

Strategies for Heat Pump Adoption at the Time of Air Conditioning Replacement

Energy Design Conference 2022

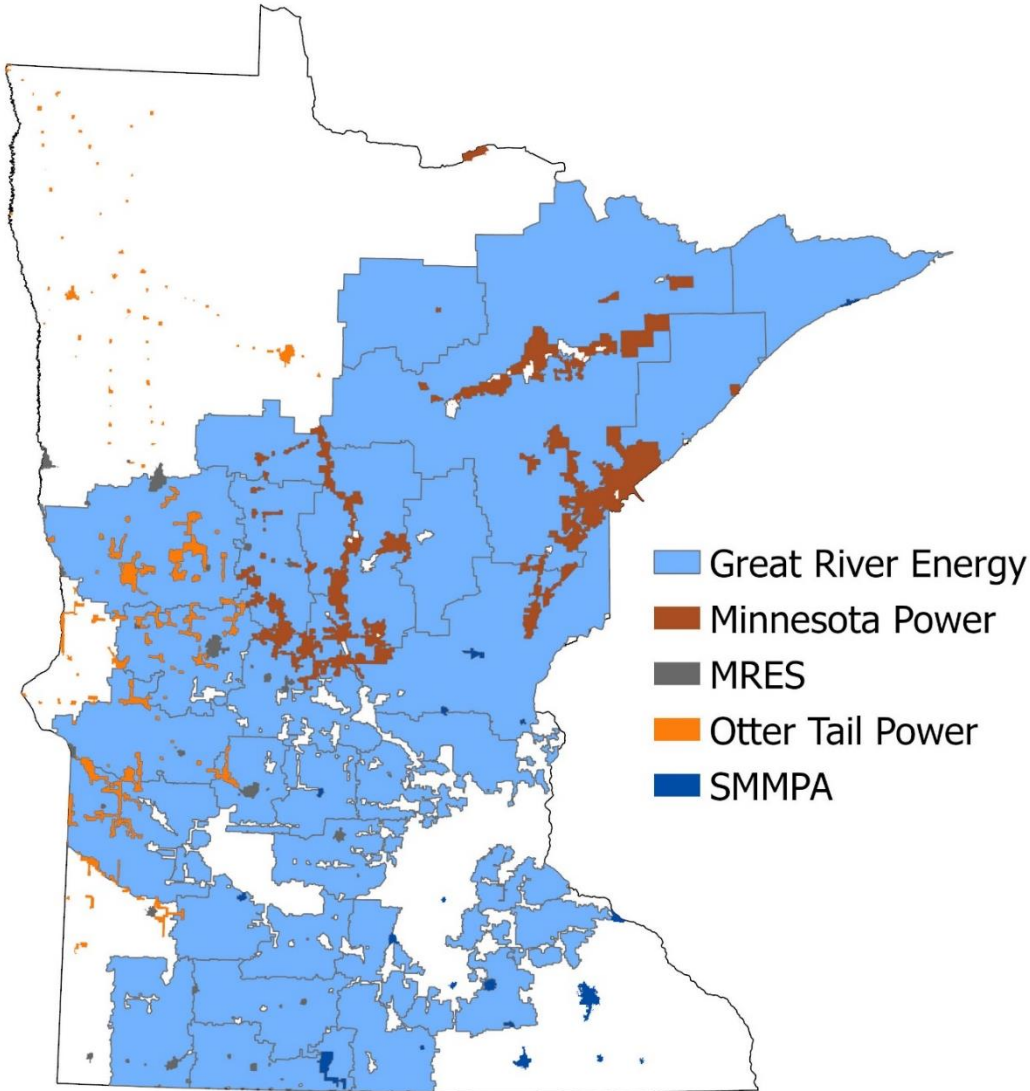
Ben Schoenbauer
Emily McPherson



Center for Energy and Environment



MN ASHP Collaborative Members

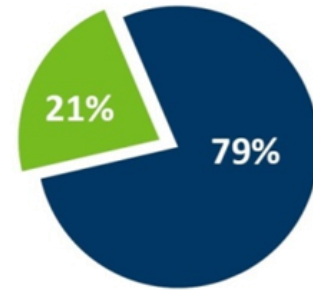


What are our goals for today?

- Recognize AC replacements appropriate for heat pumps
- Explore product options available
- Learn about sizing and design related to comfort and customer economics
- Determine the economic balance point for heat pumps integrated with a natural gas furnace
- Determine cost effective applications for heat pumps as alternatives to air conditioner replacements
- Apply customer decision making when replacing air conditioners to selling heat pumps

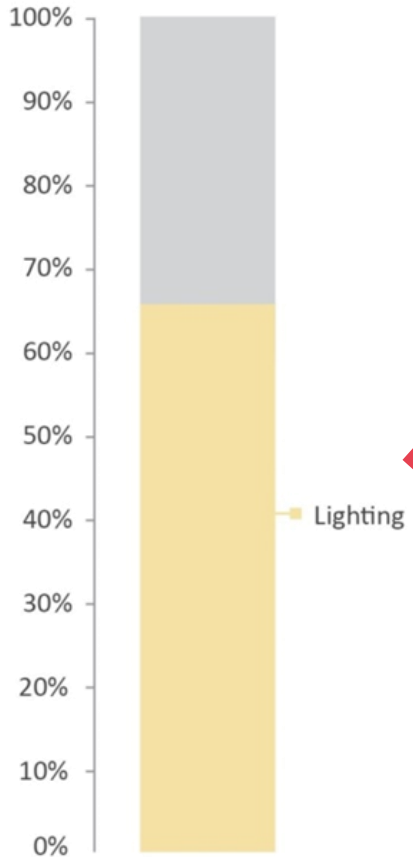
Air source heat pumps
have great potential in MN

Minnesota Statewide Electric Savings Potential 2020-2029

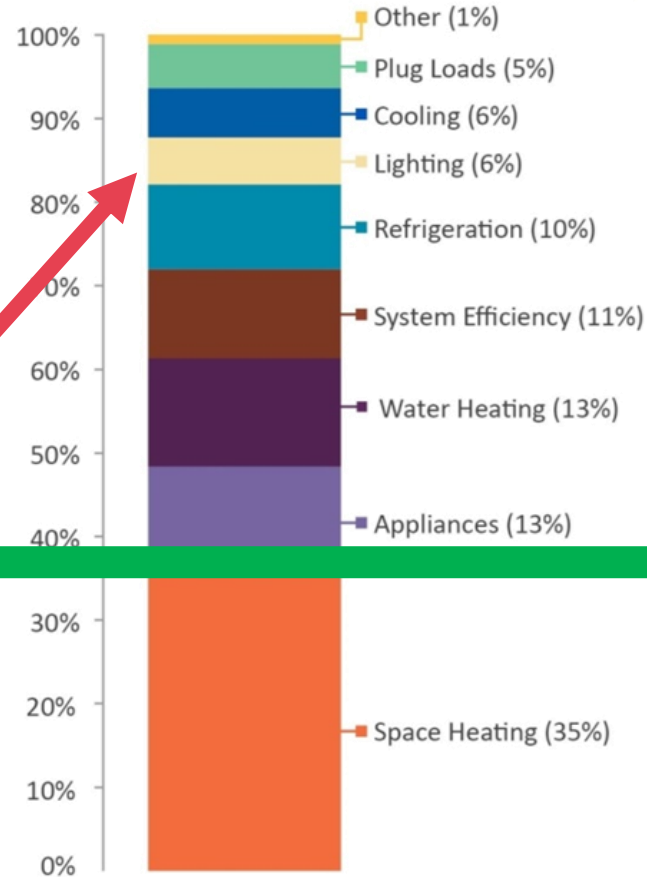


Historical Rebates

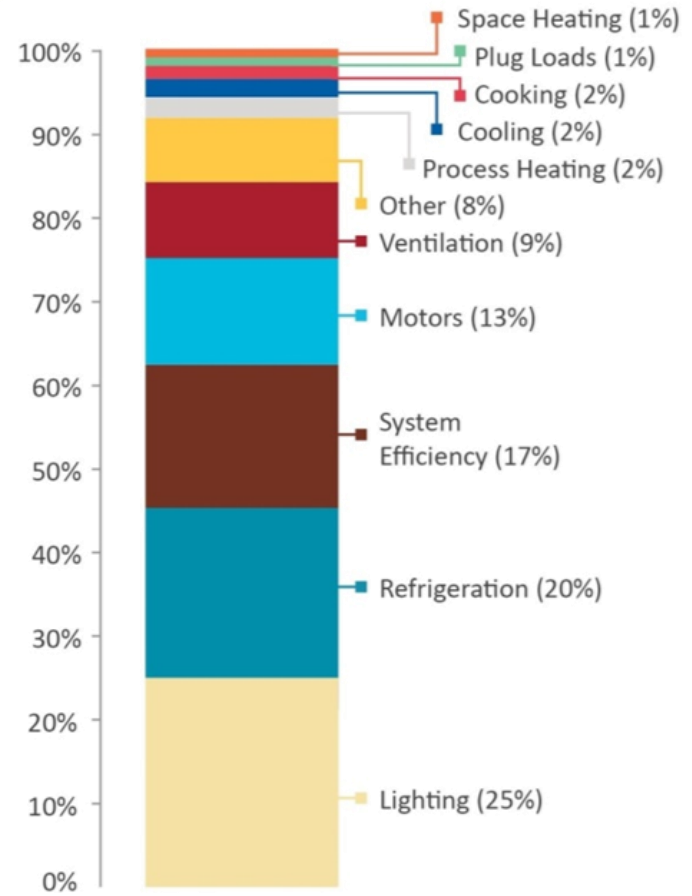
All Sectors



Residential

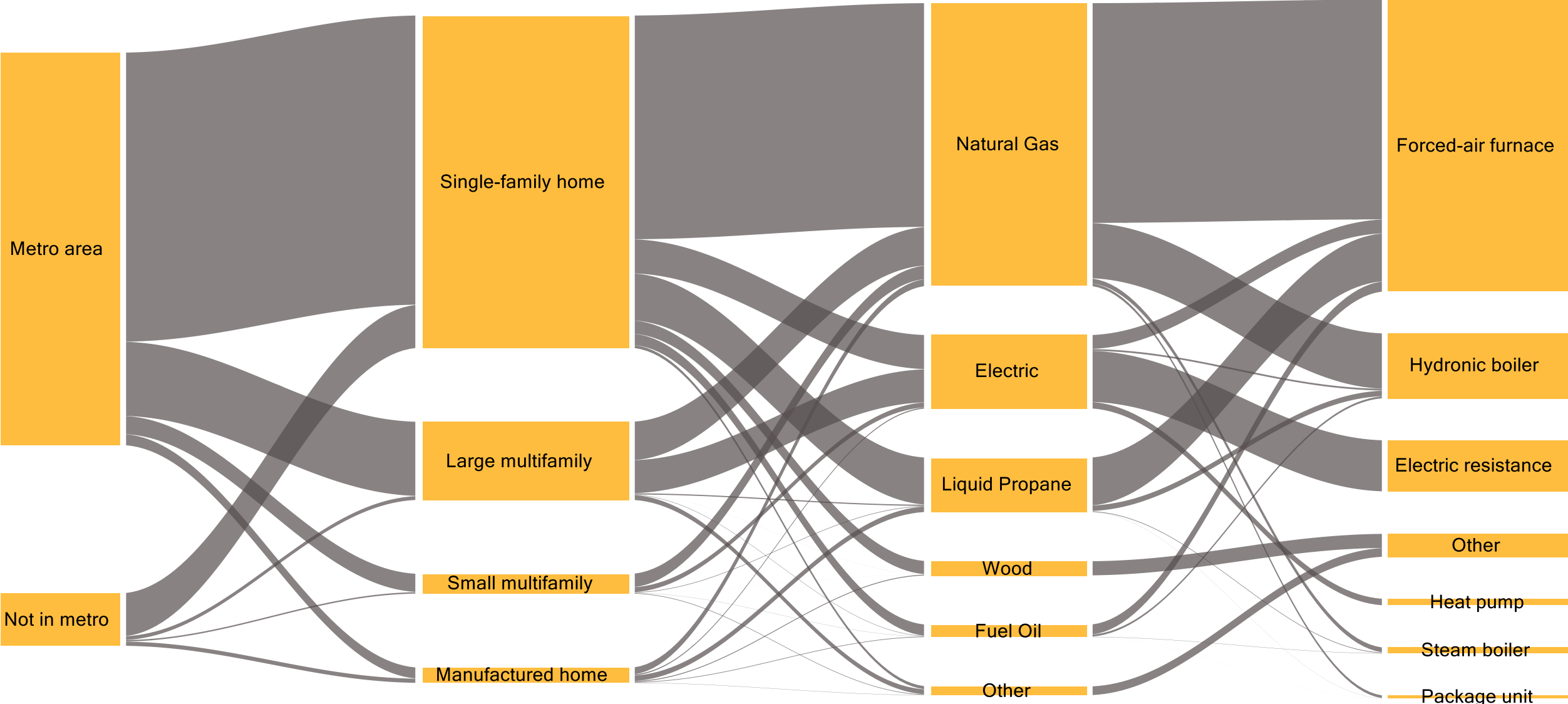


Commercial & Industrial



Primary Space Heating Types in Minnesota Homes

Total households:
2,358,346



Sources: US Census Bureau and MN Potential Study (CEE 2018)

Beneficial Electrification

- Goal: transition from carbon intensive fossil fuels to less carbon intensive electric alternative
 - Net reduction in lifetime carbon emissions
 - Net reduction in source energy use
 - Net reduction in fuel-neutral customer energy costs
 - No increase in coincident peak electricity demand

