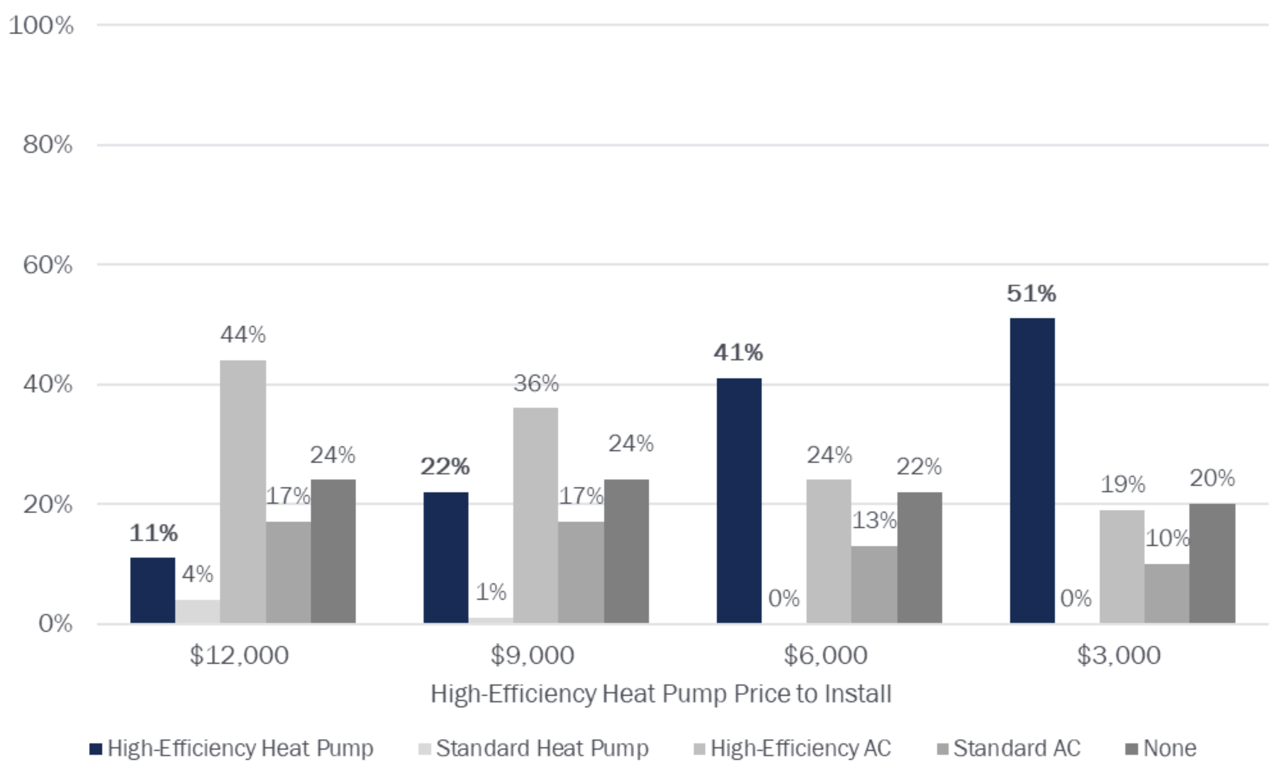
Based on responses to each conjoint exercise, we modeled relative preferences and used them to simulate predicted shares of preference across various scenarios representing choices between different combinations of available options. As part of this analysis, we simulated the influence of price (i.e., price sensitivity), warranty duration, and incentive format on relative preferences for the high-efficiency equipment in each scenario.

Notably, the outputs of the conjoint analysis simulations reflect the most likely preferences of survey respondents with only basic information about the technologies and their potential benefits. As such, additional education and customer engagement has the potential to increase the likelihood of a customer recognizing the advantage of a more efficient system and increasing preferences for those types of equipment beyond the levels forecasted by conjoint simulations. Additionally, forecasted shares of preference reflect outcomes from hypothetical scenarios not involving actual money, and while they accurately represent customers' relative preferences in this context, they may underrepresent the actual impact of the dollar amounts involved.

4.5.1 CENTRAL AC REPLACEMENT

Price sensitivity analysis reveals a relatively linear relationship between upfront cost and willingness to adopt high-efficiency heat pumps as replacement for central AC systems, suggesting larger incentives have the potential to promote increased participation with a similar level of influence as smaller incentives. Based on our review of available market pricing information, the cost to install a central heat pump ranges considerably and typically depends directly on the size of the home, capacity of system needed, and the efficiency and quality of the system, ultimately ranging from $9,000 and $12,000 for the average home. As such, an incentive of several thousand dollars would be required to bring the cost in line with that of central AC alternatives. When high-efficiency heat pumps are made available at the same $6,000 price point as central AC alternatives, shares of preference for the discounted heat pump increase to 41%. Figure 16 presents the forecasted price sensitivity for high-efficiency heat pumps replacing central AC systems, relative to commonly available alternatives.

