



Opinion **Dynamics**

# TECH CLEAN CALIFORNIA HEAT PUMP EQUIPMENT: INSIGHTS INTO CUSTOMER EXPERIENCE AND SATISFACTION

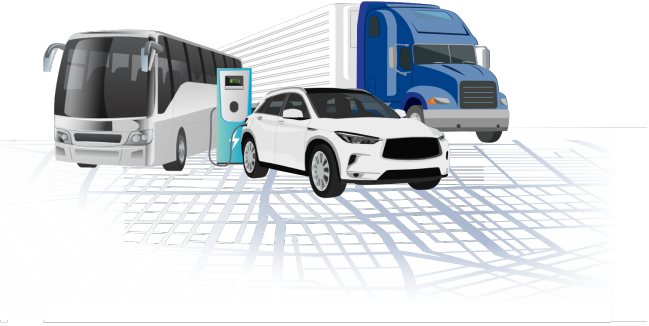
DECEMBER 13, 2023



# Agenda

- Introduce Opinion Dynamics
- Introduction to TECH Clean California
- Methods and sample
- Findings
- Conclusions
- Questions and answers

## TRANSPORTATION ELECTRIFICATION



Opinion Dynamics provides our clients with accurate and actionable information regarding energy and how people consume it

**30+ Years** of service behind  
our **75+ Team** of interdisciplinary staff

Developmental Research and Evaluation

Pilot and Program Design Advising

Customer Perspectives, Adoption, and  
Behavioral Insights

Energy, Grid, Economic and Climate Effects

Strategic Planning

Regulatory and Stakeholder Advising

## DEMAND FLEXIBILITY



## ELECTRIFICATION & DECARBONIZATION



## EE PORTFOLIO DESIGN & EVALUATION



# Overview of the WISE Approach

(Whole Independent Systems Evaluation™)

WISE is an adaptation of the long-standing developmental evaluation measurement approach and is tailored to address the unique needs of the emerging clean energy economy.

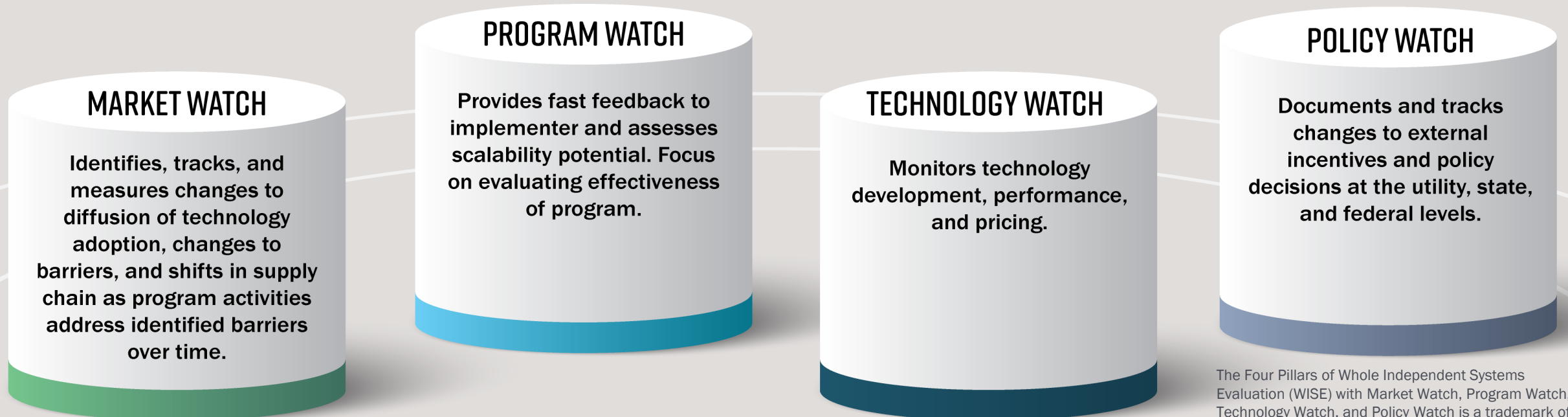
For more information on the WISE approach, visit <https://opiniondynamics.com/WISE>



# WISE Pillars

Organizing evaluation activities within the Four Pillars of Whole Independent Systems Evaluation™ (WISE) has proven effective and reflects the fact that everything is interconnected and that any change likely will have ripple effects throughout the system.

These pillars focus not only on program performance but also on identifying and tracking market transformation indicators over time, along with monitoring the evolution of technologies such as space and water heating and rapidly changing policy and regulatory developments.



The Four Pillars of Whole Independent Systems Evaluation (WISE) with Market Watch, Program Watch, Technology Watch, and Policy Watch is a trademark of Opinion Dynamics.

# Principles: U.T.O.P.I.A.

The principles of WISE enable program optimization in a complex and changing landscape without delay

## Utilization-Focused

Actionable insights enable program iteration and optimized results

## Timely

Concurrent monitoring facilitates course correction and progress without pause

## Systems Outlook

Embeds analysis within larger ecosystem context

## Complexity Perspective

Methodologies reflect interconnected dynamics of baseline and emerging conditions

## Independent

Independent, implementer-agnostic third-party evaluation oriented toward outcomes and with no vested interests

## Adaptive

Leading insight delivery through changing conditions

# OUR SPEAKERS TODAY

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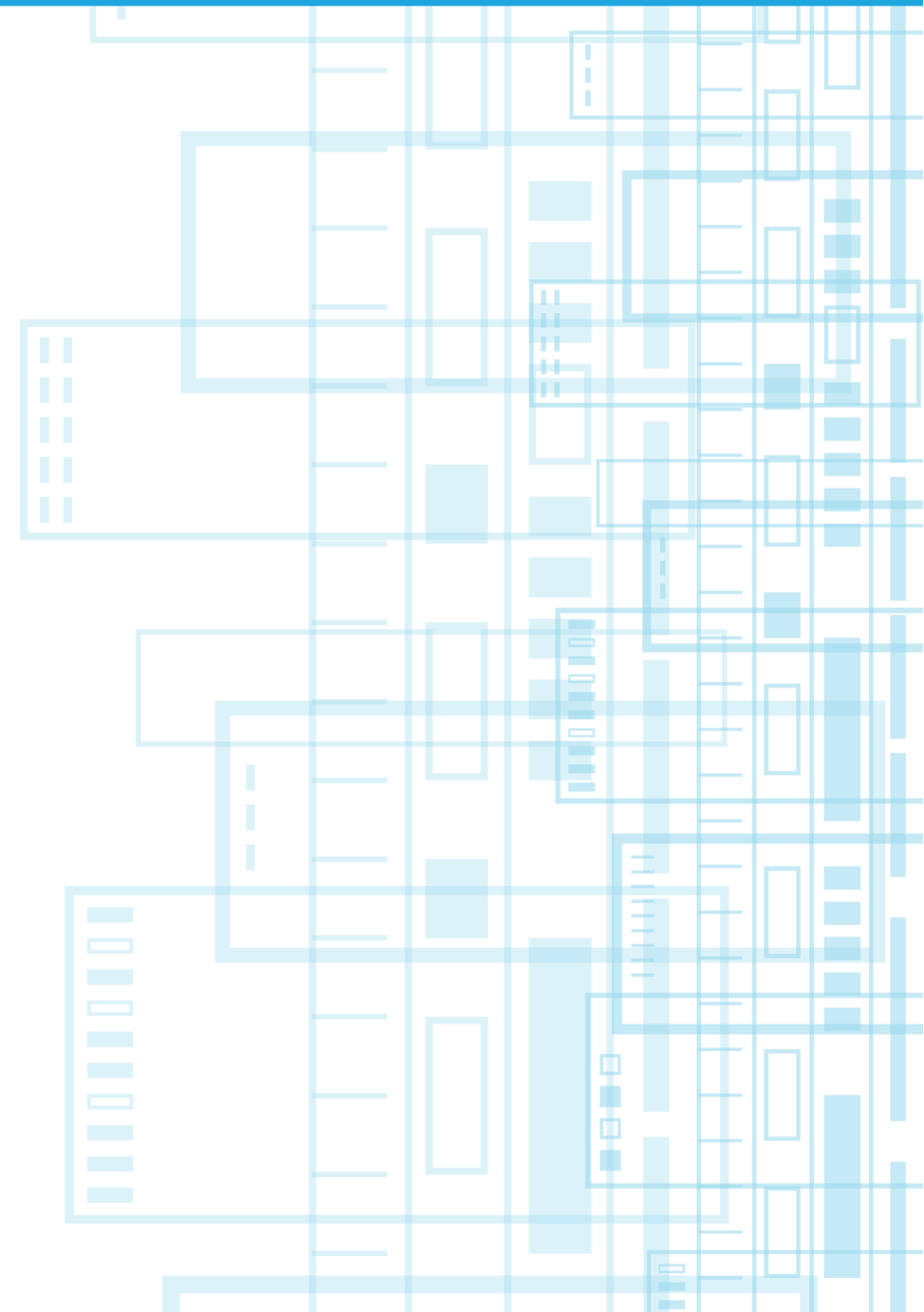
**Ellen Steiner, PhD**