Energy Conservation and Optimization (ECO) Act

- Will expand heat pump opportunities and grow the market



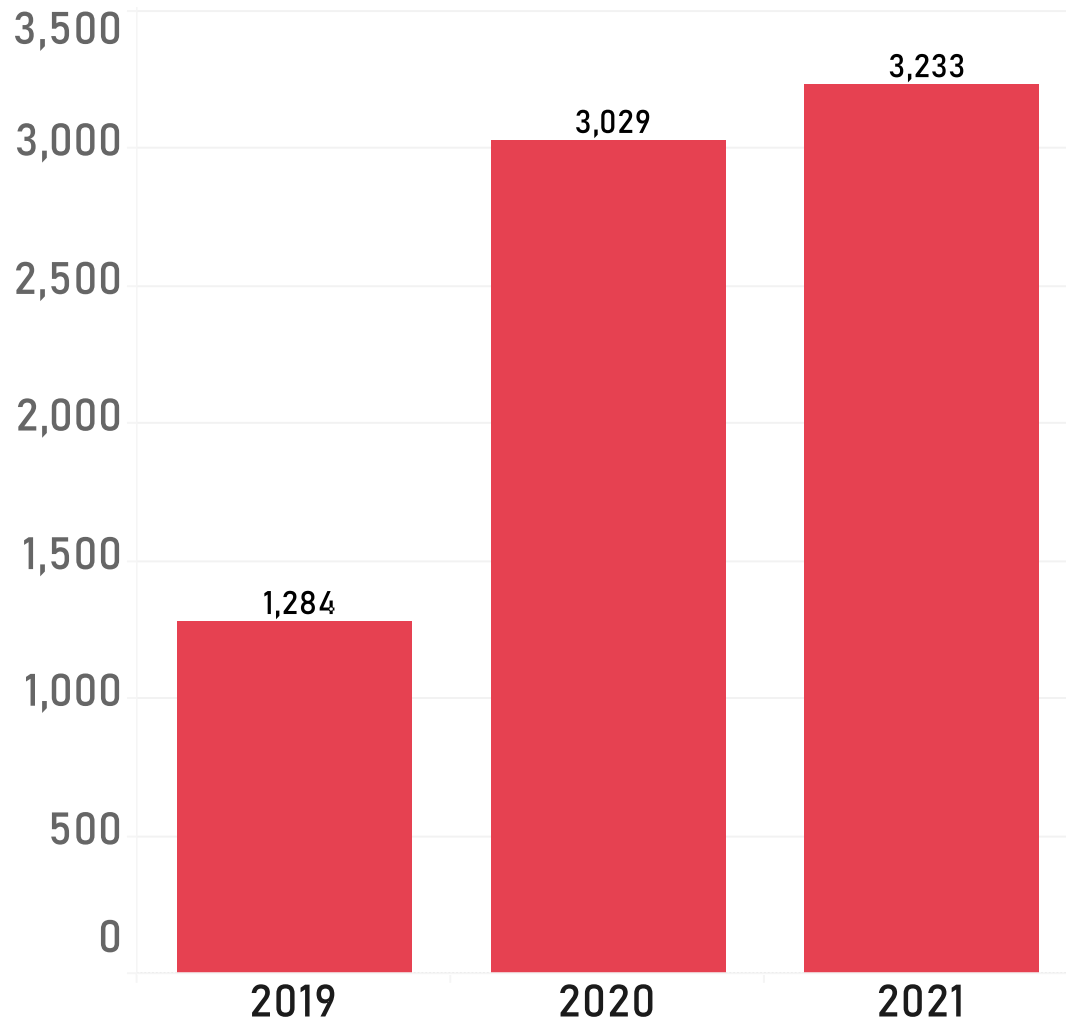
New rebates for efficient fuel switching (EFS)

Read more:

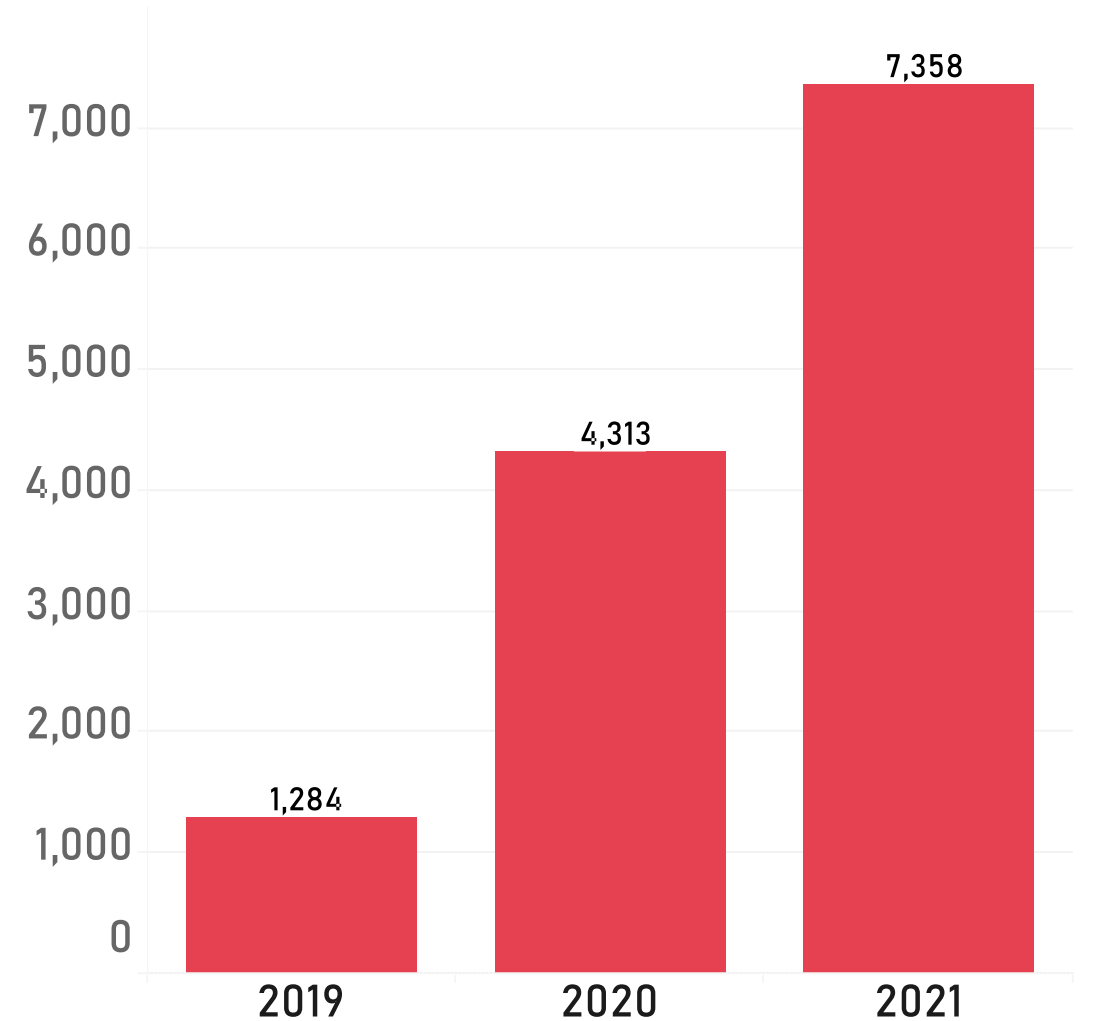
<https://www.mwalliance.org/blog/minnesota-passes-eco-act-modern-and-expansive-update-its-ee-framework>

MN heat pump market growth in utility rebate data through 2021

Total Residential ASHP Rebates by Year



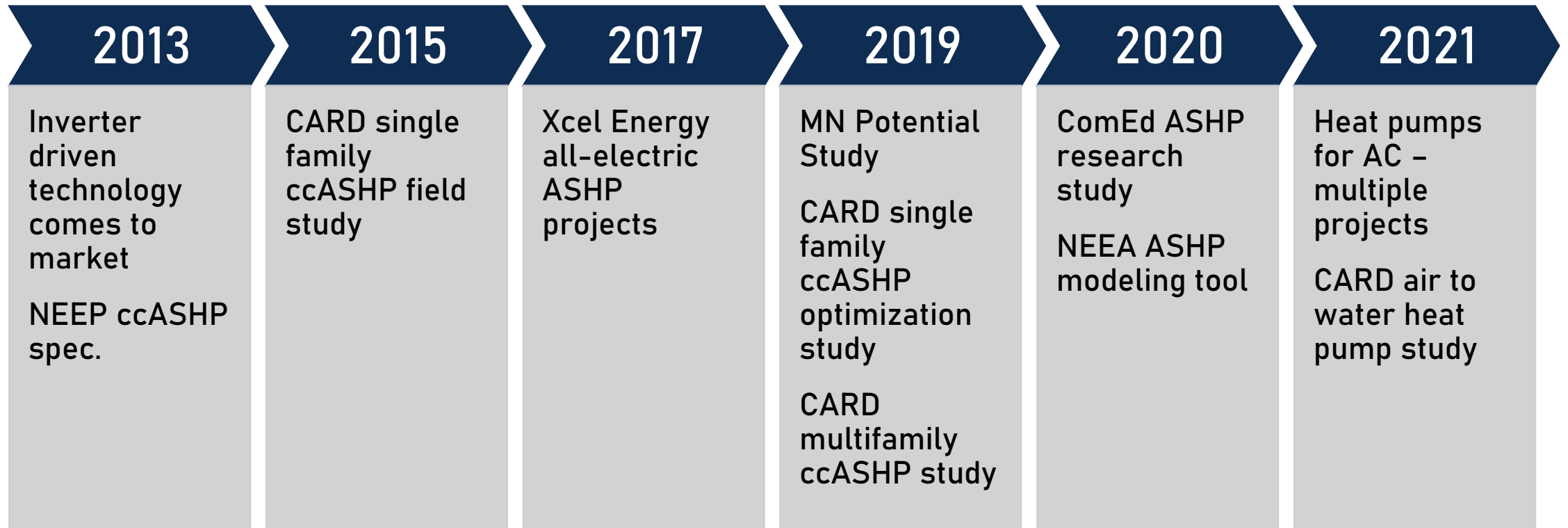
Running Total Residential ASHP Rebates



Growing potential

- Rebates shifting from lighting to space heating 2020-2029
- The ECO Act will allow fuel switching between electricity and fossil fuels, creating additional opportunities for heat pumps
- Utility rebate data show the market is already growing

CEE ccASHP Research

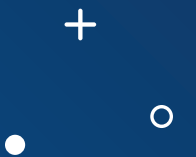




Audience Poll

How many people live in a home with a furnace and air conditioner?

How many people think replacing AC with HP is a promising opportunity?

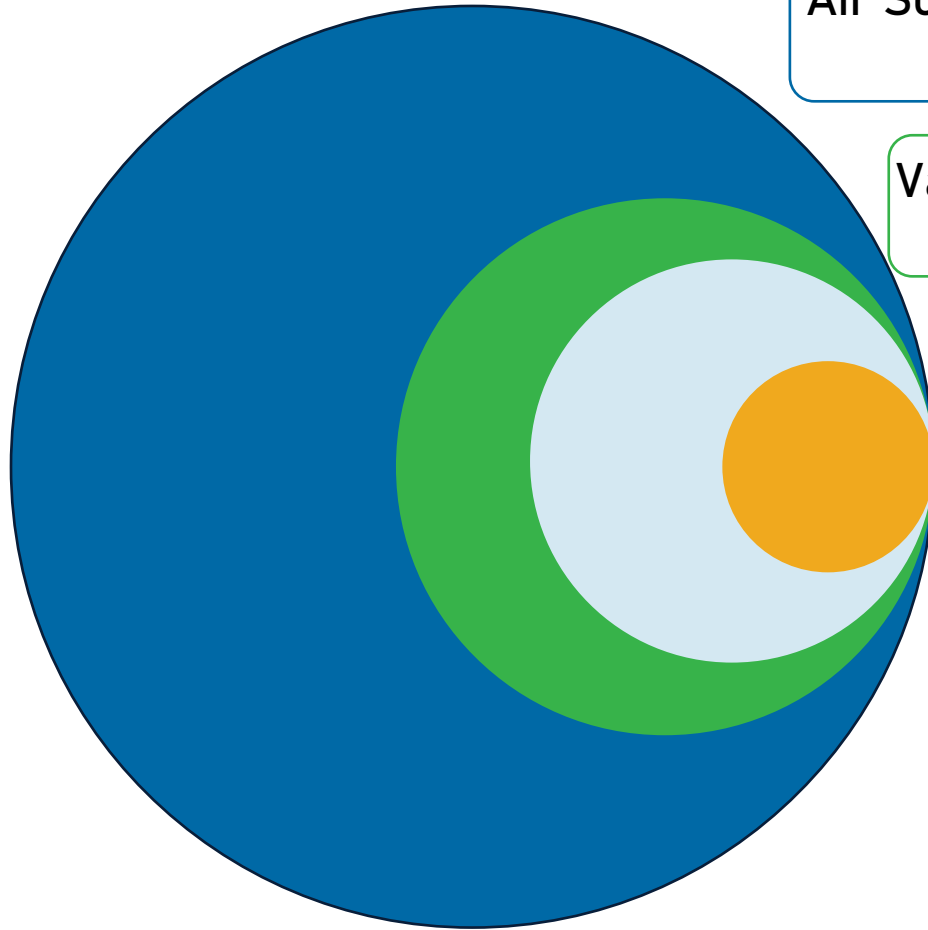


Ask an ASHP Research Engineer

What do you want to know about replacing an air conditioner with a heat pump?

Intro to CEE Research

The Many Names of a Heat Pump



Air Source Heat Pump
(ASHHP)

Variable Capacity Heat Pump
(VCHP)

Variable Speed Heat Pump
(VSHP)



Cold Climate Air Source Heat Pump
(ccASHHP)



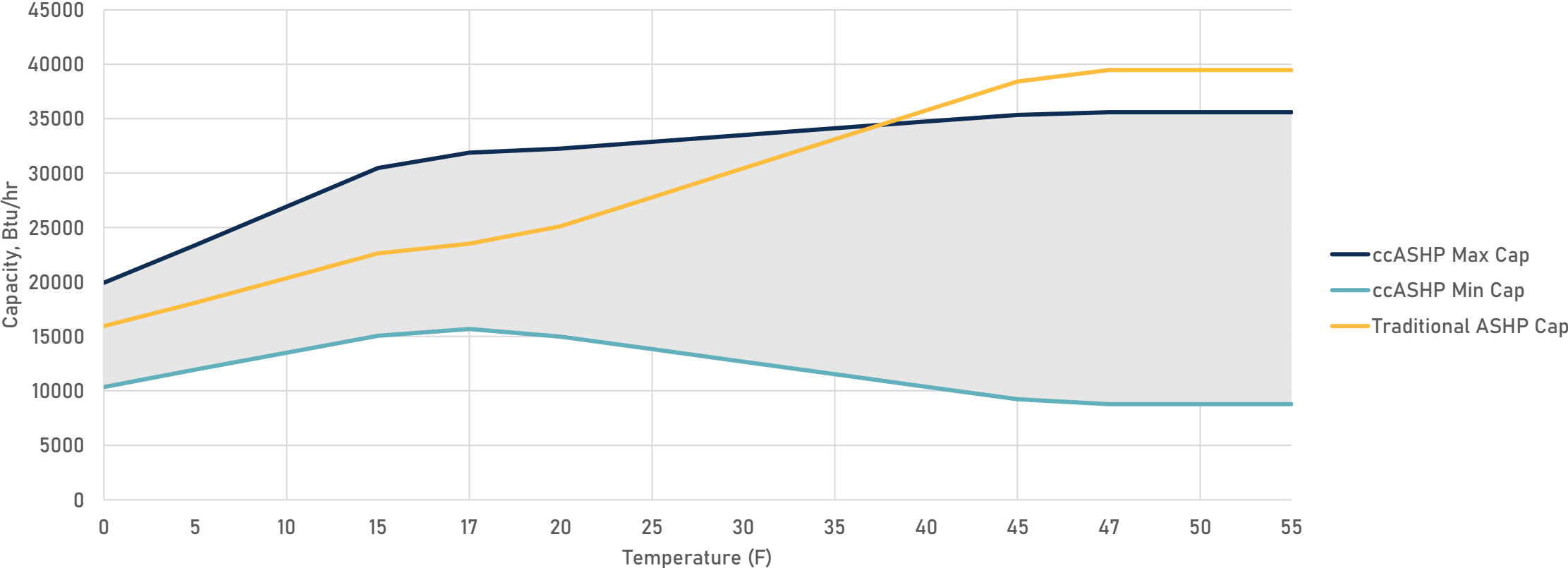
Cold Climate Ductless Heat Pump
(ccDHP)

Also Known As:

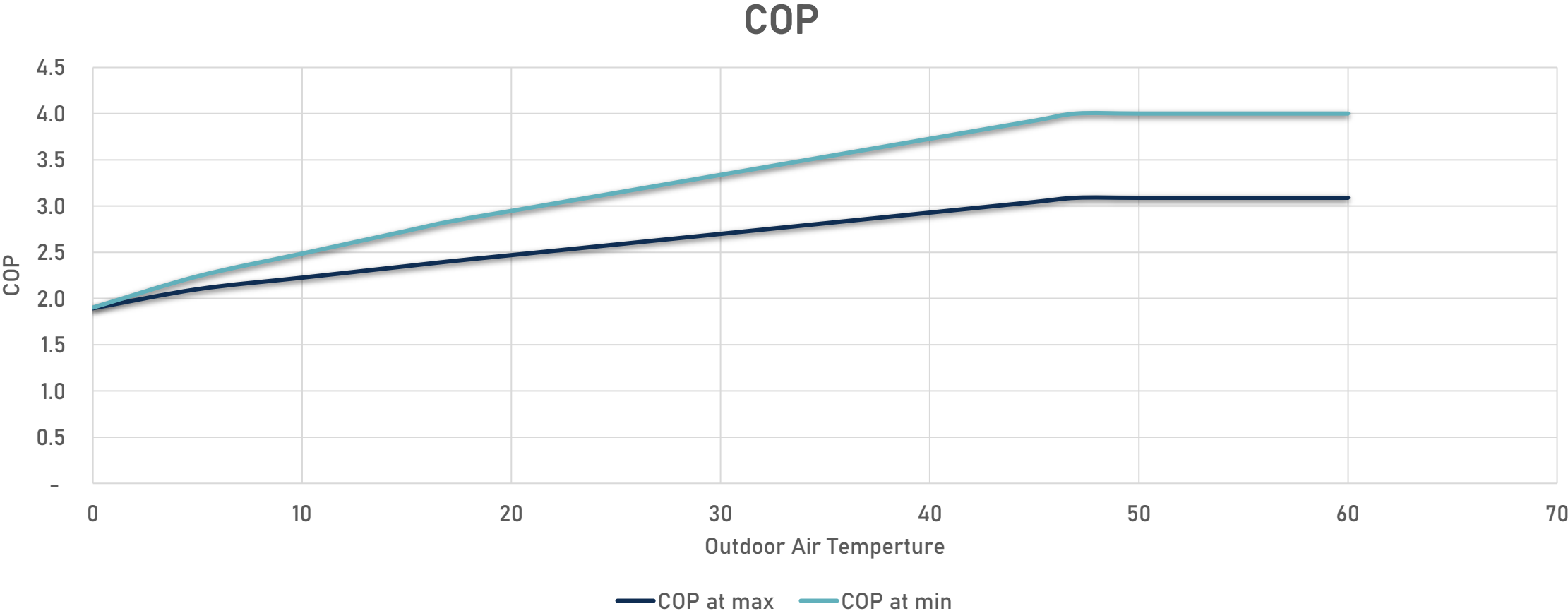
- Inverter driven
- Extended capacity
- Extra performance
- Extreme climate
- Various branded trade-names:
Hyper heat®, Aurora®, Halcyon XLTH®, Max-Heat®

ASHP Capacity

Air Source Heat Pump Capacity Comparison



ASHP COP



ccASHP Research at CEE

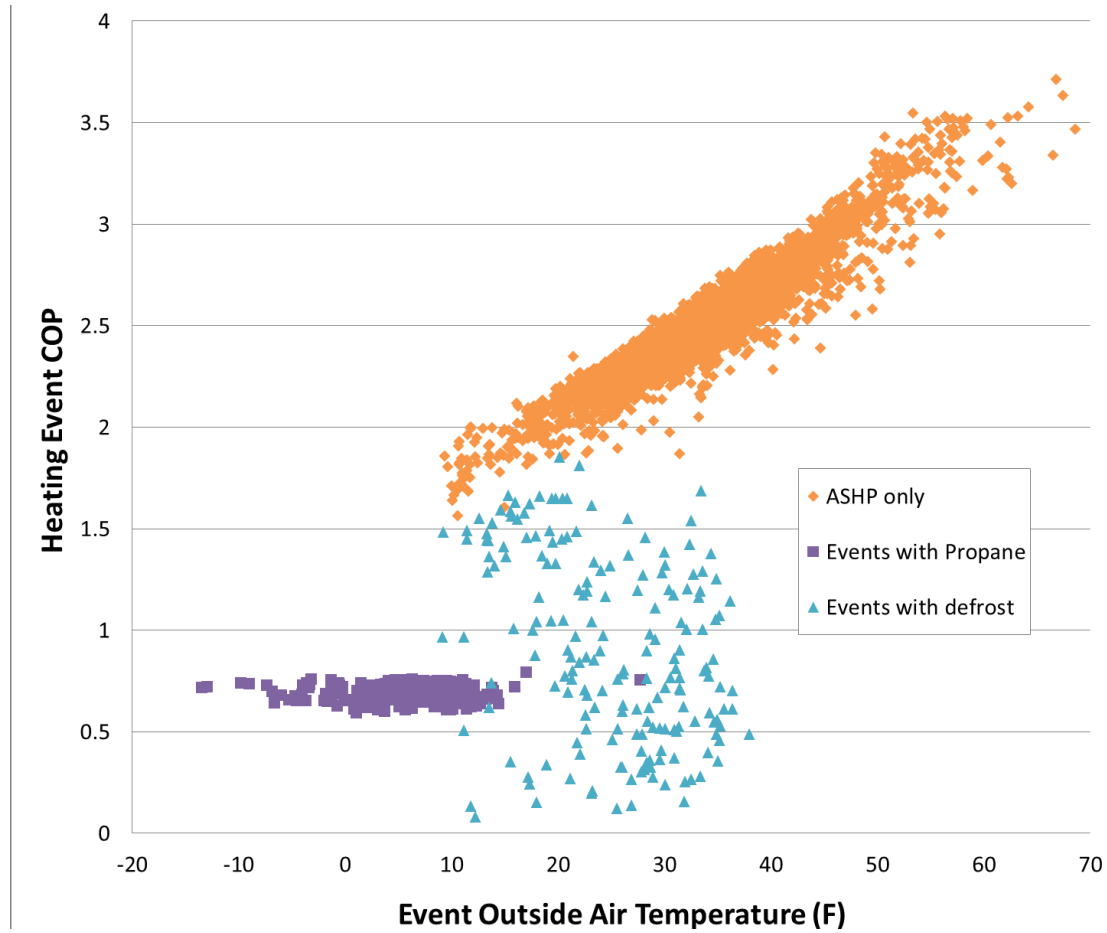
- Goals

- Do ccASHP really work during MN's cold winters?
- What savings can ccASHP's deliver?
- Develop quality installation and design best practices?
- Develop performance maps

- Scope

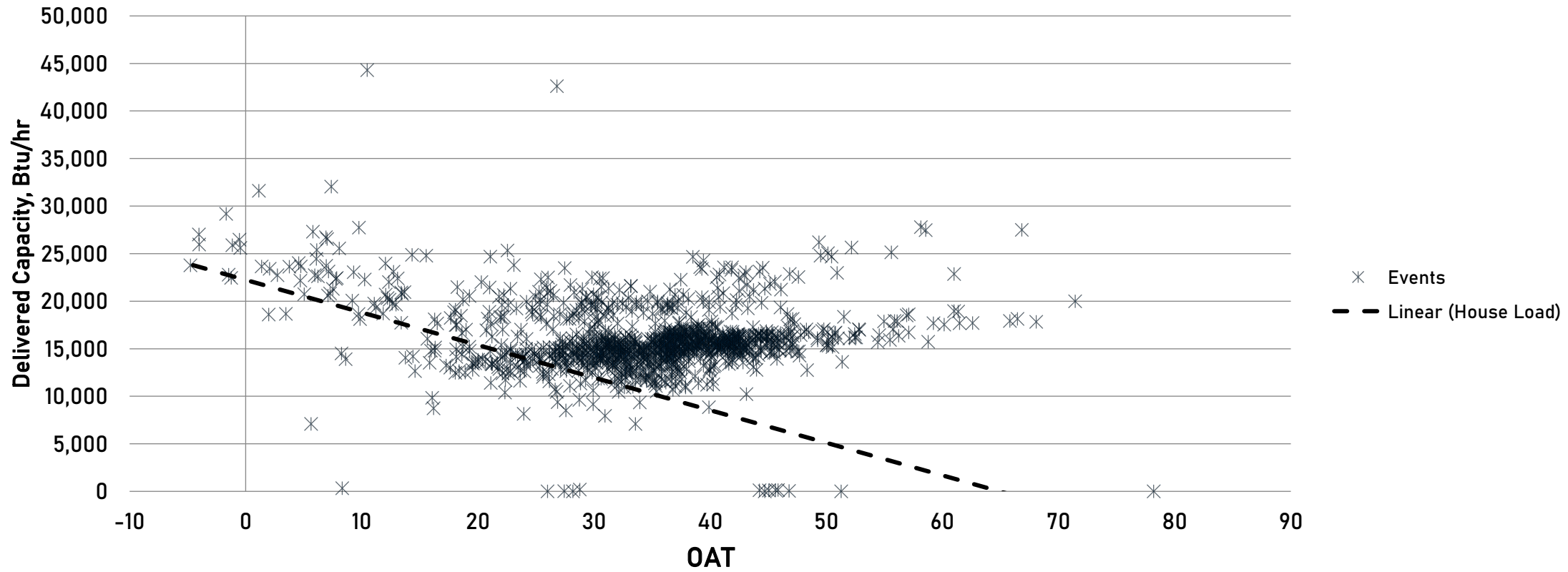
- Single family and multifamily
- Dual fuel, all-electric, ductless,
- Fuel or ER displacement and replacement

Heat Pump Efficiency



Capacity in Cold Conditions

3 Ton ccASHP



ccASHP Research Findings

01

Perform well in cold climates

- Delivering heat as at temps as low as -25°F
- Validated performance maps

02

Deliver increased capacity and COP

03

Meet manufacturer specifications

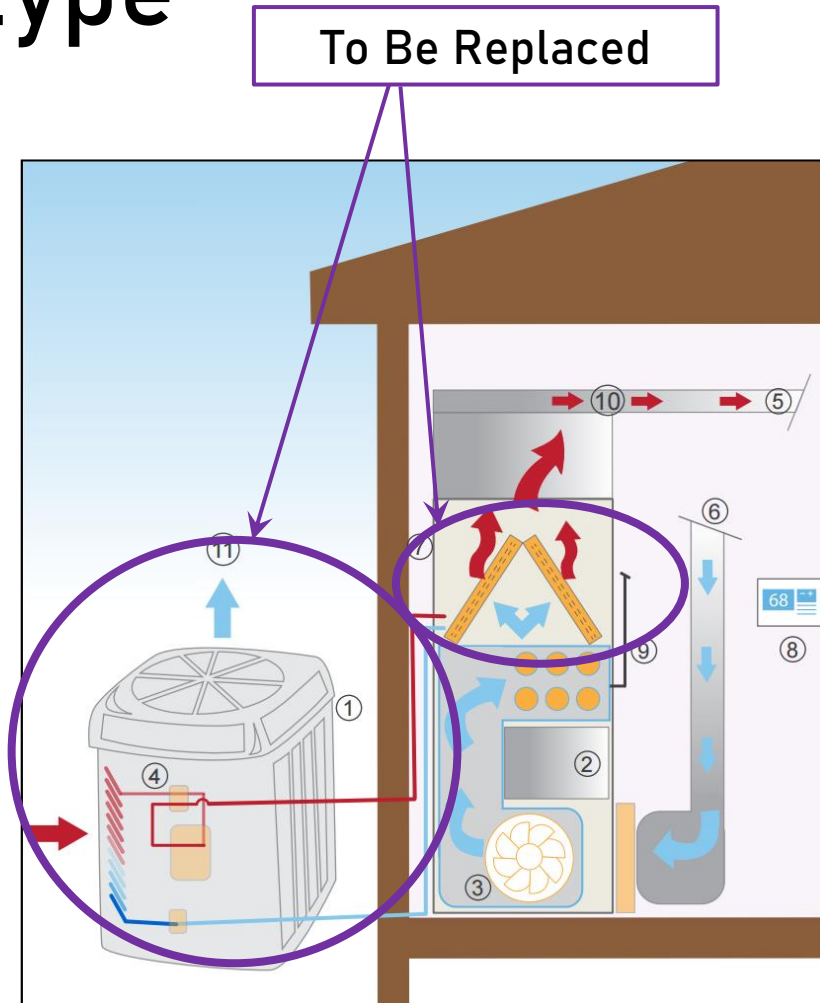
- When installed correctly

AC replacement research

- Technology demonstrations
 - Field demonstration and M&V work
- Market readiness and potential assessments
 - **CARD:** Heat Pump for ACs: Energy Savings and Modernization of Single-Family Cooling Systems
- Electrification

AC Replacement Product Definitions

Definition of AC replacement application type



- Partial component replacement
 - At AC failure
- Partial control and communication between components
 - ~90+% full optimization
 - Reduced first costs

Product definition for ASHP AC replacement

- Available Product Options:
 - Baseline Options
 - Air Conditioner – majority are min. efficiency (SEER 13) and single stage
 - Upgrade 1
 - Single stage or two stage heat pump
 - Upgrade 2
 - Variable speed heat pump

Considering single stage – entry level

- Single (or two stage) heat pumps can not increase compressor speed at cold temperatures
 - Their capacity decreases quicker as it gets cold outside
 - Leads to less operating hours for the HP
- Lower up-front costs
- Good performance at shoulder season air temperatures

VSHP as AC replacement

- System capacity is more consistent across cold winter temps
- Capable of displacing most of the heating loads
- Less expensive than first gen. ccASHPs, but more costly than ssHPs