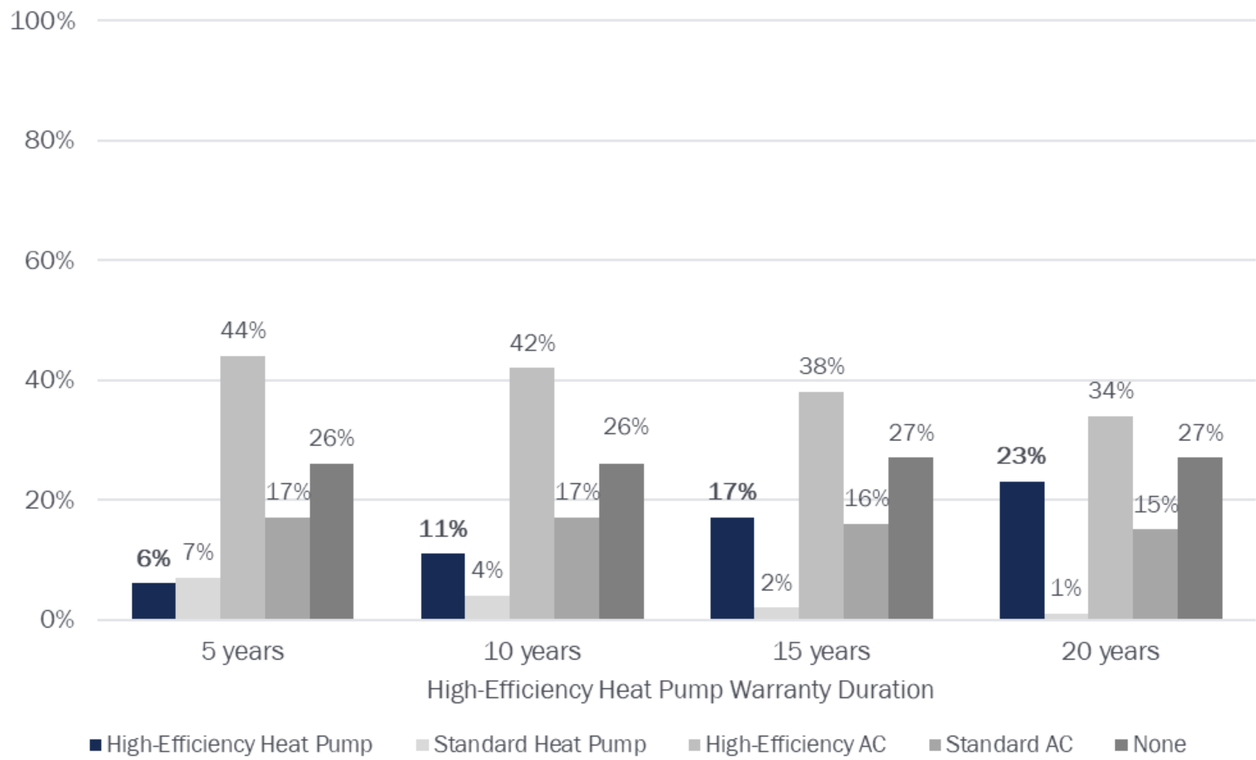
Figure 16. Price Sensitivity of High-Efficiency Heat Pump (Central AC Replacement, n=300)



Equipment Type	High-Efficiency Heat Pump	Standard Heat Pump	High-Efficiency AC	Standard AC	None
Price to Install	**Varied**	$9,000	$6,000	$6,000	
Warranty	10 years	10 years	10 years	10 years	

Warranty duration represents a key consideration for many customers choosing between available central HVAC systems, and relative preferences are substantially higher for equipment with longer warranties. We simulated shares of preference for each type of equipment at approximated realistic (non-discounted) price points and tested the impact of making high-efficiency heat pumps available with different warranty durations. Each 5-year increase in available warranty for the high-efficiency heat pump resulted in a five to six percentage point increase in preference for the high-efficiency heat pump, signaling the value of targeting incentives towards products with longer manufacturer warranties or even considering an AIC-sponsored extended warranty. Figure 17 illustrates the forecasted relative preference for each equipment type depending on the warranty available for the high-efficiency heat pump.