Vice President  
Opinion Dynamics



**Jen Loomis, PhD**

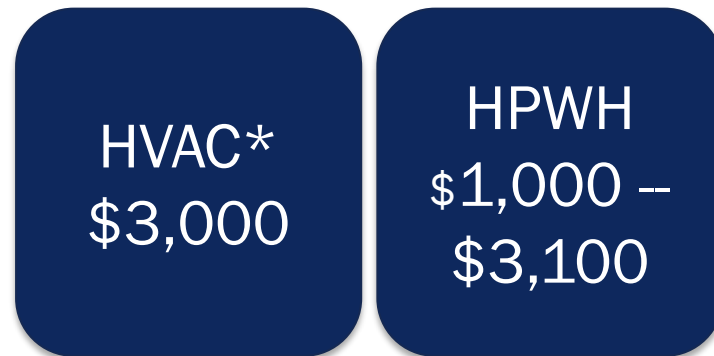
Principal Consultant  
Opinion Dynamics



# INTRODUCTION TO TECH CLEAN CALIFORNIA

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- TECH Clean California is designed to accelerate the adoption of clean space- and water-heating technology across California homes
- It uses a combination of incentives, workforce education, supply chain engagement, pilots, and consumer marketing to help transform the market
- Officially launched in December 2021
- TECH Website: [techcleanca.com](https://techcleanca.com)
  - Opinion Dynamics' Studies: [techcleanca.com/public-data/evaluation-studies/](https://techcleanca.com/public-data/evaluation-studies/)



\*Before May 13, 2022



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# OBJECTIVES AND METHODS

# CONTEXT AND OBJECTIVES

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- TECH Clean California offered incentives for HVAC air-source heat pumps and heat pump water heaters (HPWHs).
- Incentives for Californians replacing a non-heat pump space-conditioning or water-heating system in one of the four gas IOU territories.
- Roughly 10,000 heat pumps installed between late 2021 and summer 2022.
- In late 2022, we surveyed customers to understand:
  - Homeowners' experiences with their new heat pump
  - Issues they may have encountered
  - Any perceived changes to their utility costs

# METHODS

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- Survey with single-family customers who received a TECH-incented heat pump at least six months prior
- Fielded between November and December 2022
  - **494** Ducted HVAC HP customers (2,140 invited, RR of 23%)
  - **158** Ductless HVAC HP customers (1,112 invited, RR of 14%)
  - **300** HPWH customers (896 invited, RR of 33%)



# IOU DISTRIBUTION OF TECH PARTICIPANTS

Gas IOU	Equipment Type	Survey Respondents	Survey Respondents Percent	TECH Population
Pacific Gas and Electric	HVAC heat pump	282 (30%)	56%	43%
	HPWH	252 (26%)		
Southern California Gas	HVAC heat pump	258 (27%)	30%	43%
	HPWH	30 (3%)		
San Diego Gas and Electric	HVAC heat pump	110 (12%)	14%	14%
	HPWH	16 (2%)		
Southwest Gas	HVAC heat pump	2 (0%)	0%	0%
	HPWH	0 (0%)		
<b>Total</b>		<b>952</b>	<b>100%</b>	<b>10,385</b>





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# FINDINGS

# SOLAR IN CUSTOMER HOMES

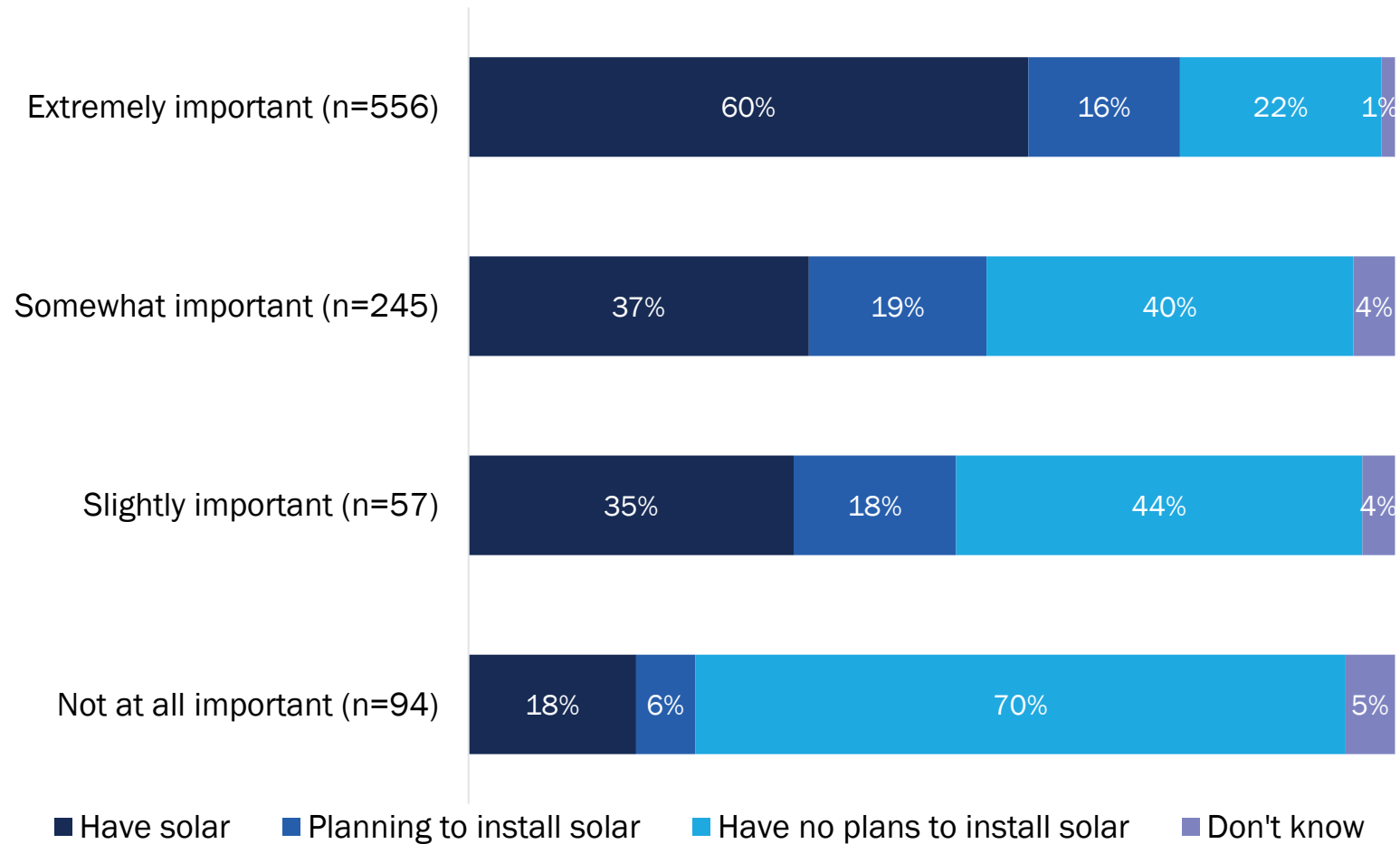


## KEY FINDING

Strong correlation between having solar panels and a desire for electric equipment

- **HPWH:** three-quarters of customers have solar or plan to install
- **HVAC:** three-fifths of customers have solar or plan to install

Importance to Customer that Equipment Use Electricity by Solar Plans





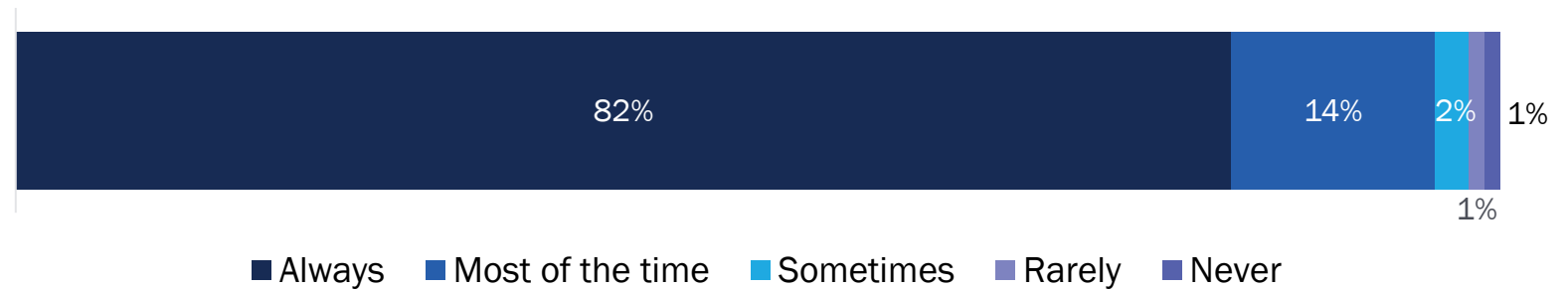
# Heat Pump Water Heaters



# HPWH - HOT WATER AVAILABILITY

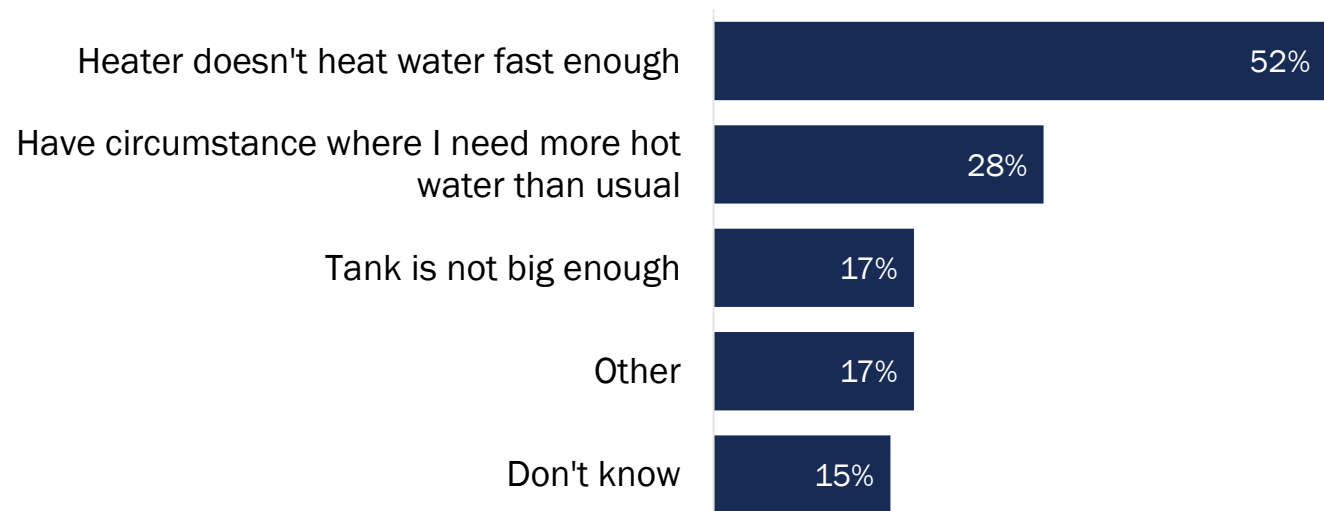
Most customers always had enough water to meet their household needs