Potential Overall Benefits

- Primary driver is decarbonization
- Cooling benefits
- Increased comfort



Installation Considerations

Single stage, variable capacity, all electric

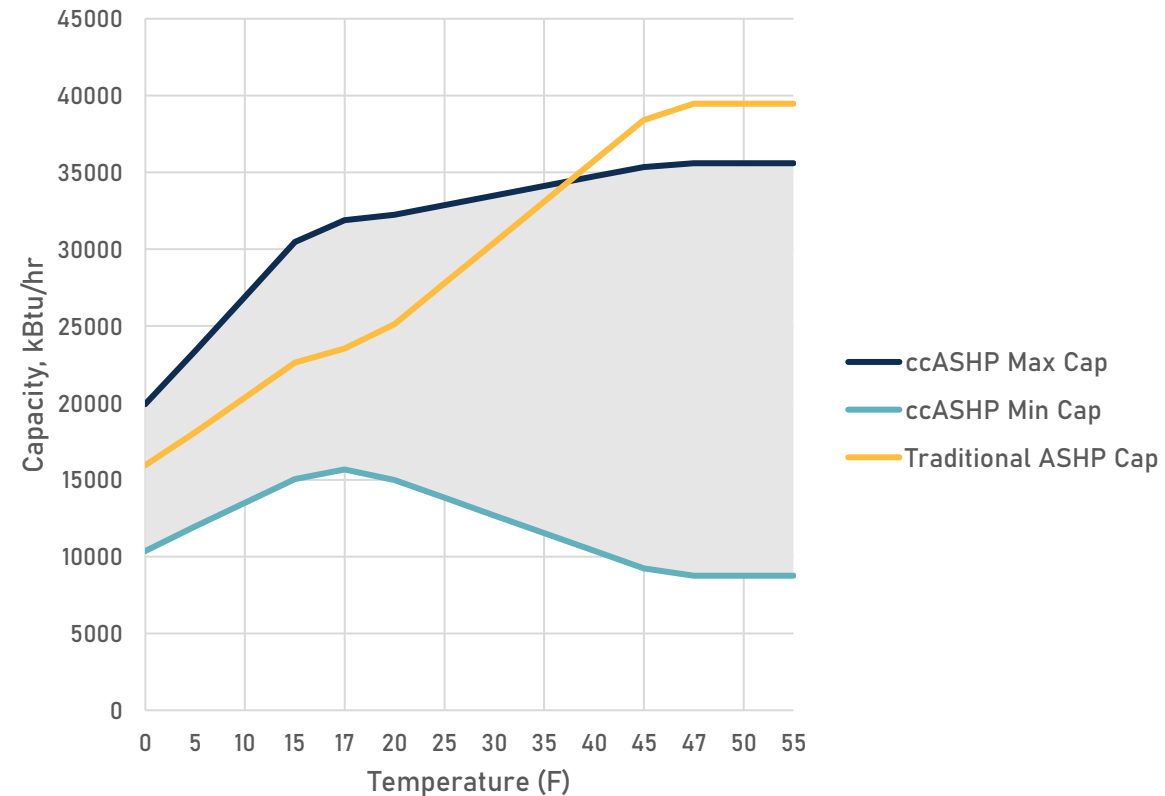


Single Stage Heat
Pumps

Single Stage HP: Sizing

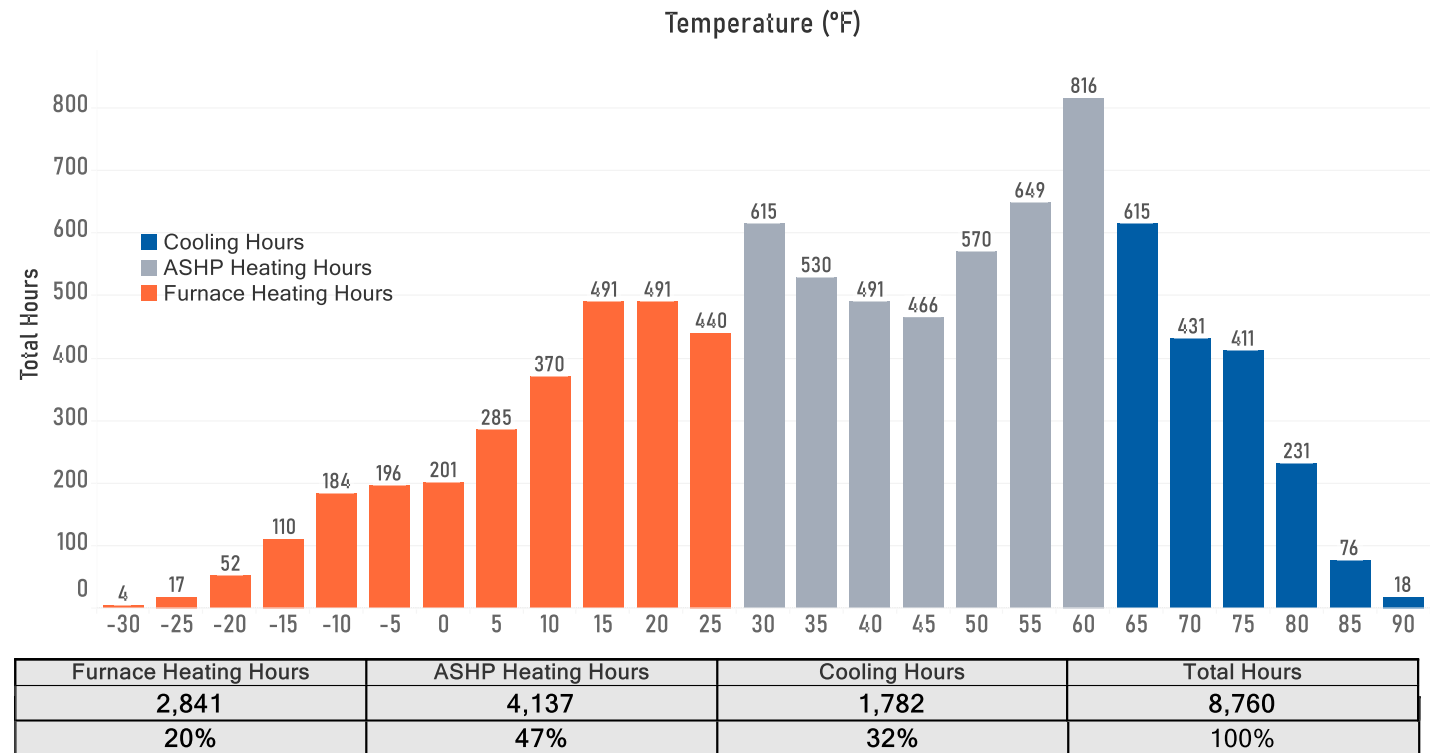
- Aligns well with
 - Shoulder season heating only
 - Natural gas furnace backup
 - Low first costs
 - Initial HP market participation
- Avoid for
 - Electric or delivered fuel applications
 - Electrification/Emissions related focus

Air Source Heat Pump Capacity Comparison



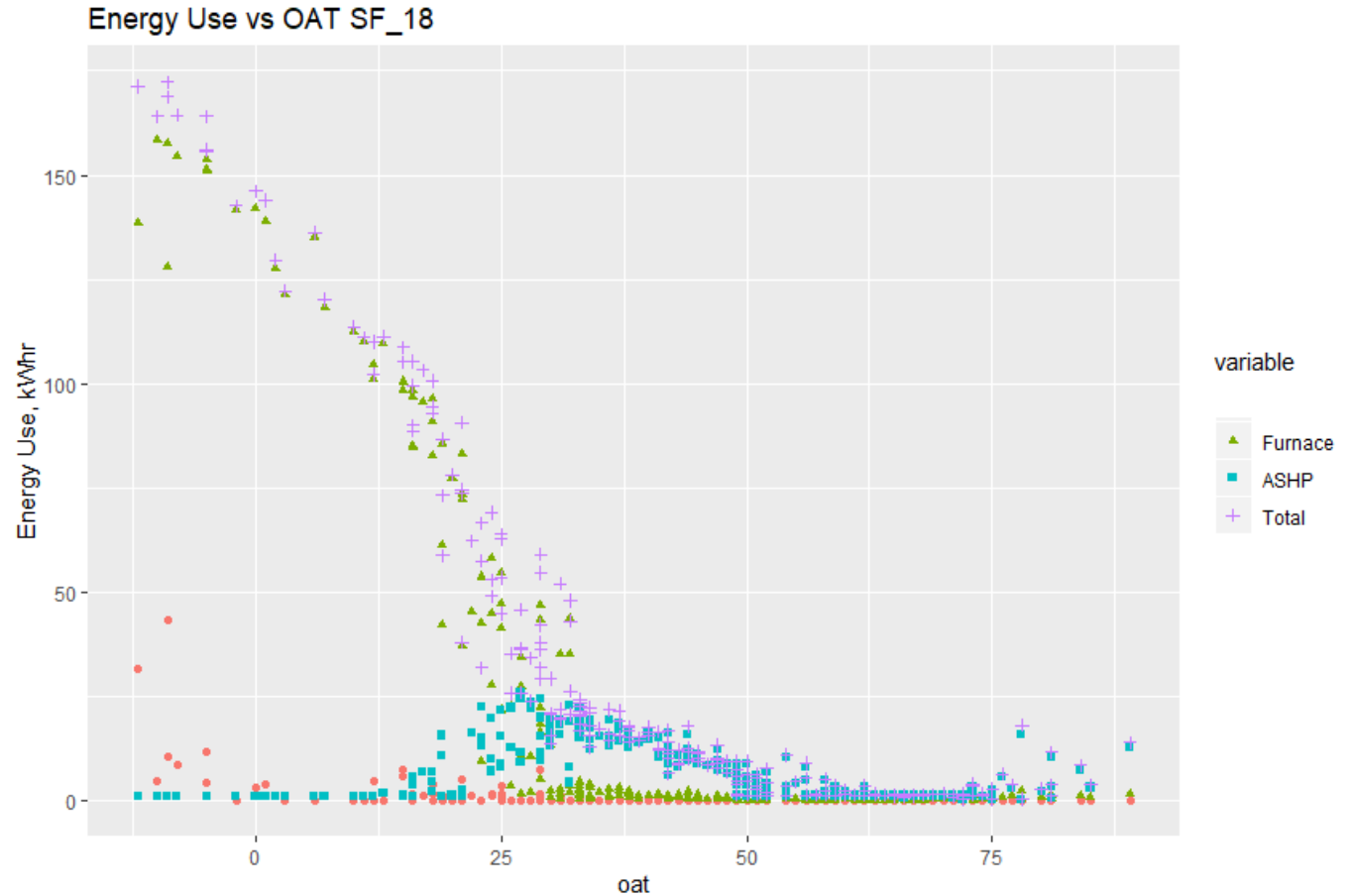
Single Stage HP: Controls

- Ducted Applications
- Integrated HP and back-up controls
- Switchover temperature
 - Based on homeowner economics

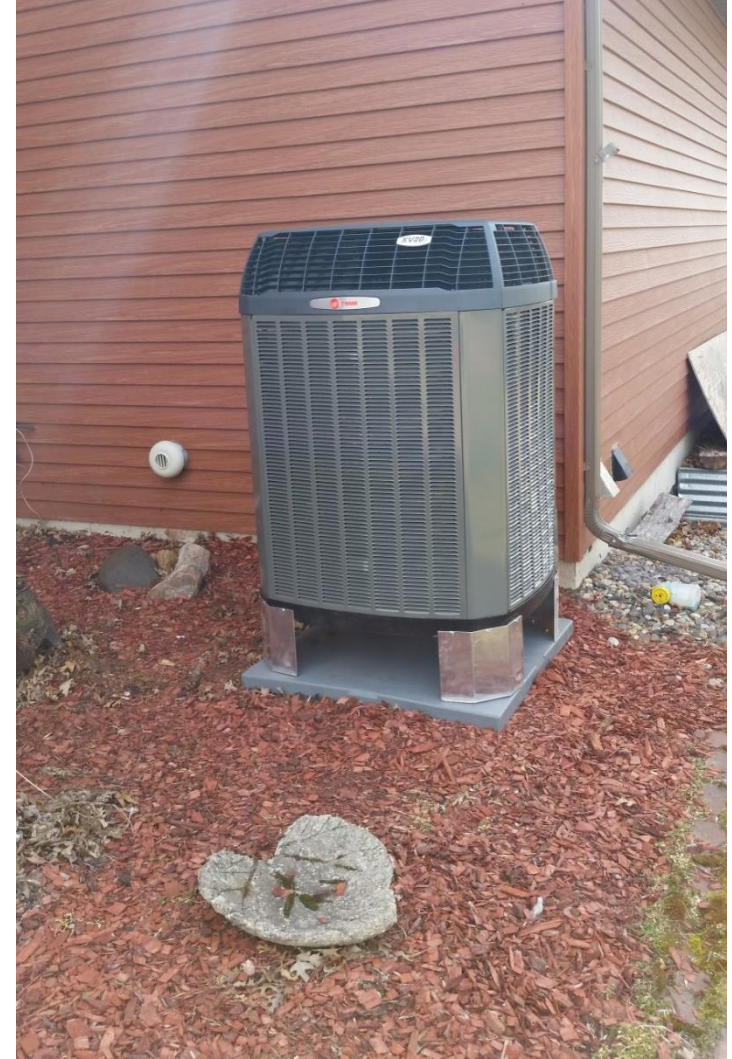


Case Study: Single Stage HP

- Two story Golden Valley home
- 2 ton single stage heat pump with furnace (electric)
- Performance
 - Heat pump was primary >32F
 - HP offset ~30% heating load



Variable Capacity HP



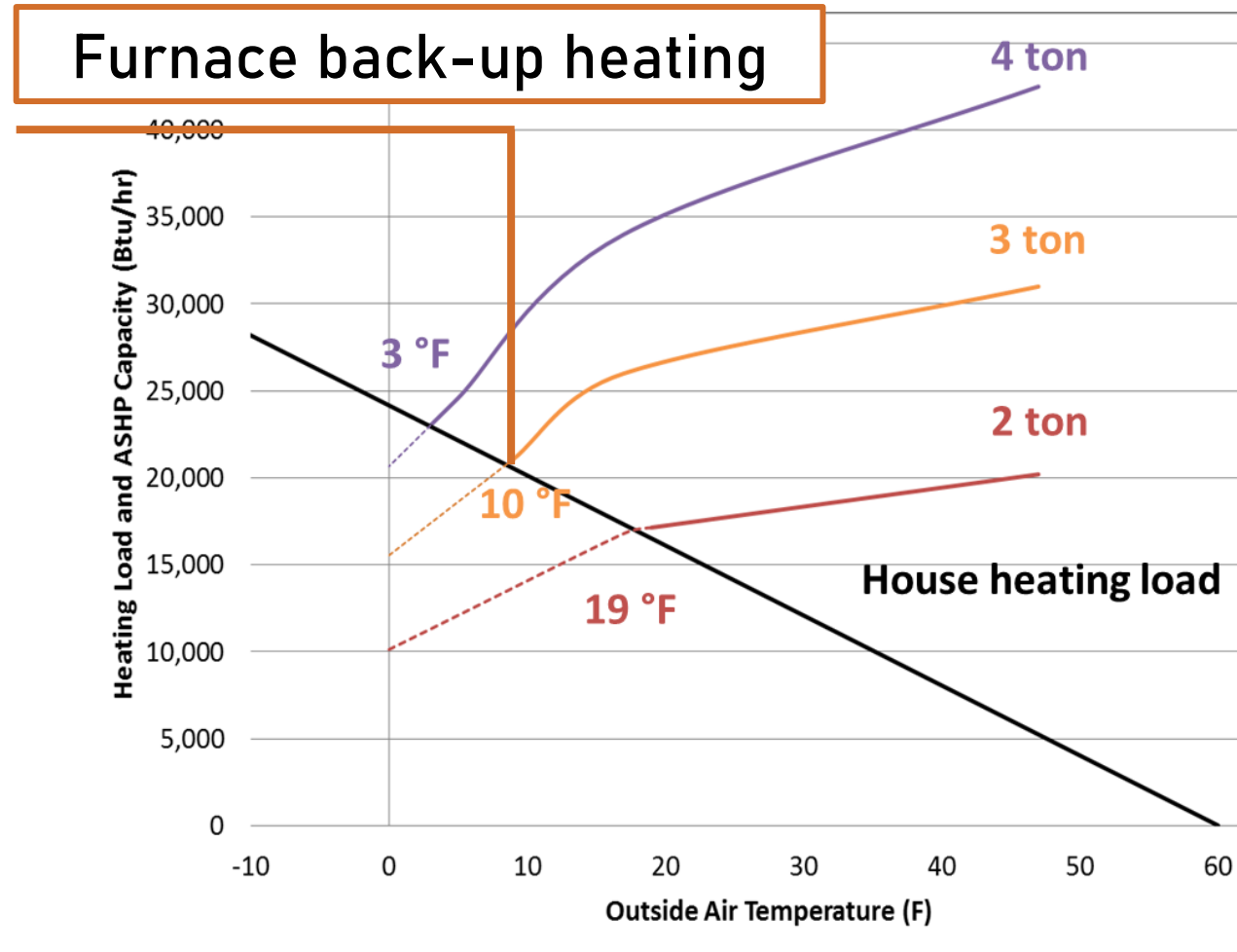
Product Selection

- Cold climate performance
 - Metrics: HSPF, COP at 5F, capacity maintenance
 - QPLs: NEEP ccASHP spec
- Installation type
 - Full system/ New Construction
 - VSHP as AC replacement