Figure 17. Influence of High-Efficiency Heat Pump Warranty Duration (Central AC Replacement, n=300)



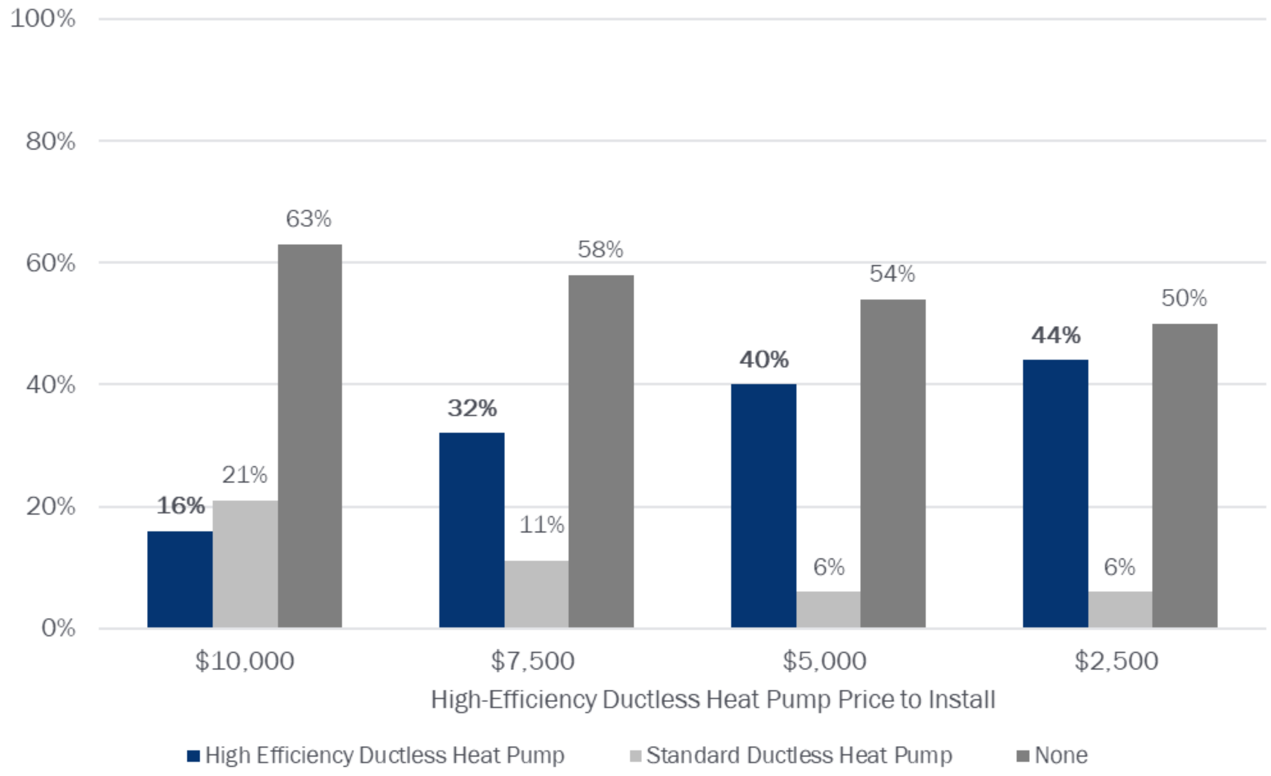
Equipment Type	High-Efficiency Heat Pump	Standard Heat Pump	High-Efficiency AC	Standard AC	None
Price to Install	$12,000	$9,000	$6,000	$6,000	
Warranty	**Varied**	10 years	10 years	10 years	

When comparing relative preferences for high-efficiency heat pumps with different *types* of incentives, we found the type of incentive made virtually no impact on customer preferences for different available options. Almost the exact same number of customers (23%) preferred the high-efficiency heat pump, regardless of whether a $1,500 incentive was made available as a point-of-sale discount or as a post-purchase rebate.