How Often Customers Have Enough Hot Water to Meet Household Needs (n=299)

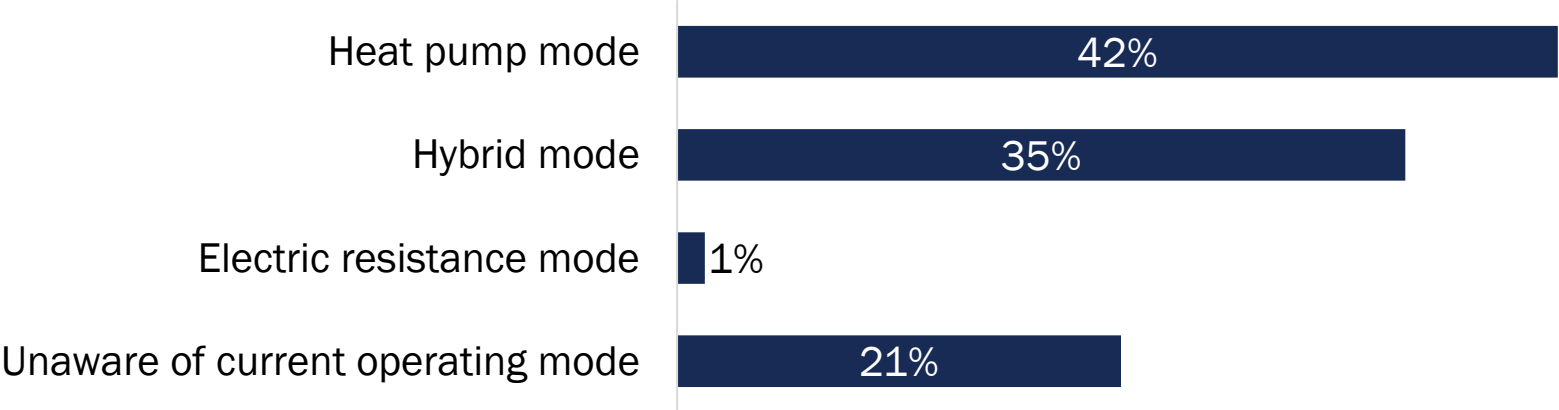


Customers think they run out of hot water due to **slow water heating** and **circumstances where more hot water is needed than usual**

Reasons Customers Run Out of Hot Water (n=54)



# HPWH – CURRENT OPERATIONAL MODE (N=300)



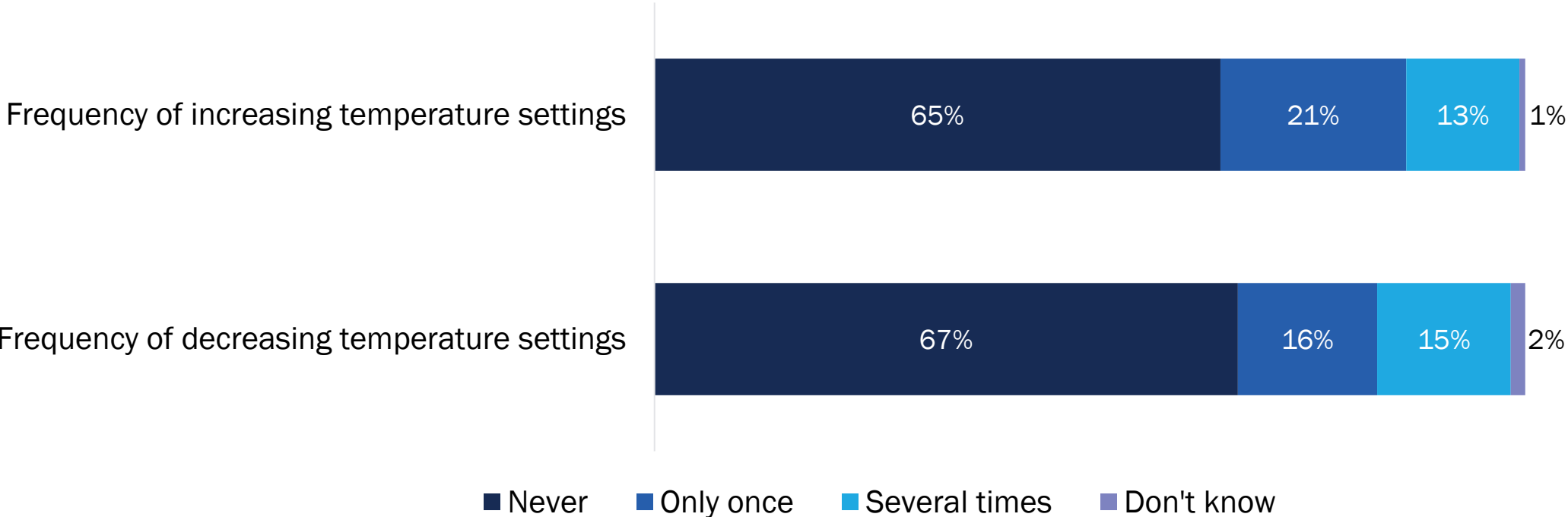
Those unaware of the mode were very unlikely to have changed it. Otherwise, those with equipment set to heat pump mode or hybrid mode were about equally as likely to have changed the mode at some point.

Have Changed HPWH Mode Since Installed?	Current HPWH Operating Mode				Total
	Heat Pump	Hybrid	Electric Resistance	Unsure	
Yes	63	49	2	4	118
No	64	55	2	55	176
<b>Total</b>	<b>127</b>	<b>104</b>	<b>4</b>	<b>59</b>	<b>294</b>

# HPWH – TEMPERATURE SETTINGS

About two-thirds of customers have never adjusted their HPWH temperature settings

Frequency of HPWH Temperature Setting Changes (n=300)

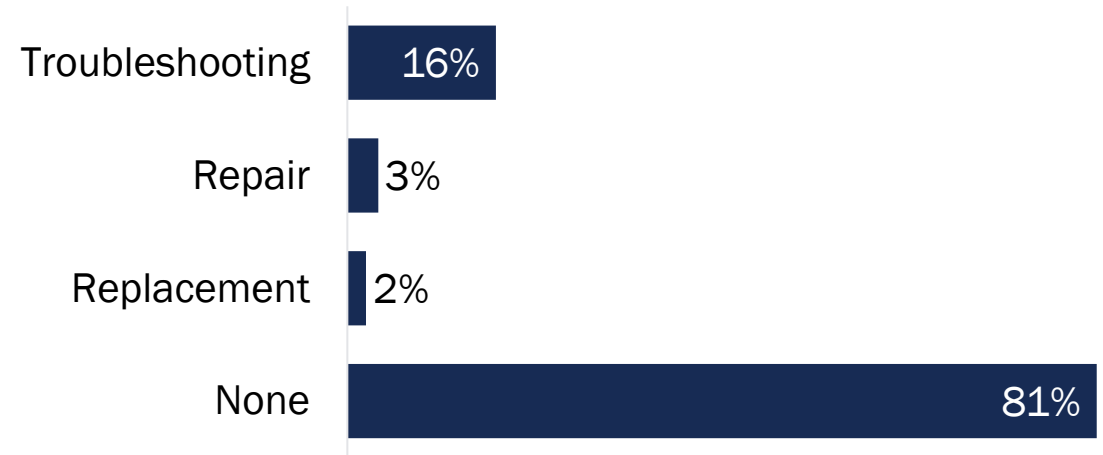


# HPWH - EQUIPMENT ISSUES

- Large majority had not needed to repair, replace, or troubleshoot issues
- Most common issues that required work were **difficulties with user app or equipment Wi-Fi connection**, equipment **noise or vibration**, or an **installation error**