Sizing

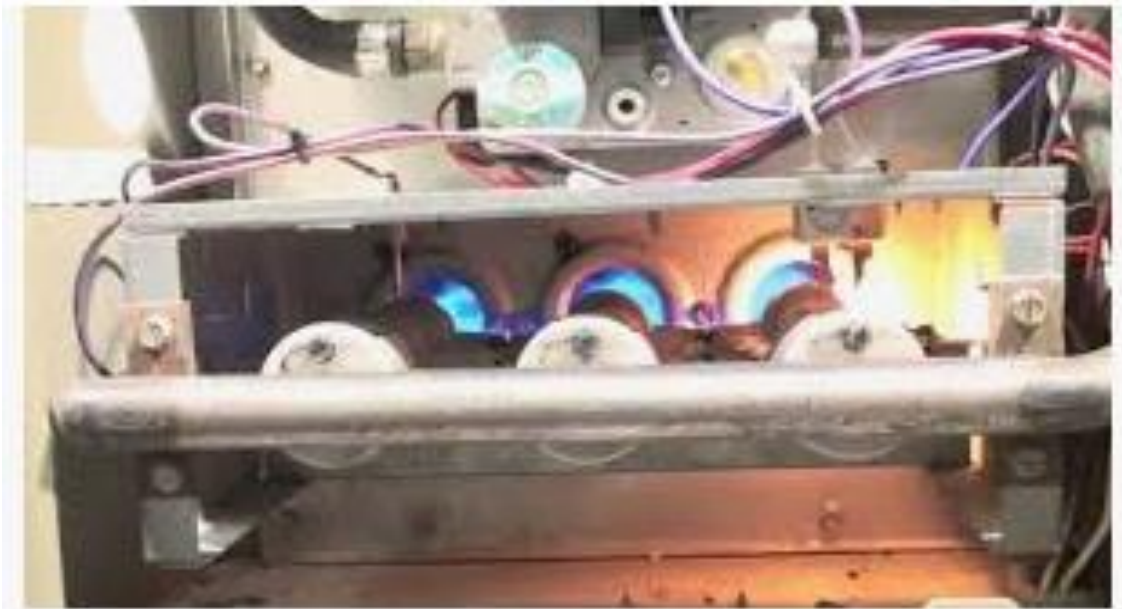
- Trade-offs between HP size and fraction of heating load meet
- Rule of thumb: Sizing for heating increases HP size by 1-ton over sizing for cooling
- Percentage of heating load meet by ASHP:
 - 4 ton ~ 86%,**
 - 3 ton ~ 77%**
 - 2 ton ~ 60%**



Controls



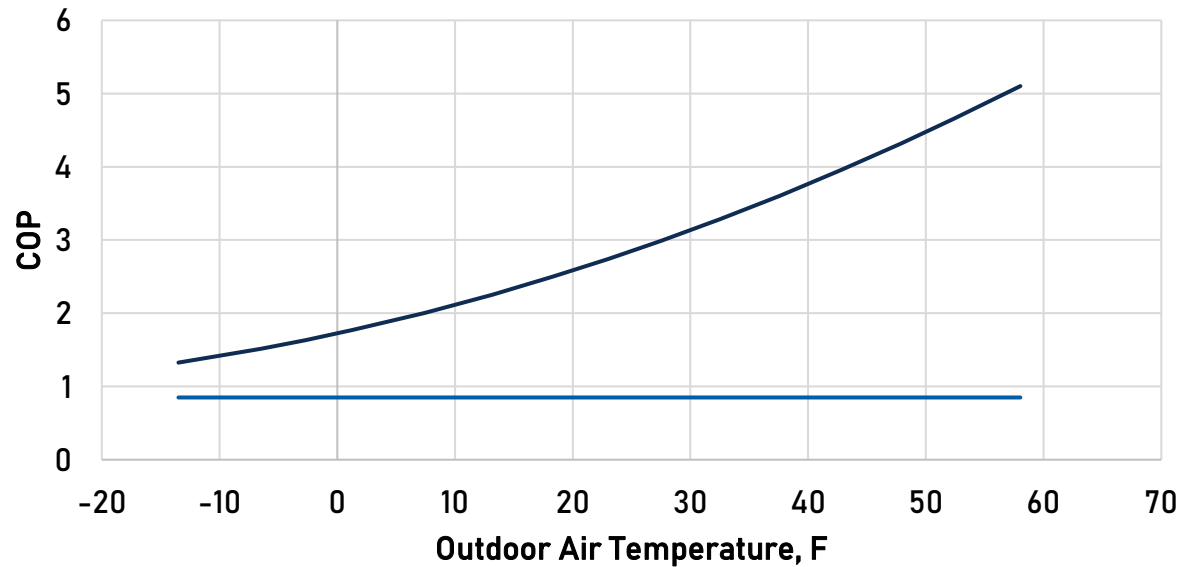
OPERATION



INTEGRATION

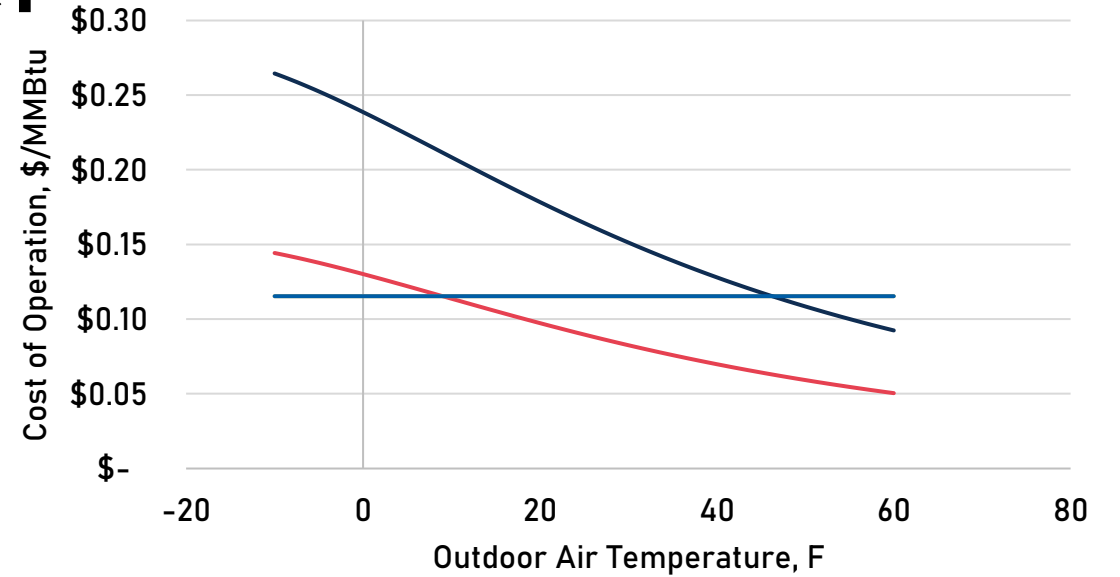
Economic Switch Over

System Efficiency



— Heat Pump — Furn

Operating Cost



— Heat Pump - \$0.06/kWh
— Heat Pump - \$0.11/kWh
— Furn - \$0.9/therm

Economics from website

- <https://www.mnashp.org/guides>



[FOR CONTRACTORS](#) [FOR UTILITIES](#) [FOR HOMEOWNERS](#) [BLOG](#) [CONTACT](#)

Resources and Guides

The guides below provide instructions on cold-climate ASHP installation best practices and design considerations. These guides complement manufacturer product training by providing energy-specific guidance that will maximize homeowner benefits.

Guides

Installation Guide
Air Source Heat Pumps Best Practices Installation Guide
A Companion to Minnesota ASHP Collaborative Design Guide

Introduction
Ensuring that air-source heat pumps (ASHPs) have been installed with and properly configured to optimize performance, generate referrals, increase sales, reduce callbacks, and improve customer comfort and satisfaction. High-quality installation also improves an ASHP system's efficiency and performance. This guide outlines the best practices for all ASHP installations, as well as guidance on homeowner education to facilitate equipment usage and identify efficient cold-climate. For guidance on equipment selection, system sizing and proper design, see our ASHP Design Guide, which provides information on specific applications. Use this ASHP design checklist to ensure that your ASHP installation should always be installed by licensed, trained professionals. Always follow the manufacturer's specifications and installation instructions, as well as all applicable building codes and regulations. All installers should attend a manufacturer's training or preferred installer program.

Installation Requirements and Best Practices

Low Salt
Installers should follow the manufacturer's instructions for minimum salt levels.

Guide: ASHP Installation Best Practices

Download

ECONOMIC BALANCE POINT FOR DUAL FUEL
The installation decision tree to select the economic switchover temperature of a dual fuel ASHP installation.
Note: The installation decision tree is based on the ASHP Design Guide.

ASHP Model	Oil		Gas		Dual Fuel		Dual Fuel		Dual Fuel		Dual Fuel	
	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 1	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 2	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 3	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 4	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 5	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 6	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 7	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 8	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 9	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas
ASHP 10	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas

Guide: Economic Balance Point for Dual Fuel (Switchover Temp)

Download

Guide To Sizing & Selecting Air-Source Heat Pumps in Cold Climates
A Companion to NEEP's Guide to Installing Air-Source Heat Pumps in Cold Climates

Introduction
The use of air-source heat pumps (ASHP) in cold climates requires specific design, installation, and operation considerations. This guide provides information on the design, installation, and operation of ASHP systems in cold climates. It covers the selection of equipment, system sizing, and the installation of controls. The guide also provides information on the operation of ASHP systems in cold climates. The guide is intended for use by installers, designers, and homeowners. The guide is based on the ASHP Design Guide and the ASHP Installation Guide.

There are many types of equipment and a variety of common applications for ASHP installation in cold climates. Considerations of design and installation requirements, equipment selection, and operation considerations are provided. The guide also provides information on the operation of ASHP systems in cold climates. The guide is intended for use by installers, designers, and homeowners. The guide is based on the ASHP Design Guide and the ASHP Installation Guide.

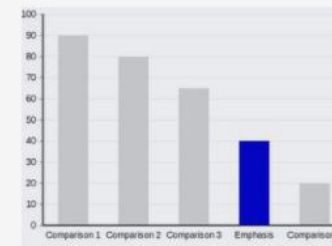
Key considerations for equipment selection and installation include:

- Heating (or heating & cooling) equipment
- Fuel/energy requirements
- Installed cost
- Heat distribution

Each category requires the relevant information on sizing and equipment selection, system configurations, the operation of the equipment, and tips on how to troubleshoot for each application category included in the guide.

NEEP: Guide to Sizing & Selecting ASHP in Cold Climates

Download



Guide: Cost of Heat Pump Comparison Resources

View



VSHP as AC Case Study

- Single family home in Murdock, MN
- VSHP installed in Feb 2022
- 3.5 ton single stage HP replaced with 3.5 ton VSHP
- Cost \$6,000 compared to \$15,000 for full system

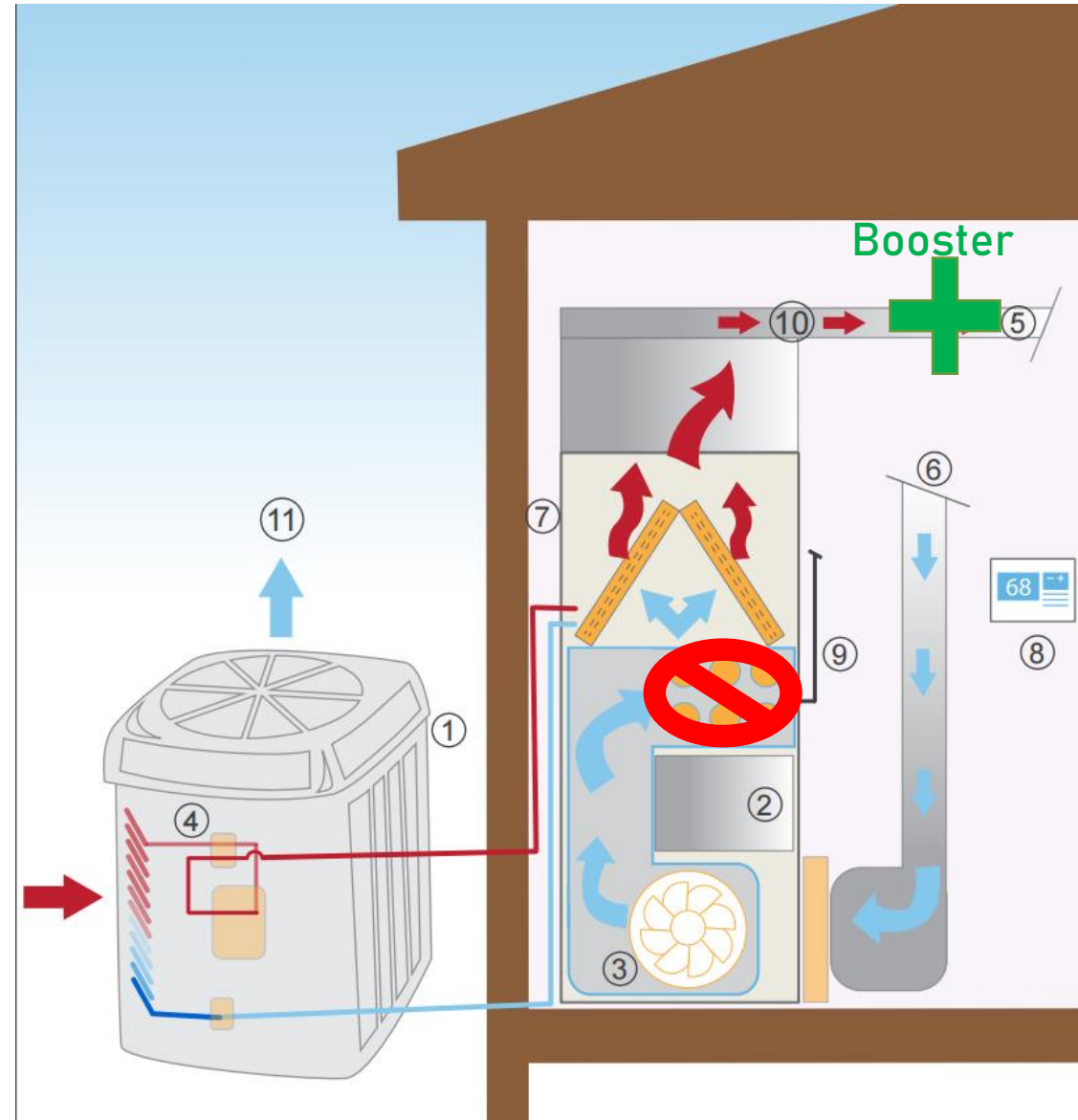
- Expected Results
 - COP ~1.9
 - Reduction of short cycling -> improved comfort

All-Electric HP



Product Selection and System Design

- Heat pump has similar considerations as other VSHPs
- Backup furnace replaces with electric booster heater
- Sizing impacts