4.5.2 DUCTLESS HVAC UPGRADE

Price sensitivity analysis revealed diminishing returns for price reductions, with a relatively flat curvilinear relationship between installation cost and willingness to adopt for high-efficiency ductless heat pump upgrades. When the price of the new high-efficiency system is reduced from $10,000 to $7,500, the share of preference—or likelihood of selecting that option—doubles from 16% to 32%. However, each subsequent reduction of $2,500 results in progressively smaller increases in adoption. When the high-efficiency option is made available for the dramatically reduced price of $2,500, half of respondents still prefer not to pursue an upgrade and stick with their existing fan or window AC. The cost to install a ductless heat pump ranges widely, depending on the number and capacity of units needed for size of the space, as well as the efficiency and quality of the system. Our review of available market pricing information identified the average cost for installation of a new high-efficiency ductless heat pump system falls between $7,500 and $10,000. Figure 18 illustrates the price sensitivity forecasted for high-efficiency ductless heat pump upgrades, relative to a less efficient alternative or opting not to upgrade.

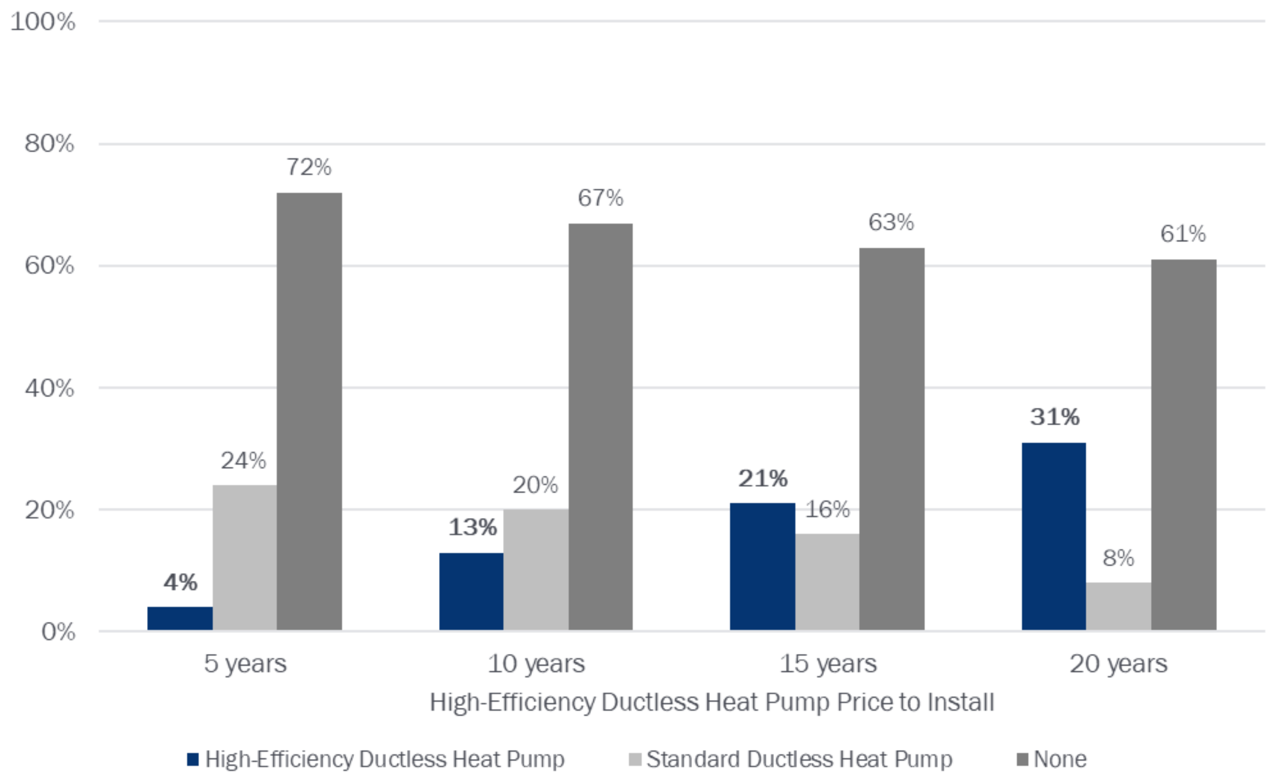
Figure 18. Price Sensitivity of High-Efficiency Heat Pump (Ductless HVAC Upgrade, n=155)



Equipment Type	High-Efficiency Ductless Heat Pump	Standard Ductless Heat Pump	None
Price to Install	**Varied**	$7,500	
Warranty	10 years	10 years	

Warranty duration plays a large role in driving relative preferences for ductless heat pump upgrades. We simulated shares of preference for each type of equipment at approximated realistic (non-discounted) price points and tested the impact of making high-efficiency heat pumps available with different warranty durations. Each 5-year increase in available warranty for the high-efficiency heat pump resulted in an eight to ten percentage point increase in preference for the high-efficiency heat pump, signaling the value of targeting incentives towards products with longer manufacturer warranties or even considering an AIC-sponsored extended warranty. Figure 19 shows the forecasted relative preference for each equipment type depending on the warranty available for the high-efficiency ductless heat pump.