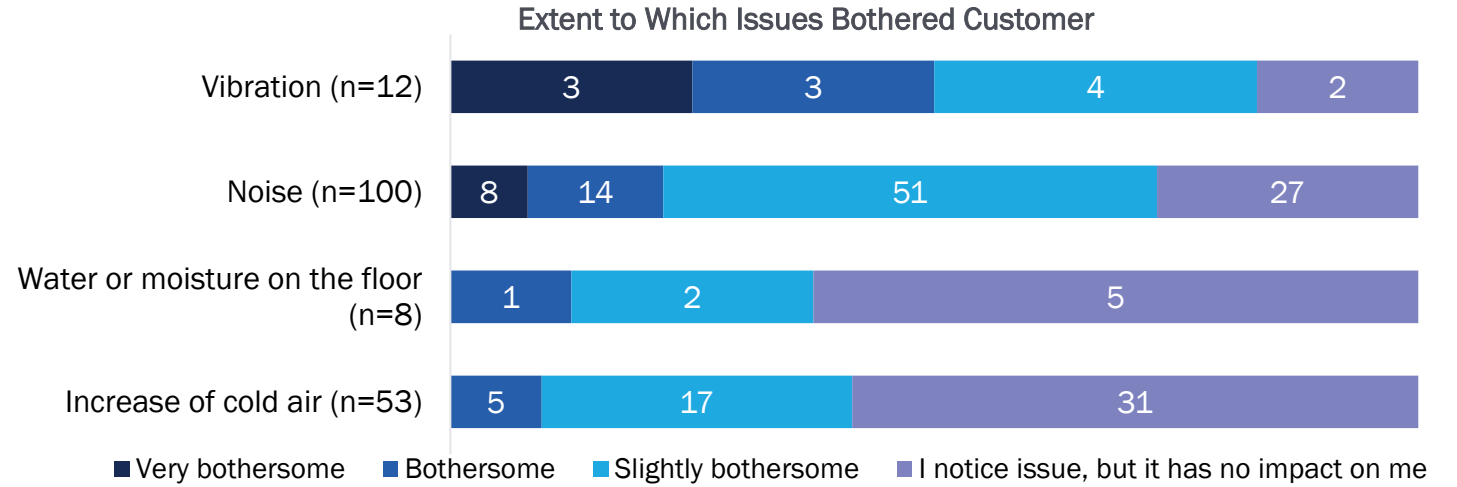
Work Required on HPWH Equipment Since Installed (n=300)



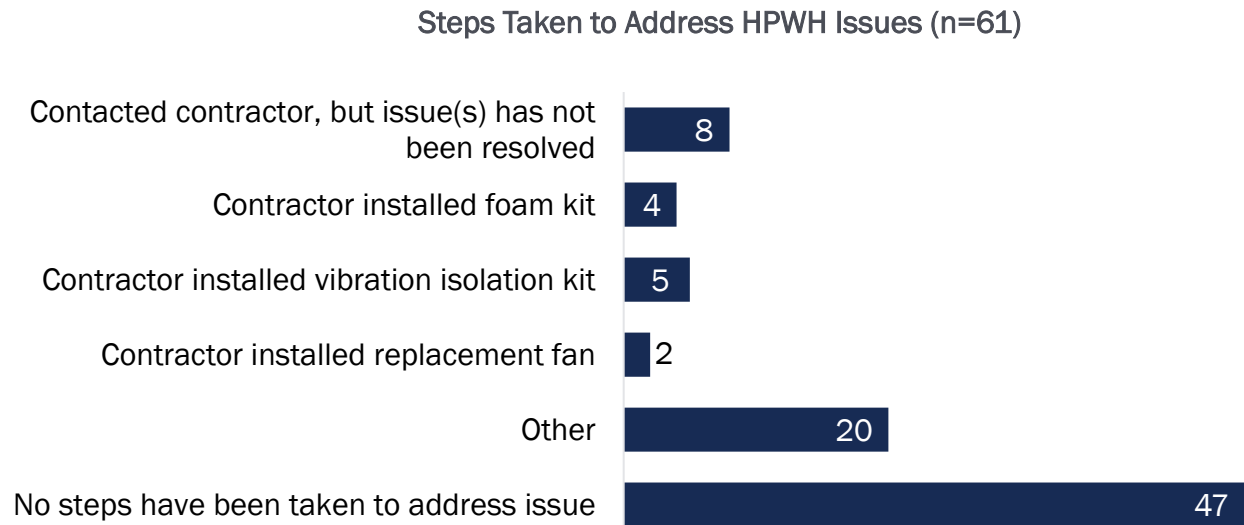
Issue	Number of Respondents (n=58)	Percent of Respondents
Difficulties with user app or Wi-Fi	18	31%
Noise or vibration	17	29%
Installation issue	10	17%
Limited hot water availability	8	14%
Temperature control issue	8	14%
Equipment part repaired or replaced	6	10%
Whole unit replaced	6	10%

# HPWH – DISRUPTION FROM EQUIPMENT ISSUES

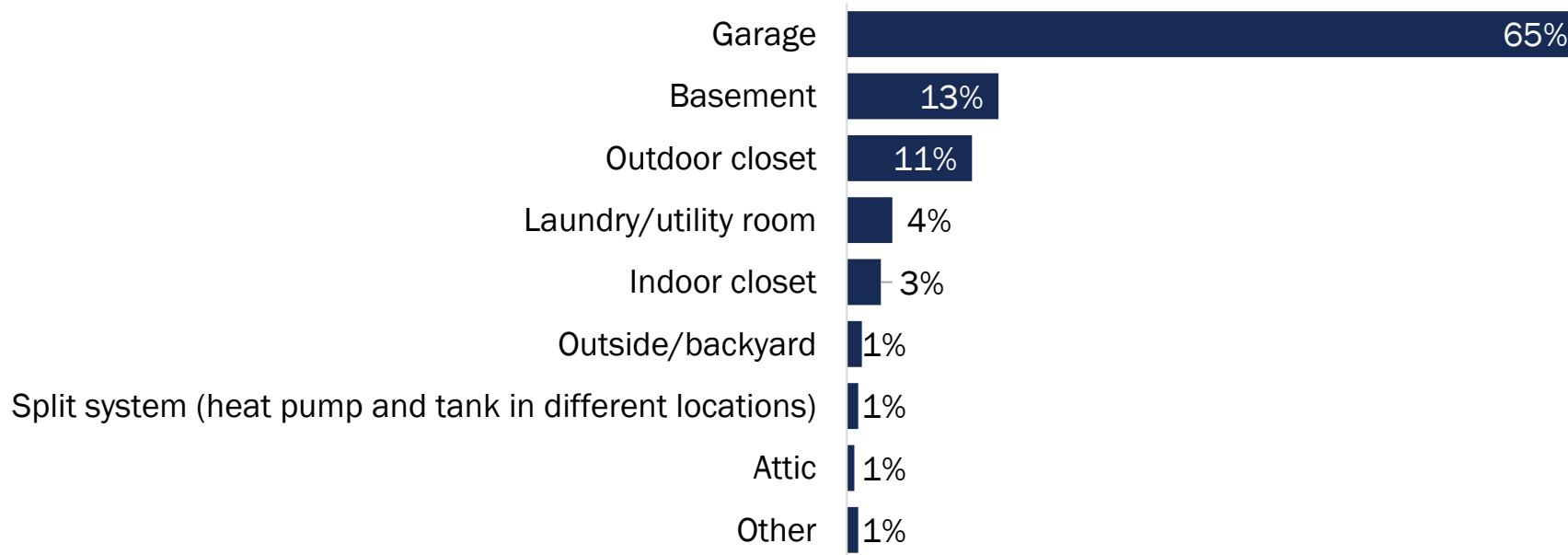
- Overall, customers are minimally or not bothered by most equipment issues
- Vibration issues** most bothersome, **cold air near the HPWH** least bothersome



- More than half of customers who reported an issue have not taken any steps to address the problem



# HPWH – LOCATION AND NOISE



The noise level is so loud my kids can't sleep sometimes. I had to adjust the time when it heats up.

Turned off at night to let guests sleep without the hum.

Noise noticed more when HPWH installed in conditioned spaces:

- 6 of 9 (67%) with HPWH installed in an indoor closet
- 7 of 12 (58%) with HPWH installed in a laundry or utility room
- 63 of 131 (32%) with HPWH in the garage
- 10 of 23 (30%) with HPWH installed in an outdoor closet

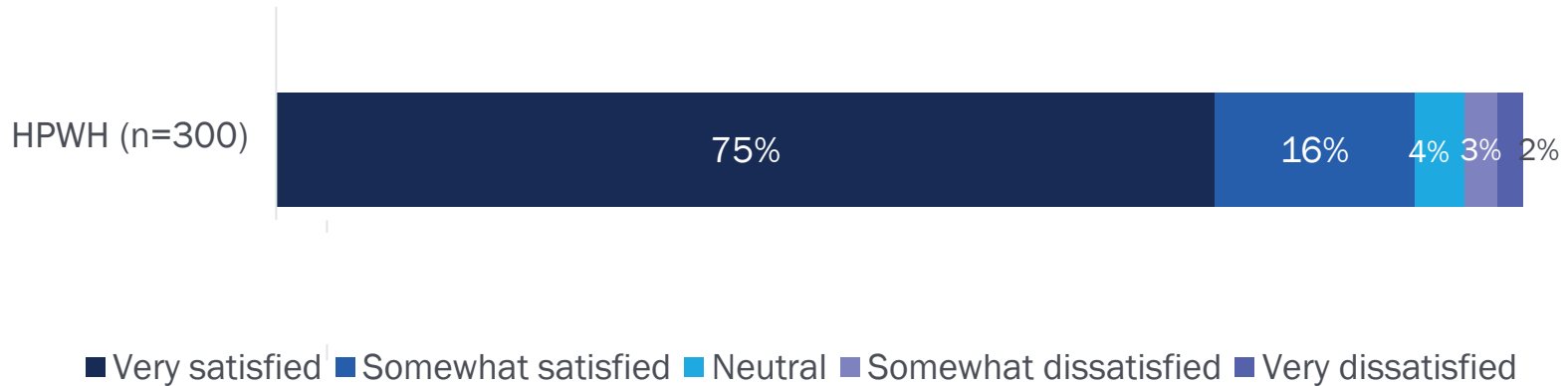
# CUSTOMER SATISFACTION

- 5% were dissatisfied
- Most customers saw value in their heat pump investment
- More likely to rate it as good than great
- 86% of HPWH customers likely to recommend it to others
- 50% extremely likely