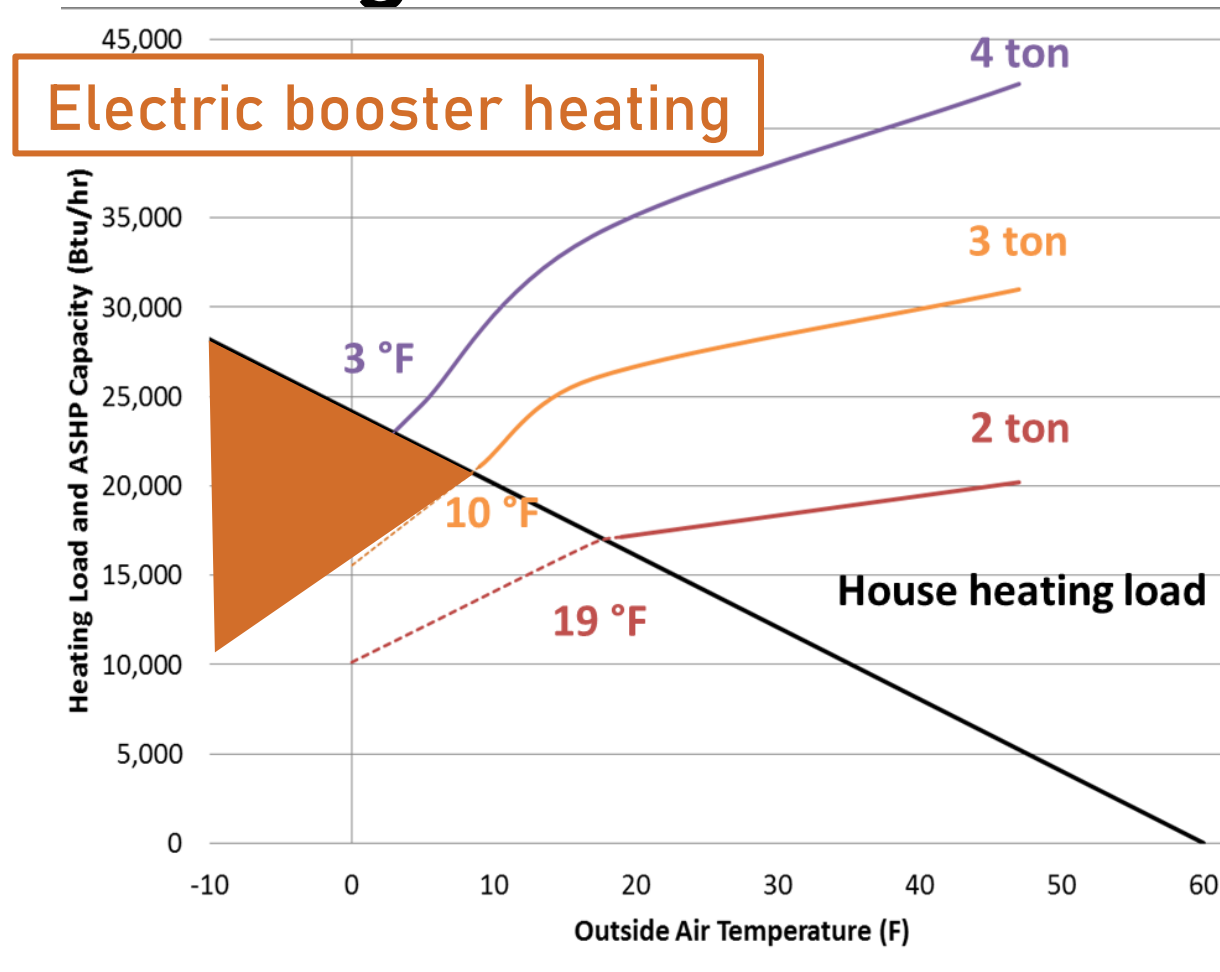
All Electric HP: Sizing

- Trade-offs between HP size and fraction of heating load meet
- Rule of thumb: Sizing for heating increases HP size by 1-ton over sizing for cooling
- Percentage of heating load meet by ASHP:

4 ton ~ 86%,

3 ton ~ 77%

2 ton ~ 67%



Booster Heater

- Modulation
- Why to boost?
- When to boost?



All- Electric Case Study

- Minneapolis 1.5 story single family home
- 2 ton AC upgraded to 3 ton variable speed HP
- Natural gas furnace heating was replaced by HP
- Results:
 - 91% of heating load was met by the HP
 - 56% reduction in site energy
 - 5% reduction in emissions in the first year
 - Annual heating COP of 1.85
 - 50% increase over natural gas heating (\$0.9/therm and \$0.13/kWh).
 - Would be break even vs nat. gas. At \$0.065/kWh

Figure 1. Indoor Unit

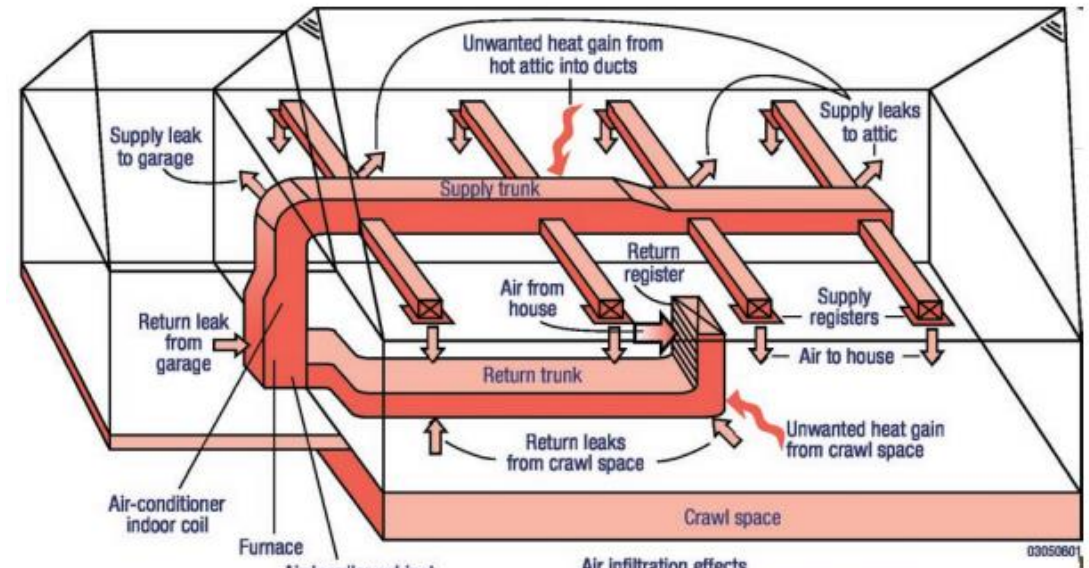


Figure 2. Outdoor Unit



Considering Ductwork

- VSHP typically have
 - Lower airflows
 - Lower air temperatures
- Comfort impact?
- Quality installation requirements
 - Look for unconditioned spaces
 - Look for existing issues



Air infiltration effects
1. A room with a supply register is isolated from the return register by a closed door.
2. Overall duct leakage may be unbalanced.

<https://www.nrel.gov/docs/fy05osti/30506.pdf>

Q
A
S
E
A

Q&A

Market Research Findings



Acknowledgements

Minnesota Department of Commerce Division of
Energy Resources

Leede Research

Goals of Market Research

- Uncover homeowner perceptions:
 - Find out what customers value (price, features, and benefits)
 - Determine drivers of replacement (e.g., end of life or proactive)
 - Uncover current awareness levels
- Understand contractor, distributor and manufacturer opportunities and barriers

Market Research Interviews

- 438 Minnesota Households - Online survey
- 30 Installers - In-depth Interviews
- 3 Distributors - In-depth Interviews
- 5 Manufacturers - In-depth Interviews

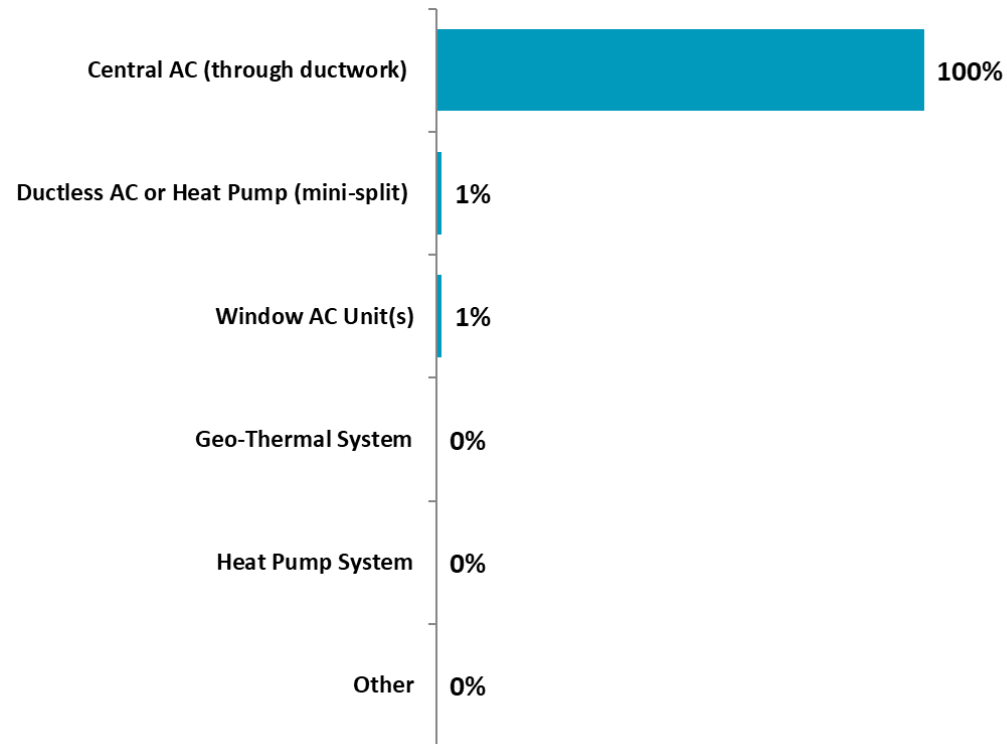


Zoom in on Customer Perceptions

Customer Survey Overview

- Method
 - Online surveys
 - Leede Research carried out survey work and analysis
- Target Audience
 - Homeowners with furnace and AC
 - Segmented recent purchasers and intenders
- Timing
 - Information from this study reflects the current environment at the time of the gathering. **It will generally be good for 18 months to 2 years, unless something significantly impacts the target market for these products.**

Customer Home Type – Customers with AC and Furnace



Approximately how old is your current system?

Mean = 11.1 years old

(If Yes – Group 2A – Owner; If 2 years or less – Group 2A1 – Recent Purchaser – Complete Purchase Section)

Are you considering upgrading or replacing the system in the next 3 years?

Yes: 19%

No: 55%

Not Sure: 26%

(If YES – Group 1A – Intender – Complete Purchase Process)

If NO Forced Air in S5 AND Window or Ductless Units – Thank & End

S5A. Which of the following describes the air conditioning in your home?

(Multiple responses possible)

Home Environment



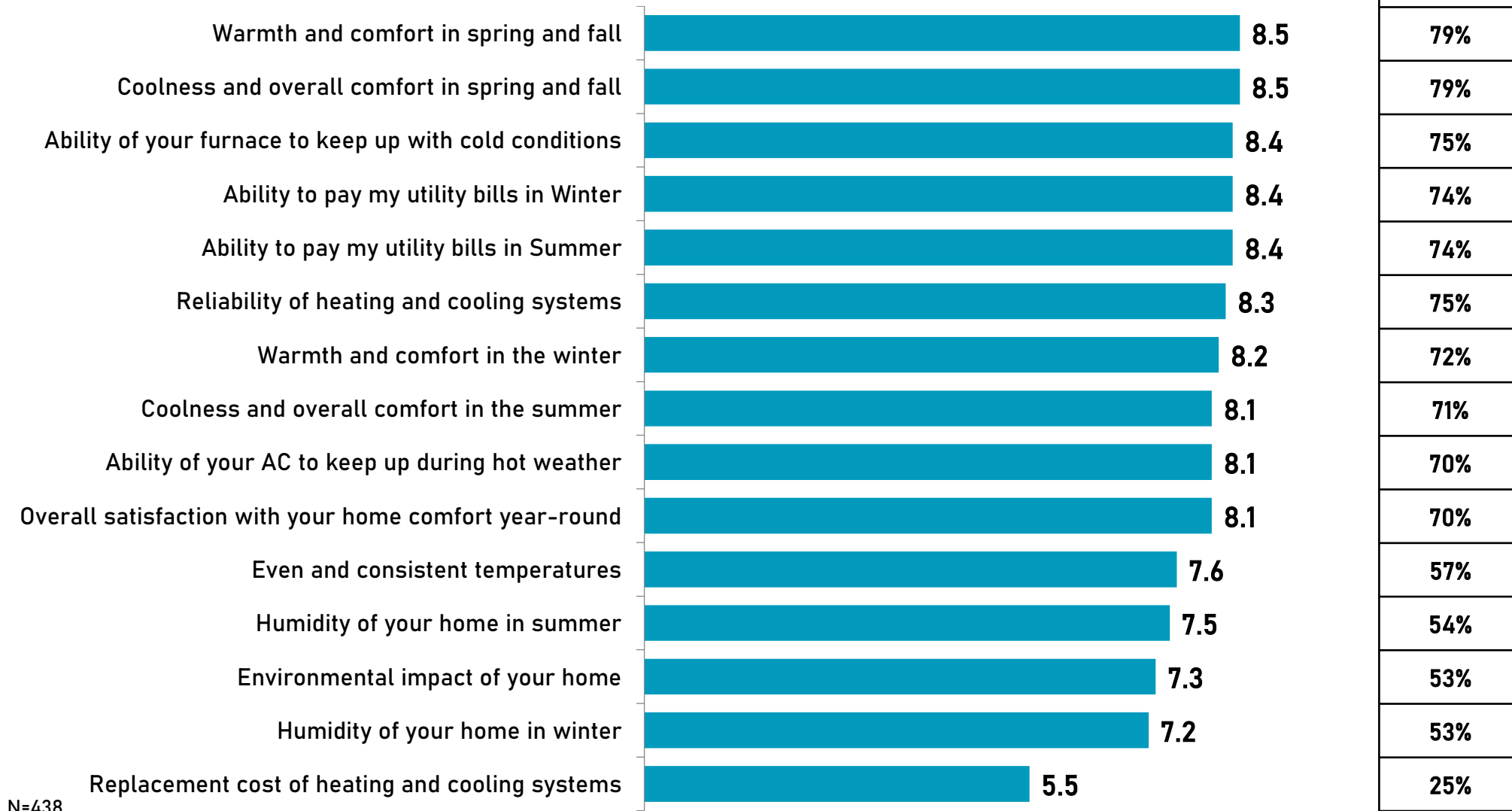
Understanding respondent homes

Rate Overall Comfort in Home

All items show above average satisfaction levels.

There are issues with replacement costs which could be a tool in the future.

Comfort levels appear to be sound.