Figure 19. Influence of High-Efficiency Heat Pump Warranty Duration (Ductless HVAC Upgrade, n=155)



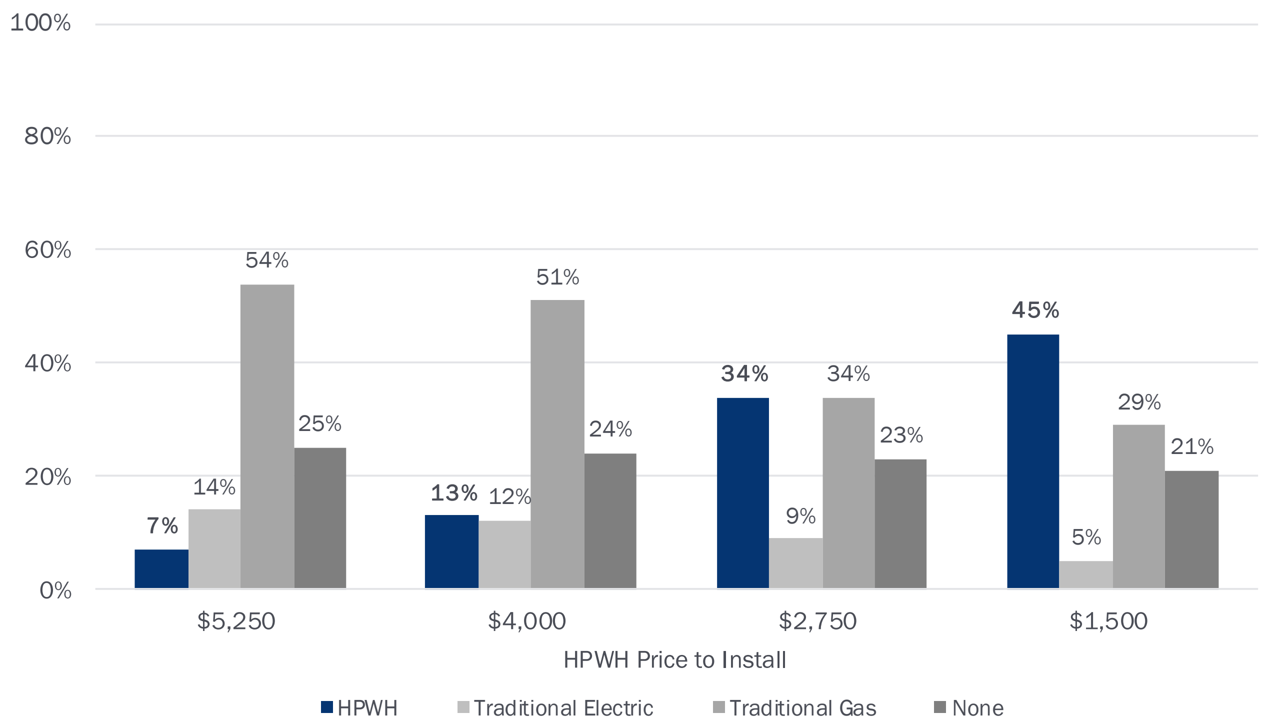
Equipment Type	High-Efficiency Ductless Heat Pump	Standard Ductless Heat Pump	None
Price to Install	$10,000	$7,500	
Warranty	**Varied**	10 years	

When comparing relative preferences for high-efficiency heat pumps with different *types* of incentives, we found the type of incentive made virtually no impact on customer preferences for different available options. Nearly the same number of customers preferred the high-efficiency heat pump, regardless of whether it was made available with a $1,500 point-of-sale discount (36%) or a $1,500 post-purchase rebate (35%).

4.5.3 GAS WATER HEATER REPLACEMENT

Price sensitivity analysis for HPWHs as a replacement for a gas water heaters highlight a clear preference for like-for-like replacements over switching to an electric alternative. Our review of available market pricing information identified the average cost for installation of a new high-efficiency heat pump falls between $3,000 and $4,000. As such, considerable price reductions are required to convince those with gas water heaters to pursue a HPWH alternative. When HPWHs are made available at the same $2,750 price point as gas water heater alternatives, just as many customers prefer the gas water heater as the more efficient HPWH. Reducing the price further to $1,500 increases demand for the HPWH option to 45%. Figure 20 presents the forecasted price sensitivity for installation of a HPWH in place of a previous gas water heater, relative to commonly available alternatives.