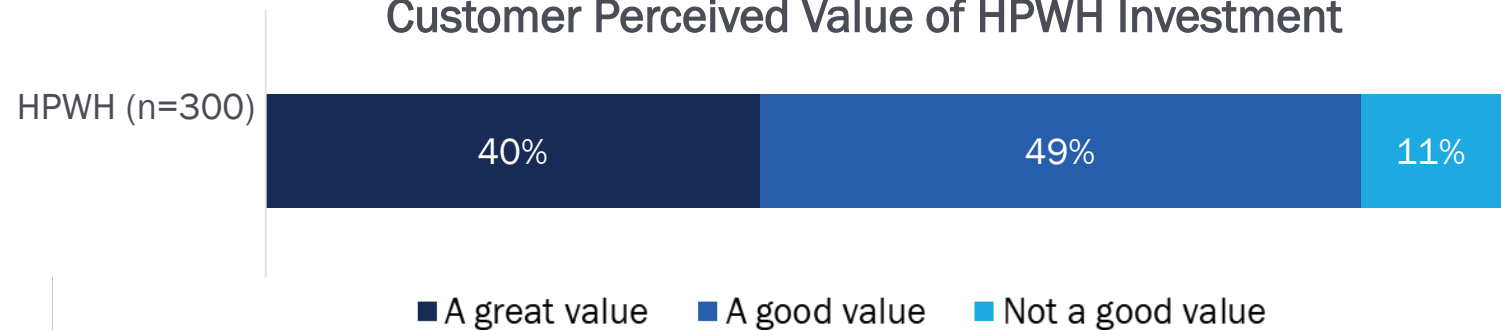
**Positive reasons:** cost-effective, high-quality, beneficial to the environment

**Negative reasons:** upfront cost, high electricity bills, limited hot water, noisy

## Overall Customer Satisfaction with HPWH



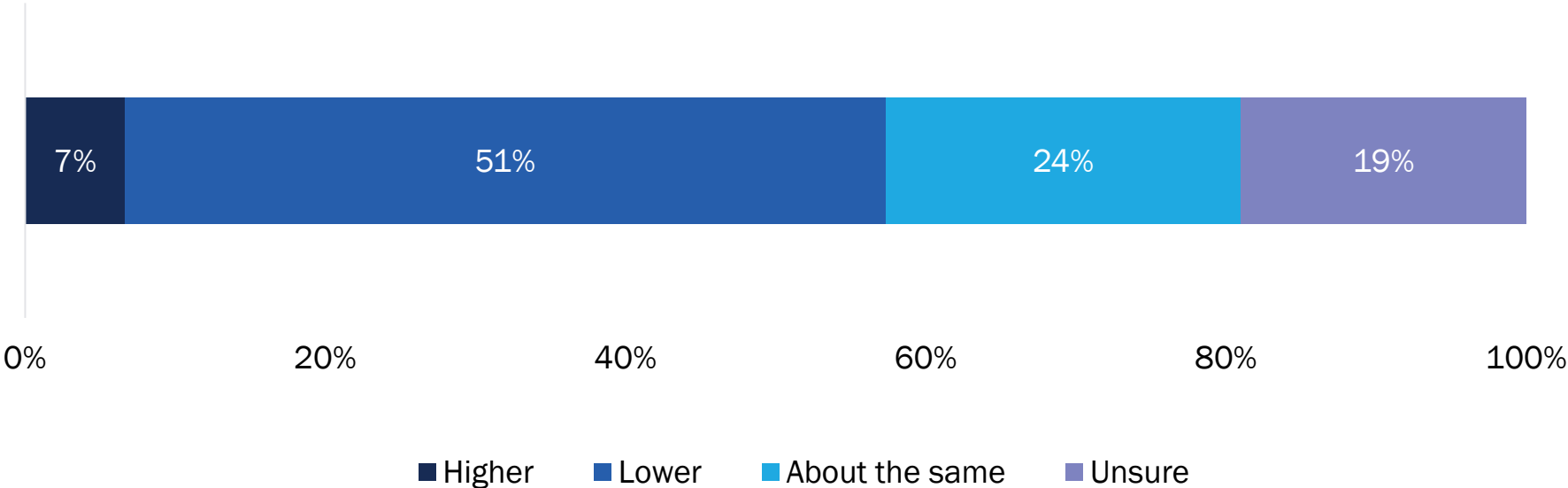
## Customer Perceived Value of HPWH Investment



# HPWH - ENERGY COSTS

- Nearly three-quarters of customers who reported a decrease in energy bills have solar
- An involuntary change in electric rates had greatest association with increased energy bills

Perceived Change in Monthly Energy Bills (n=300)



It is efficient, works well, and has saved me some money

No issues so far, save on monthly bills, plenty of hot water in heat pump-only mode

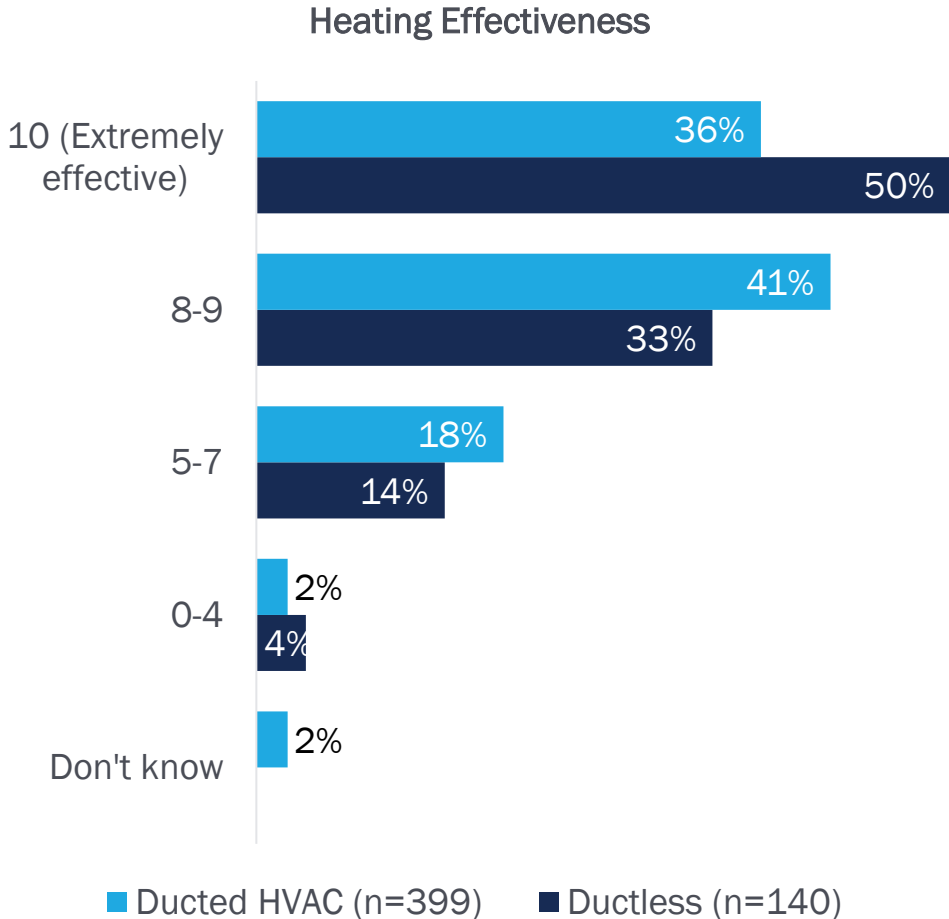
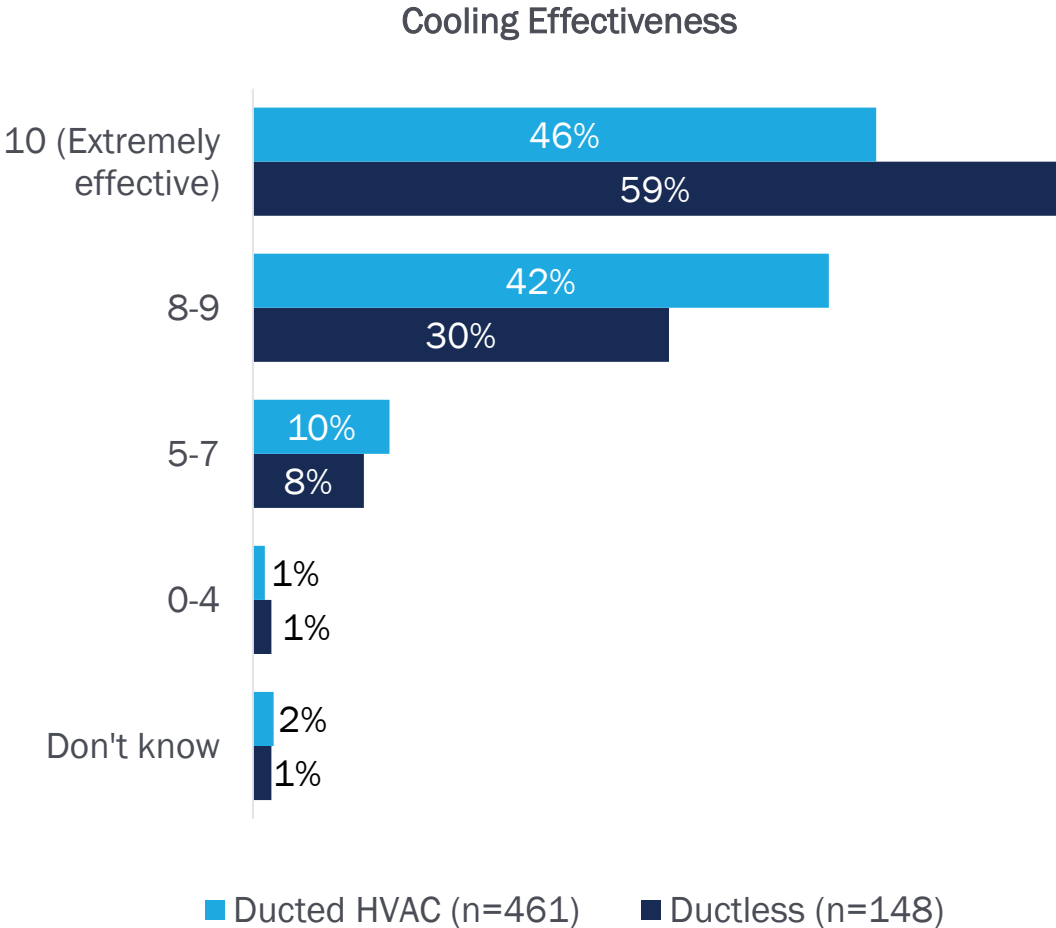