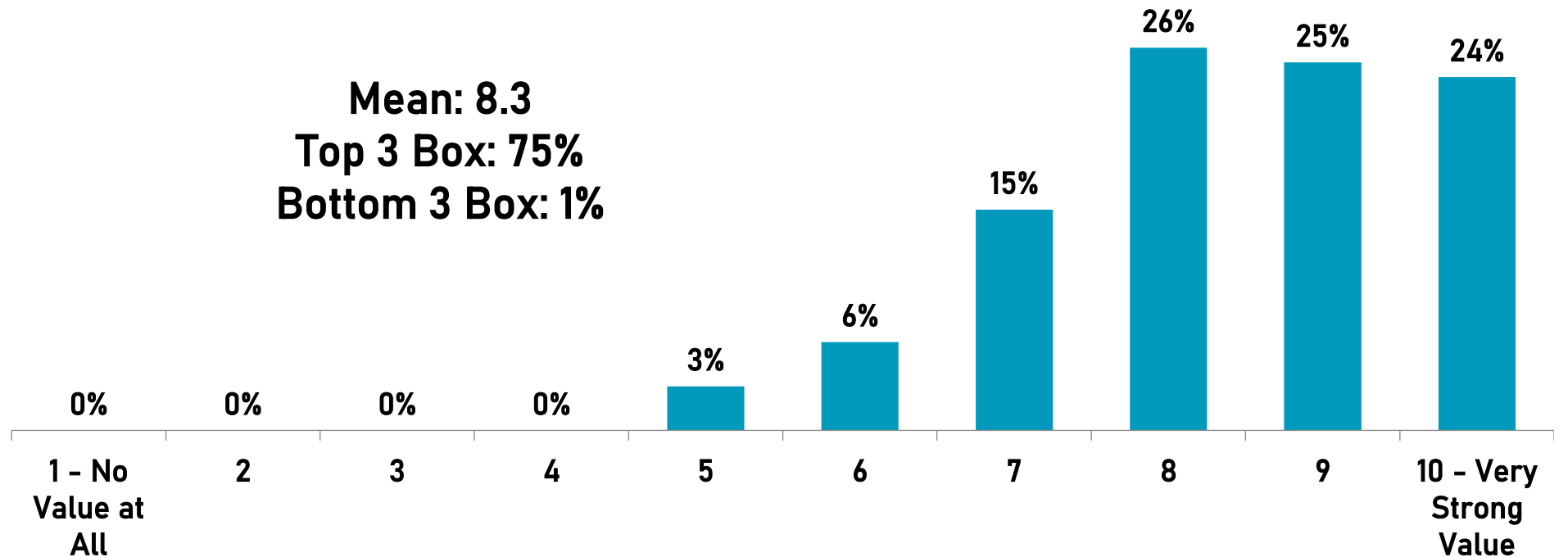


N=438

H1. The following are a list of items that relate to your satisfaction with the overall comfort of your home. Please rate your satisfaction with each item from 1 to 10, with 1 being Not at All Satisfied, to 10 being Totally Satisfied with that area:

Value of Heating/AC Systems

Respondents indicate strong value in their current systems



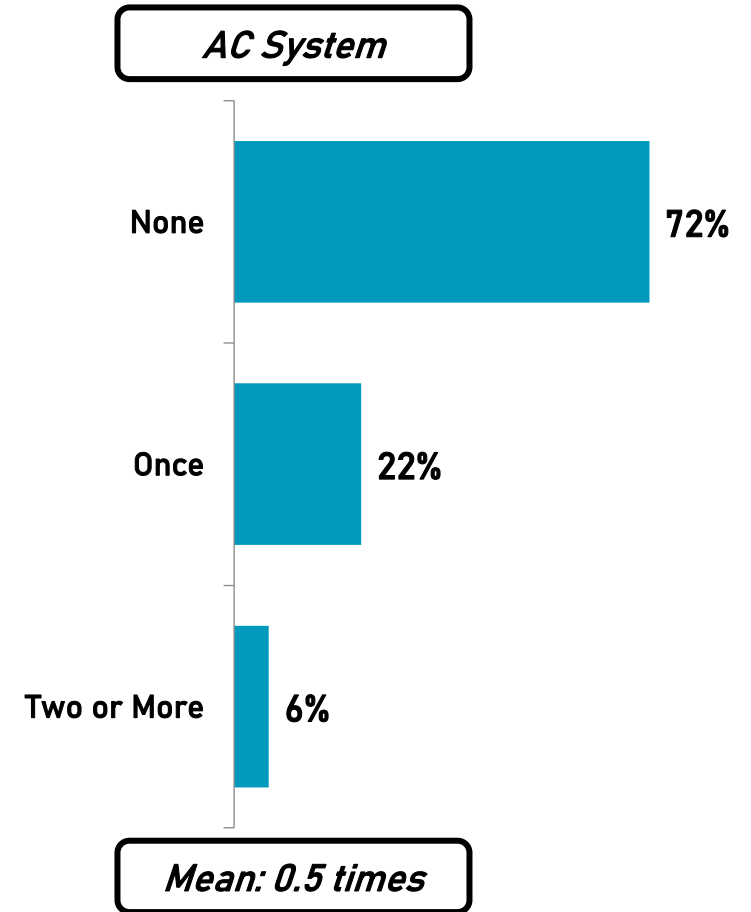
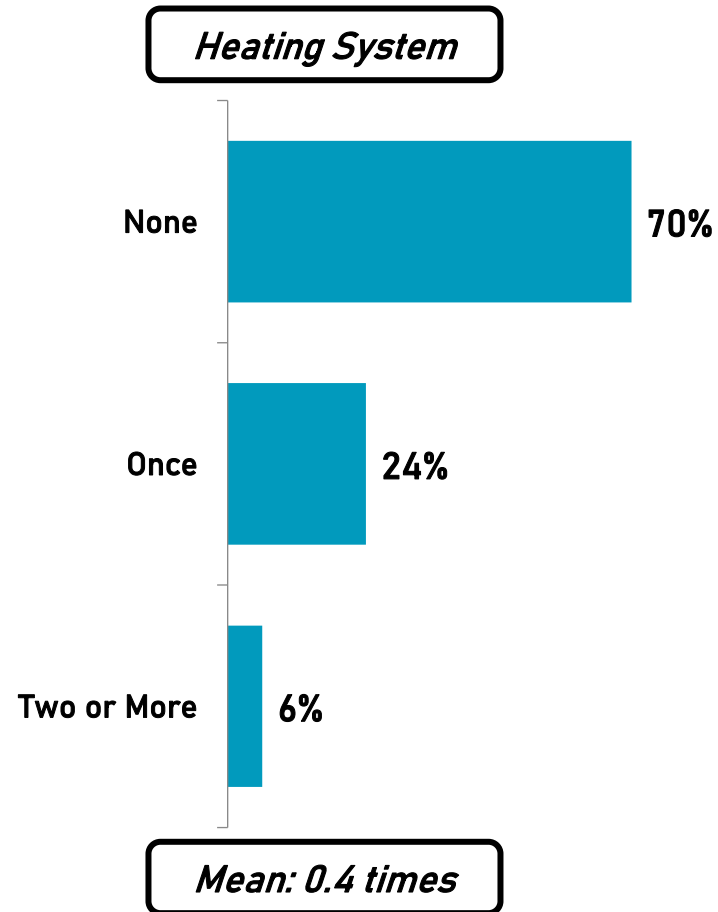
H3. Thinking about your heating and AC system and relationship to your overall quality of life at home, please rate the value.

N=438

Service on Units

It appears that around 30% of respondents have had some servicing on their existing equipment.

The high degree of non-service may offer future potential



N=438

H4. How many times in the past year have you had to service the following:



Shopping Process

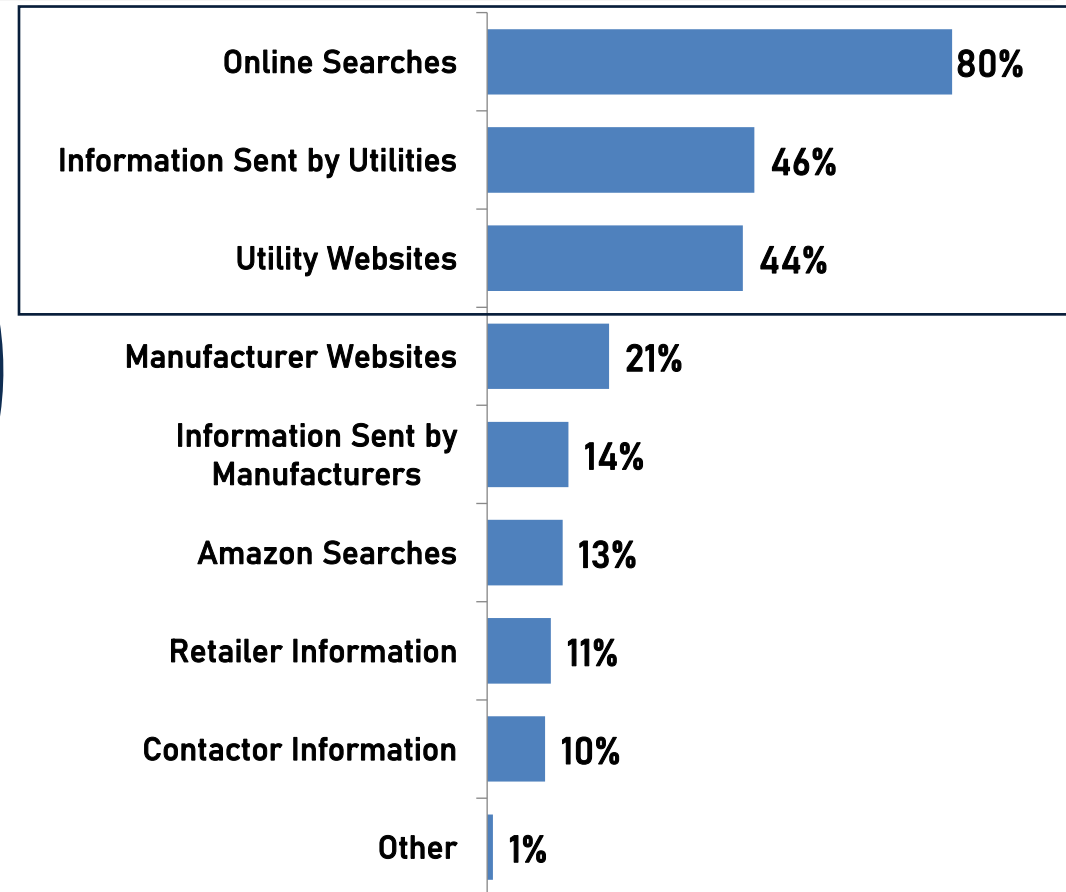
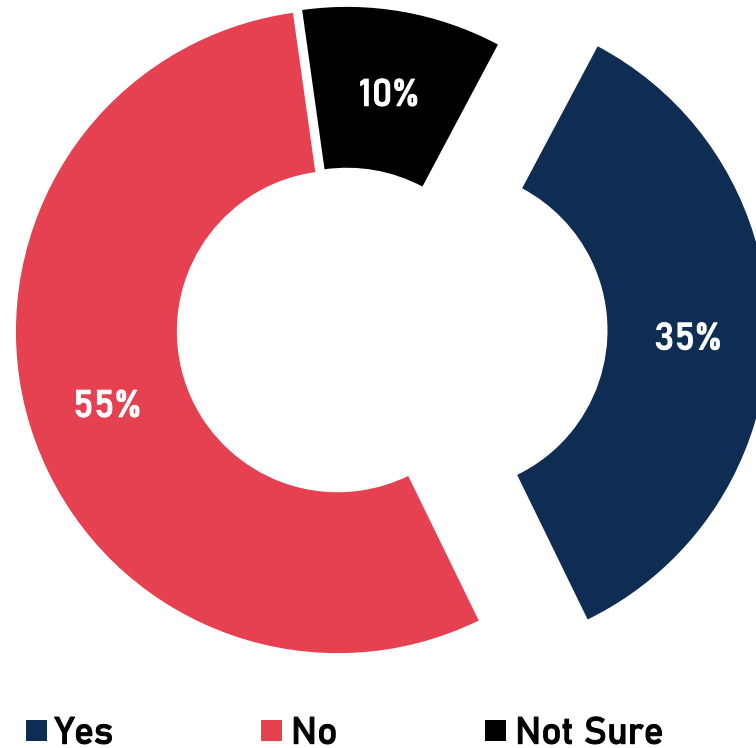
Understanding how respondent shop

Look for Information

Over a third of respondents were actively looking for information on their home comfort and efficiency.

Online resources and utility information are the key sources.

If Yes: Please check any of the following sources that you would typically use for this type of information:



N=438

H5. Do you currently look for information to help you to improve the comfort or energy efficiency of your home?

N=153

Replacement Motivators

Failure of the existing unit is the most significant factor in making changes.

Current AC Unit Fails	65%	6%	3%	3%	0%
Replacement of Furnace or Heating	3%	10%	8%	6%	5%
Ongoing Problems with AC Unit	5%	32%	11%	4%	6%
AC System is Old	4%	6%	12%	7%	6%
Outdoor & Indoor Noise from AC Sys	1%	1%	5%	3%	3%
Size of Footprint for Outdoor AC Unit	1%	1%	2%	1%	2%
New AC is More Efficient	3%	8%	11%	11%	11%
Money Savings on New AC System	2%	7%	13%	13%	8%
Utility Incentives or Rebates for New AC	5%	7%	9%	11%	8%
Contractor Recommends Replacement	3%	3%	4%	3%	4%
Contractor Incentives, Rebates or Financing	2%	3%	3%	7%	6%
New Features or Technology for AC	1%	3%	4%	7%	6%
New Unit has Lower Environmental Impact	2%	3%	8%	6%	8%
General Improvement to Home or Increase Value	2%	4%	3%	5%	9%
Greater Home Comfort Overall	3%	4%	5%	7%	11%

N=438

SP2. The following are a set of items that might impact your consideration to replace your existing air conditioning system. Please select the TOP 5 items that would create the strongest interest in considering a new AC system.

Purchase Process



Recent Purchasers
Vs.
Intenders

System Replacement Trends – Recent Purchasers

Most customers replaced their furnace at the same time as AC

Still, a significant portion only replaced AC

P1a. In the installation process did you replace your heating system at the same time?
N=71

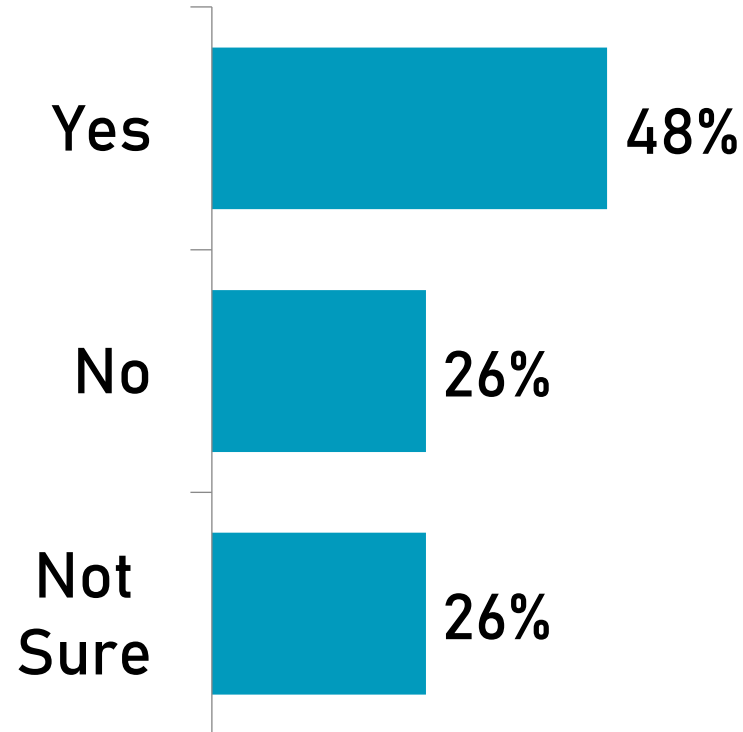
Yes: 63%

No: 37%

System Replacement Trends - Intenders

Under half would replace the furnace at the same time,

This is less than the actual purchase group, which may indicate perception differences



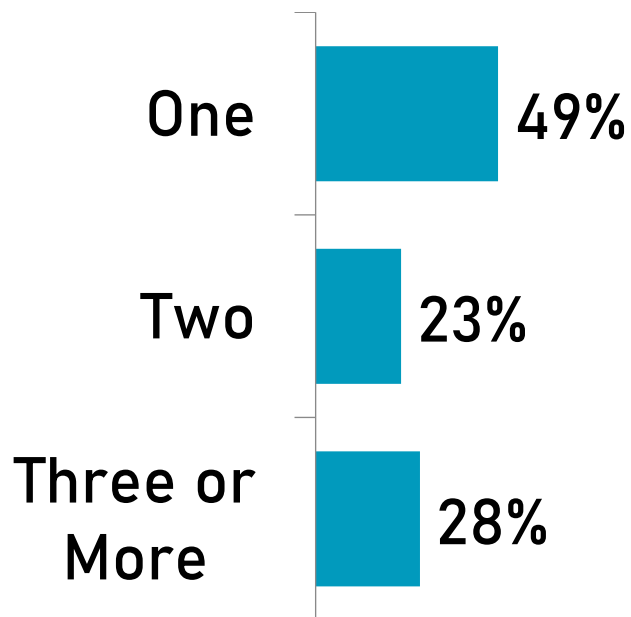
PP1a. In that process would you also replace your furnace at the same time?