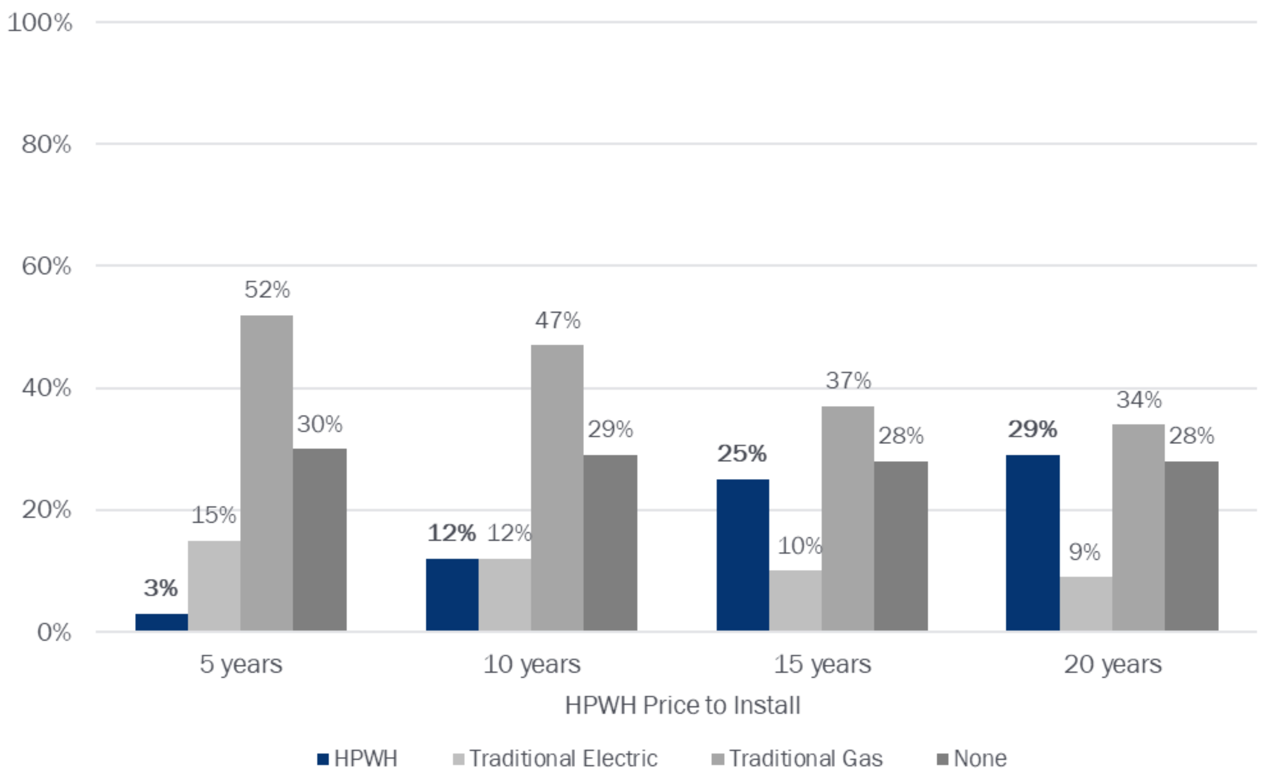
Figure 20. Price Sensitivity of HPWH (Gas Water Heater Replacement, n=326)



Equipment Type	HPWH	Traditional Electric	Traditional Gas	None
Price to Install	**Varied**	$1,500	$2,750	
Warranty	10 years	10 years	10 years	

Warranty duration represents a substantial driver of decision-making for customers replacing a gas water heater. We simulated shares of preference for each type of equipment at approximated realistic (non-discounted) price points with differing warranties available for the HPWH option. A mere 3% of respondents would choose a HPWH with a five-year warranty, but that share increases to 12% with a ten-year warranty and 25% with a fifteen-year warranty. Respondents didn't draw as large a distinction between a fifteen and twenty year warranty, suggesting a fifteen-year HPWH warranty may be sufficient to encourage adoption of the technology. Figure 21 presents the forecasted relative preference for each equipment type depending on the warranty available for the HPWH.