# HVAC Heat Pumps



# HVAC – HEATING/COOLING EFFECTIVENESS

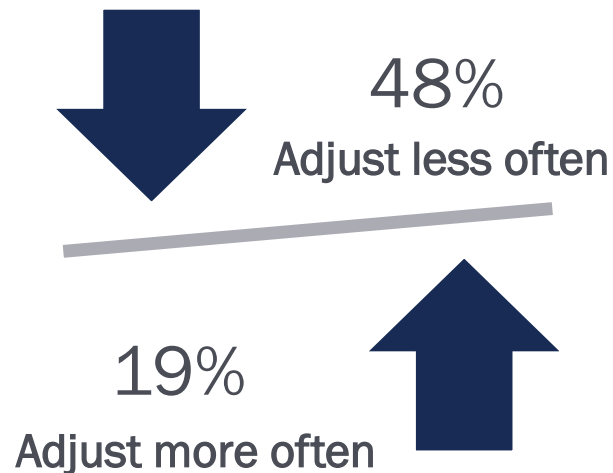
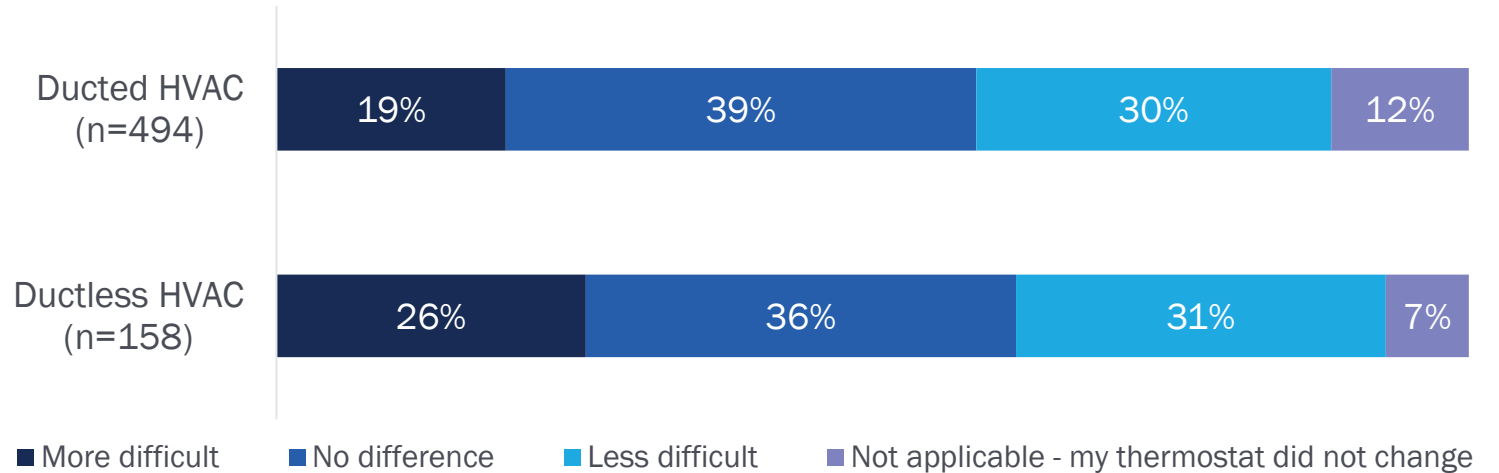
Ductless HPs rated more effective than ducted in terms of both heating and cooling



# HVAC – OPERATING THERMOSTAT

- 90% of customers had to update their thermostat when their HP was installed
- In most cases, the new thermostat was either similar or easier to operate than their previous system

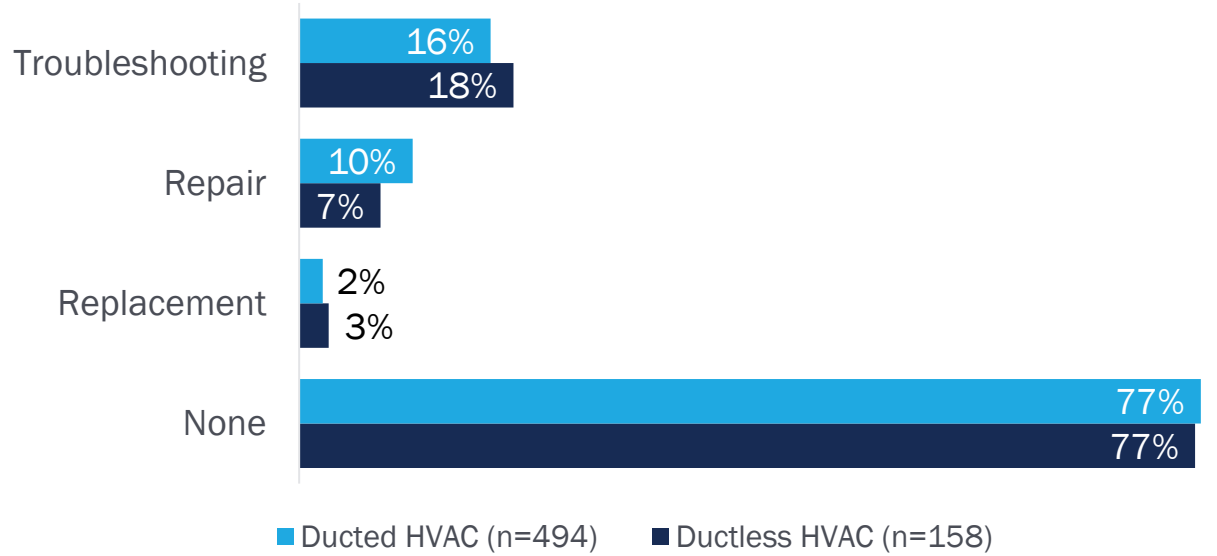
Level of Difficulty Operating New Thermostat Compared to Old System



The thermostat remotes are totally dumb. They are not programmable, they are unclear on how to operate, and most crucially they won't allow the heat to be set below 62 degrees.

# HVAC – EQUIPMENT ISSUES

- More than three-quarters of customers reported having no issues with their HVAC HP
- Installation issues, insufficient heating/cooling and thermostat complications** were among the top reported issues

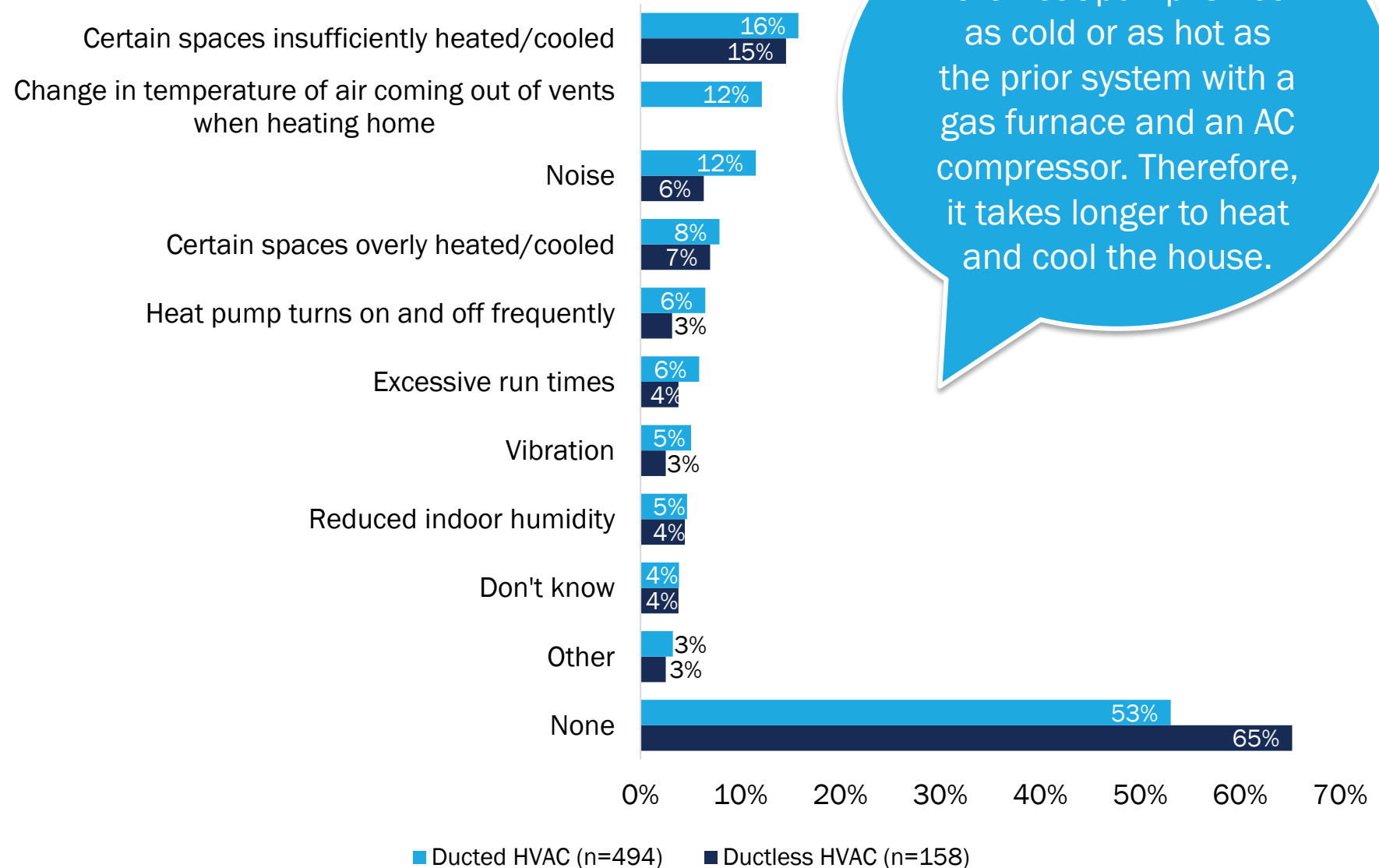


Issue	Number of Respondents (n=151)	Percent of Respondents
Installation issue	46	30%
Insufficient heating/cooling	35	23%
Thermostat issue	32	21%
Equipment part repaired or replaced	24	16%
Noise or vibration	22	15%

# HVAC HEAT PUMP ISSUES & HOW BOTHERSOME

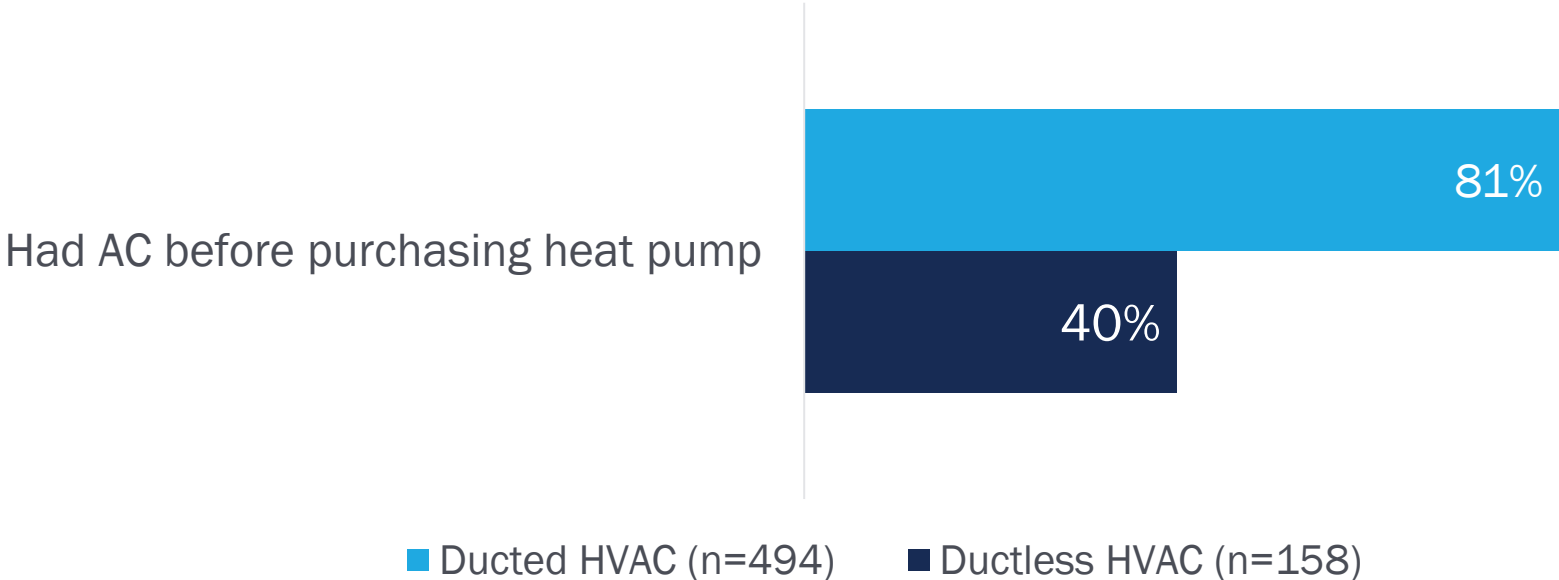
60 of the 494 ducted HVAC customers noticed that the air coming out of the vents was not as hot when heating the home.

- This bothered 37 of them (62%).
- Was very bothersome or bothersome to 13 (22%).
- Noise bothered 55 of the 57 ducted HP customers who noticed it.



# HVAC – WHETHER CUSTOMER HAD AC BEFORE INSTALLING HP

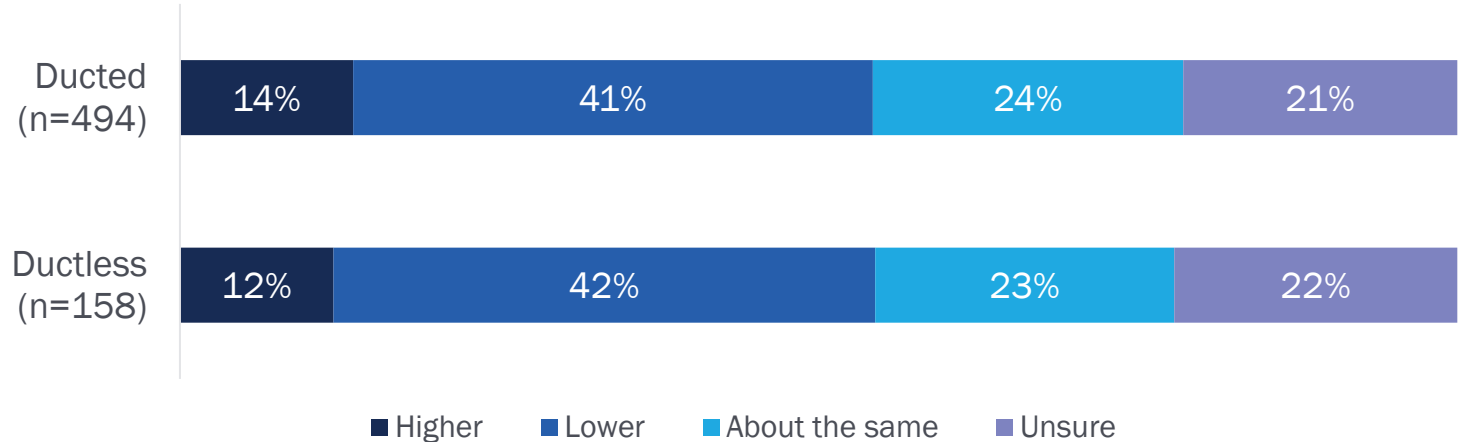
Ducted HVAC customers were twice as likely than ductless customers to have had AC before their heat pump was installed



# HVAC - ENERGY COSTS

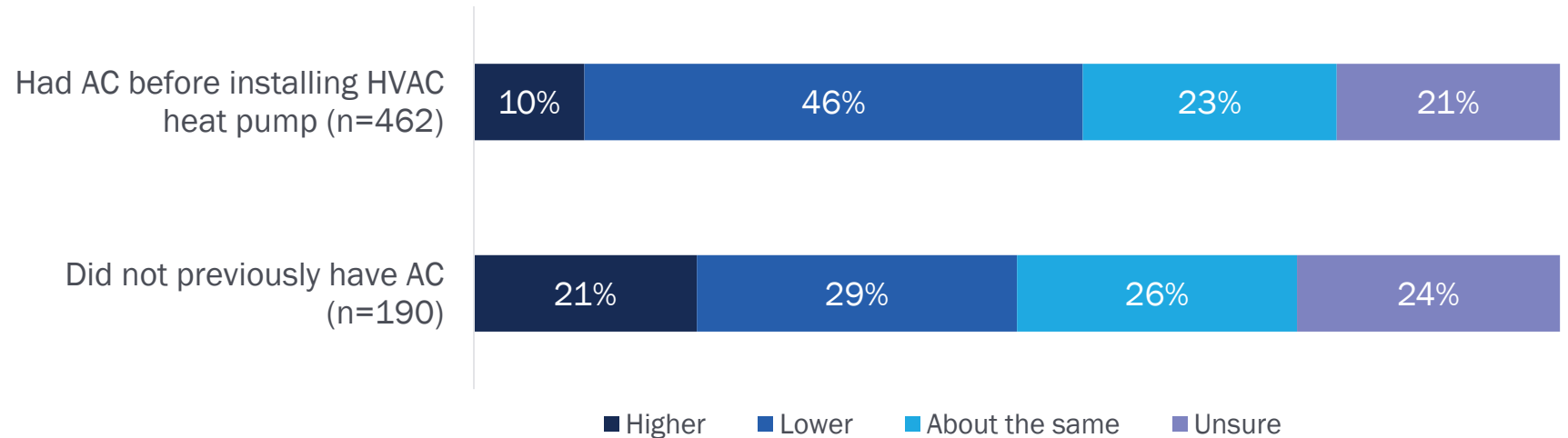
Changes in energy costs were nearly the same across ducted and ductless equipment