Figure 21. Influence of HPWH Warranty Duration (Gas Water Heater Replacement, n=326)



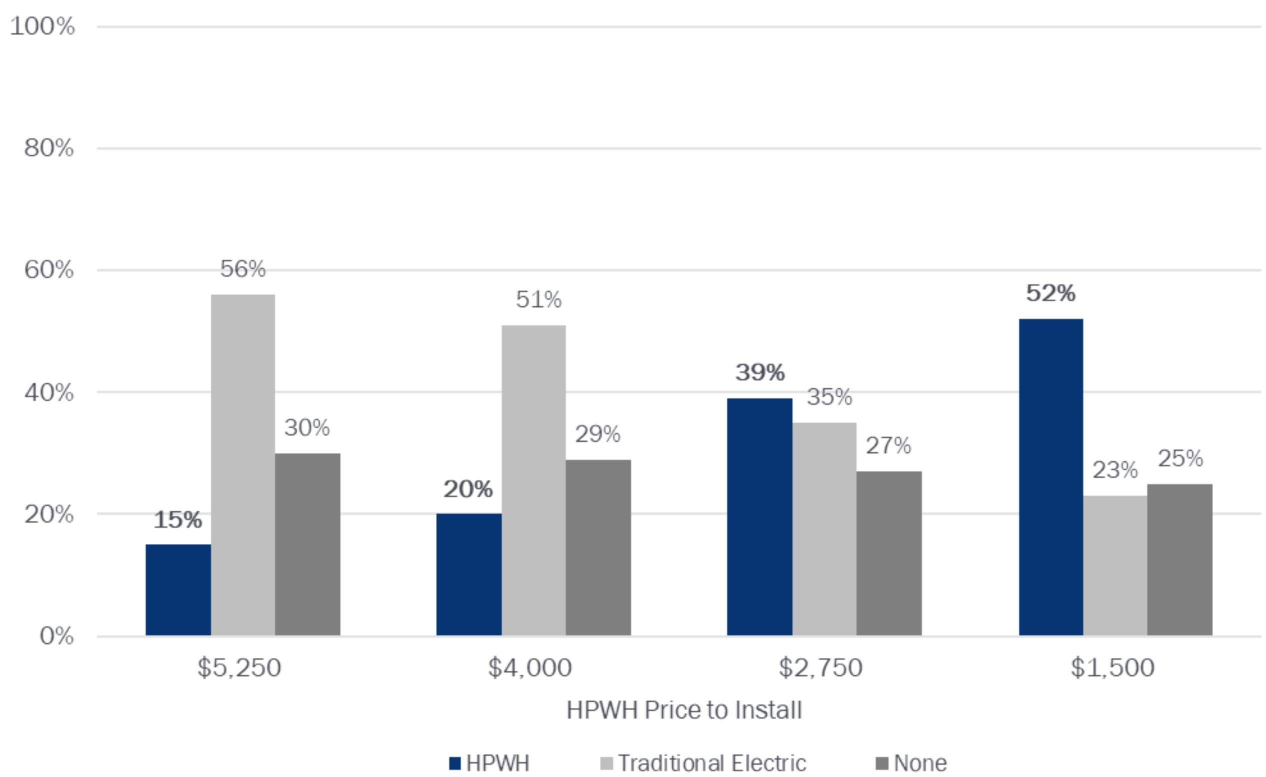
Equipment Type	HPWH	Traditional Electric	Traditional Gas	None
Price to Install	$4,000	$1,500	$2,750	
Warranty	**Varied**	10 years	10 years	

When comparing relative preferences for HPWHs with different *types* of incentives, we found the incentive format made almost no impact on customer preferences for different available options. Nearly the same number of customers preferred the HPWH, regardless of whether it was made available with an $800 point-of-sale discount (46%) or an $800 post-purchase rebate (45%).

4.5.4 ELECTRIC WATER HEATER REPLACEMENT

Price sensitivity analysis for HPWHs as replacement for traditional electric water heaters reveal that while most customers are unwilling to consider a HPWH at $5,250 or $4,000 interest in HPWHs increases almost linearly as the price is further reduced. Our review of available market pricing information identified the average (non-discounted) cost to install a new HPWH falls between $3,000 and $4,000, while a traditional electric alternative costs closer to $1,500. When the HPWH price is reduced from $4,000 to $2,750, nearly double as many customers opt for a HPWH (39% compared to 20%), and almost as many more would prefer the HPWH if made available for $1,500 (52% compared to 39%). Figure 22 presents the forecasted price sensitivity for installation of a HPWH in place of a previous electric water heater, relative to a less efficient alternative or refusal of either available option.