Perceived Change in Monthly Energy Bills by HVAC Type



Whether a customer did or did not have AC before their heat pump was installed was a stronger predictor of changes in energy costs

Perceived Change in Monthly Energy Bills by Whether Customer Had AC Before



# CUSTOMER SATISFACTION



**5% or fewer** were very or somewhat dissatisfied



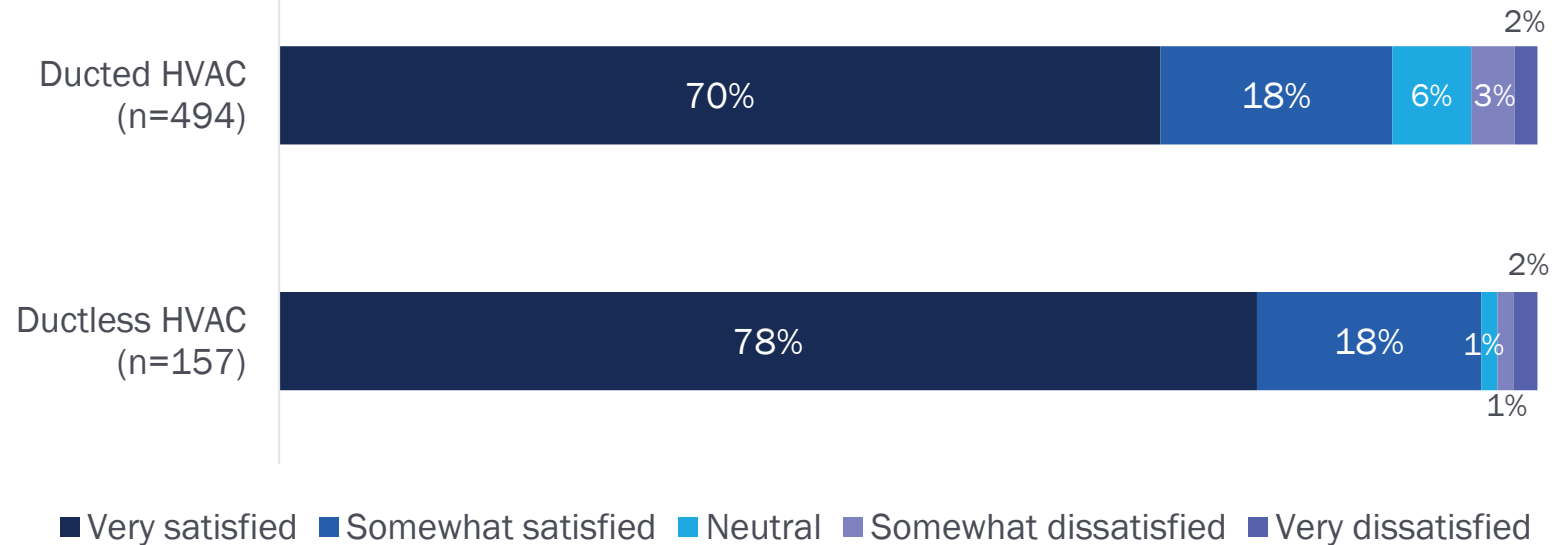
Average likelihood to recommend rating (0-10)

- Ductless: **9**
- Ducted: **8**

**Positive reasons:** cost-effective, effectively heats/cools home, beneficial to the environment

**Negative reasons:** performance issues, high upfront cost, and high operating cost

## Overall Customer Satisfaction with Equipment



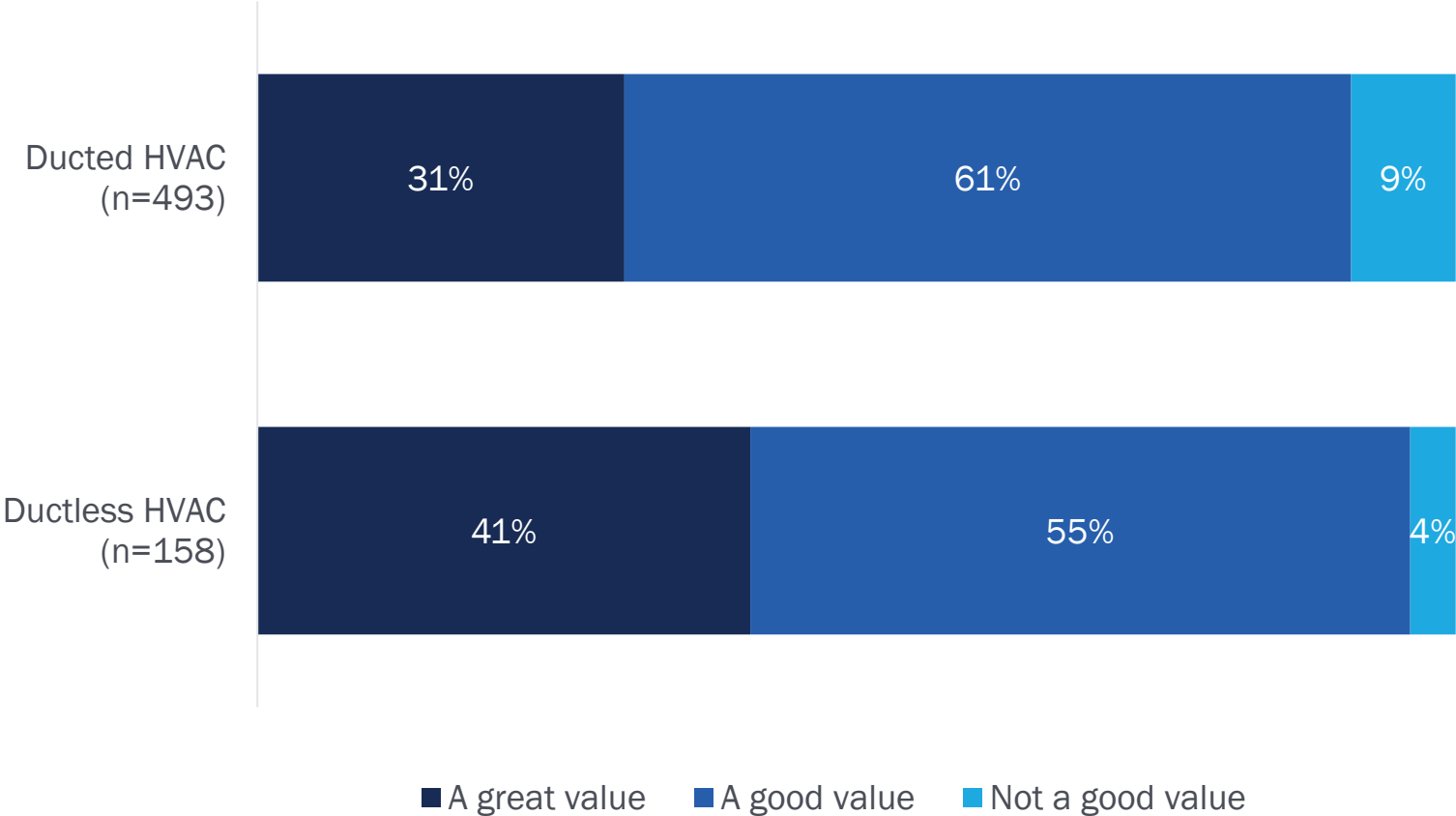
For the same cost as before, I now run my air conditioning all day, instead of only in the hottest hours of the day.

# PERCEIVED VALUE OF HEAT PUMP INVESTMENT

- Most customers saw value in their heat pump investment
- Customers more commonly rate investment as “good value” rather than “great value”

Our mini split heat pump not only heats and cools our home effectively, but the air quality inside the house is much improved.

Customer Perceived Value of Heat Pump Investment





Questions?



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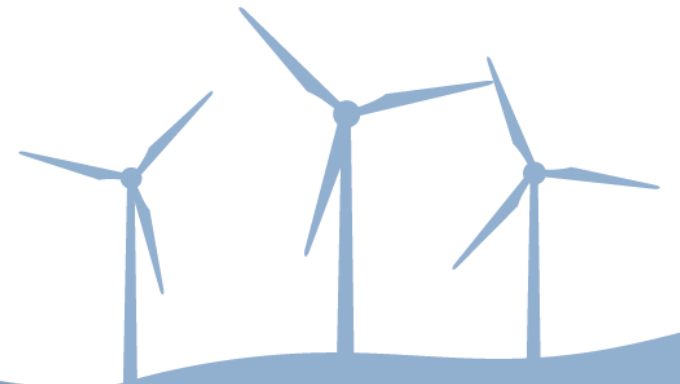
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