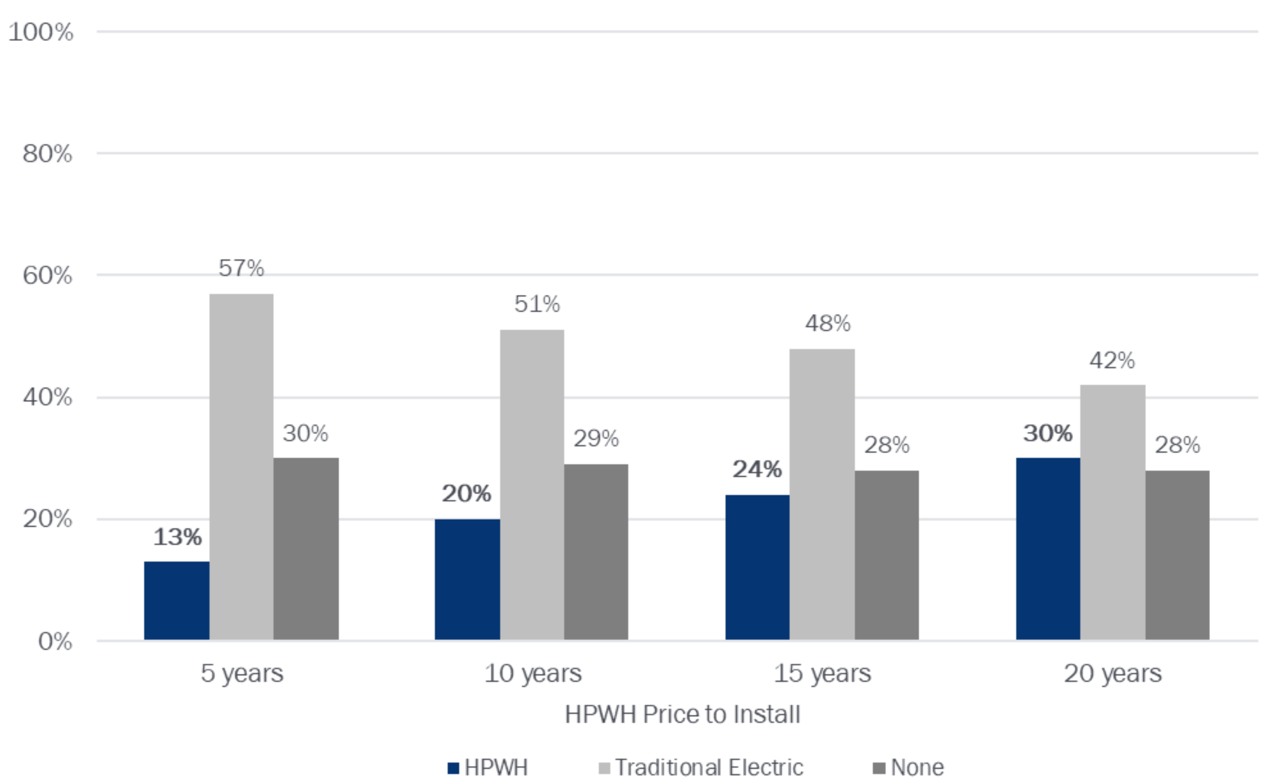
Figure 22. Price Sensitivity of HPWH (Electric Water Heater Replacement, n=316)



Equipment Type	HPWH	Traditional Electric	None
Price to Install	**Varied**	$1,500	
Warranty	10 years	10 years	

Warranty duration represents a key consideration for many customers choosing between available central HVAC systems, and relative preferences are substantially higher for equipment with longer warranties. We simulated shares of preference for each type of equipment at approximated realistic (non-discounted) price points and tested the impact of making high-efficiency heat pumps available with different warranty durations. Each 5-year increase in available warranty for the high-efficiency heat pump resulted in a four to seven percentage point increase in preference for the high-efficiency heat pump, signaling the value of targeting incentives towards products with longer manufacturer warranties or even considering an AIC-sponsored extended warranty. Figure 23 shows the forecasted relative preference for each equipment type depending on the warranty available for the HPWH option.

Figure 23. Influence of HPWH Warranty Duration (Electric Water Heater Replacement, n=316)



Equipment Type	HPWH	Traditional Electric	None
Price to Install	Varied	$1,500	
Warranty	10 years	10 years	

When comparing relative preferences for HPWHs with different *types* of incentives, we found the incentive format made almost no impact on customer preferences for different available options. Nearly the same number of customers preferred the HPWH, regardless of whether it was made available with an $800 point-of-sale discount (50%) or an $800 post-purchase rebate (49%).

Appendix A. Data Collection Instrument

The following attachment contains the data collection instrument fielded as part of this study.

AIC Heat Pump
Incentives & Program

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