N=84

AC Unit Selection Process – Recent Purchaser

There is a small number of systems considered in the process, indicating their HVAC partner is not offering a wide selection.

High efficiency is being offered and is taken almost nine out of ten times



P2. How many different AC units or systems did you consider in that process?

N=71

Yes: 68%
No: 11%
Not Sure: 21%

P2a. Were you offered a high-efficiency option in these units?

N=71

Yes: 88%
No: 13%

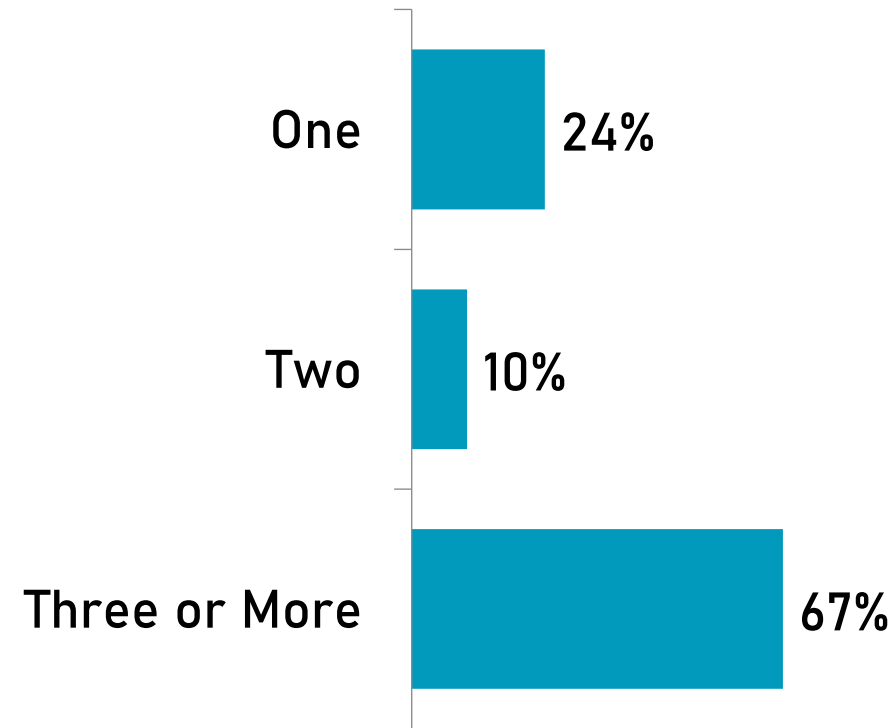
If Yes: Did you purchase the high-efficiency option?

N=48

AC Unit Selection Process - Intender

While the mean is just under 3, there are two-thirds of respondents who would likely consider three or more units in their process.

High efficiency is very attractive and a key purchase need in the category



PP2. How many different AC units or systems would you likely consider in that process?

N=84

Yes: 96%
No: 1%
Not Sure: 2%

PP2a. Would you consider a high-efficiency option in these units if offered?

N=84

Yes: 100%

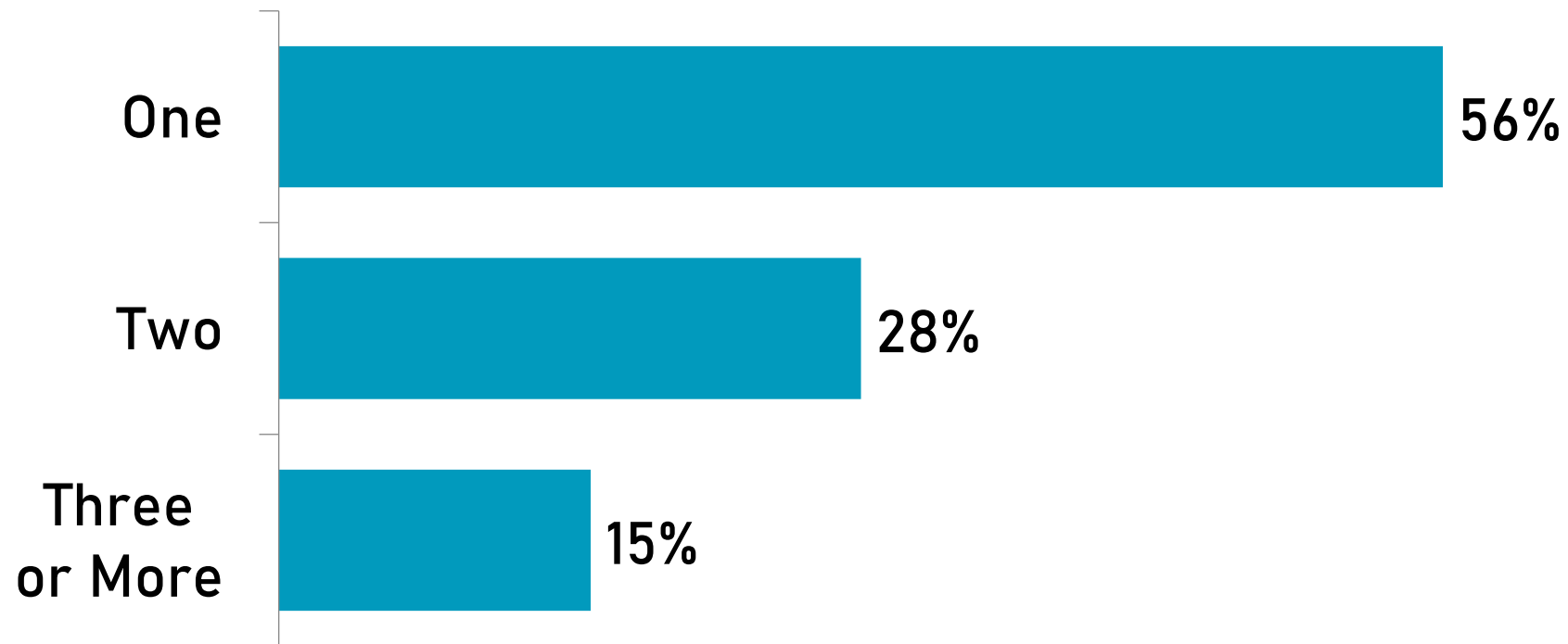
If Yes: Would you purchase the high-efficiency option?

N=81

Installation Sources Considered – Recent Purchasers

Consumers are generally looking to a single contractor in their shopping process

Typically taking under four weeks to purchase and install

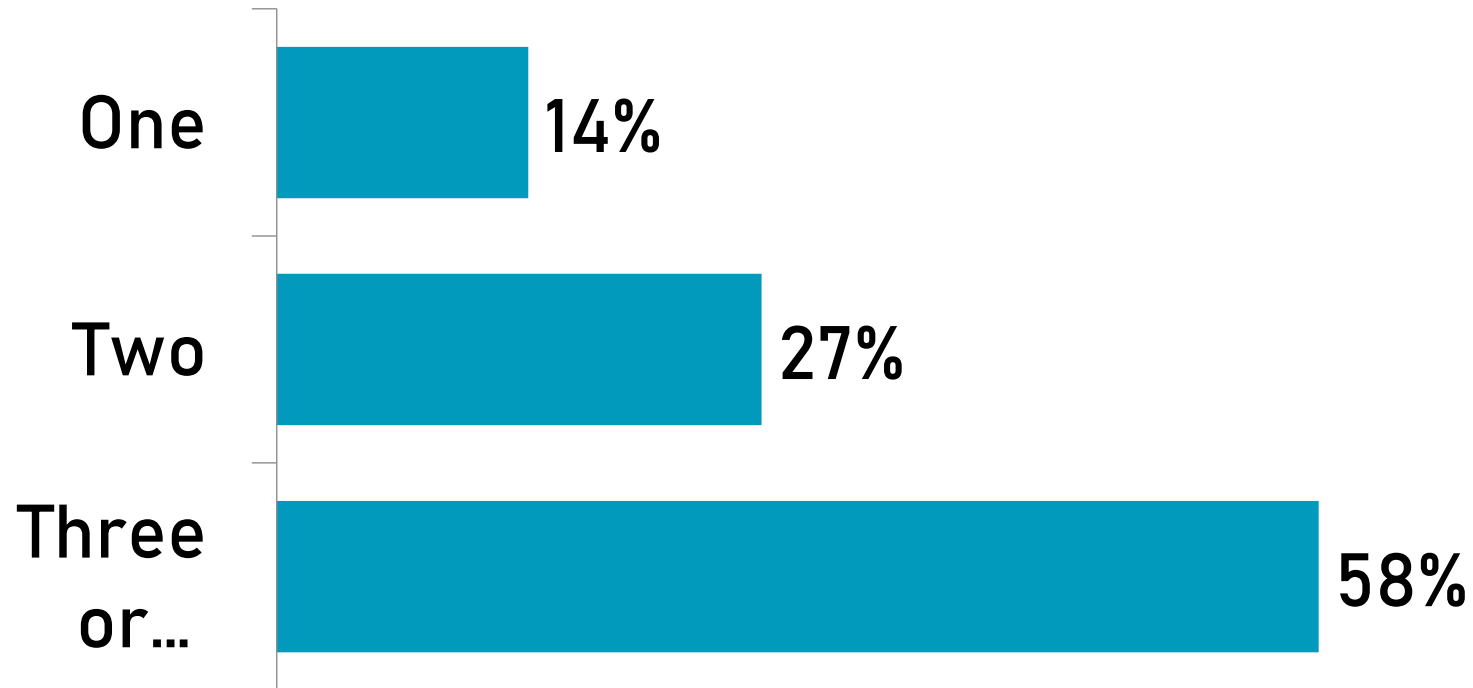


P3. How many different sources (contractors, etc.) did you consider in that process?

Installation Sources Considered - Intenders

There are more contractors considered by intenders.

Window to install is generally comparable.



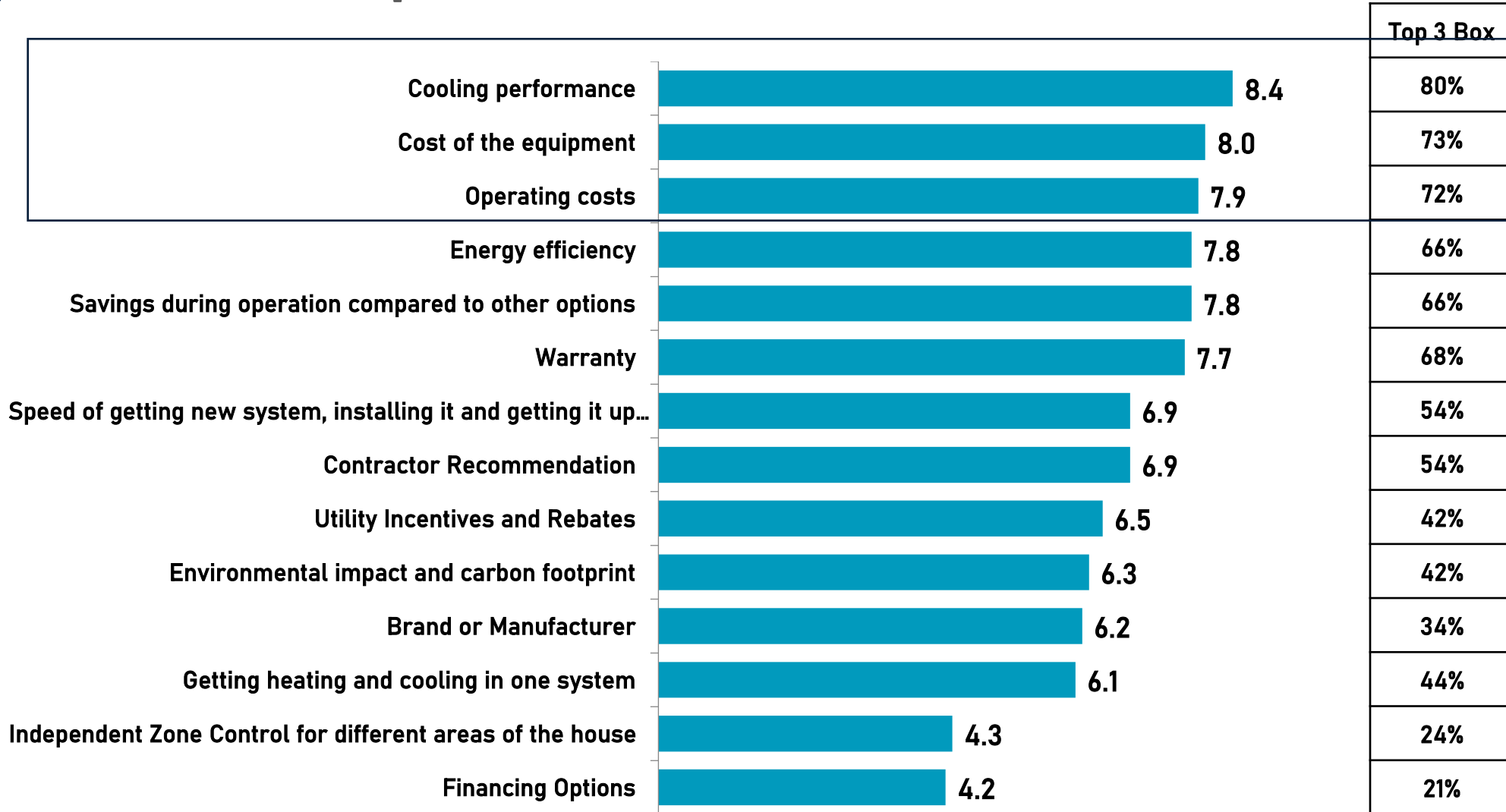
PP3. How many different sources (contractors, etc.) would you consider in that process?

Attribute Importance – Recent Purchasers

The rating process shows varied levels of importance to consumers.

Cooling Performance and Costs showing the highest scores

Zone Control and Financing are below average



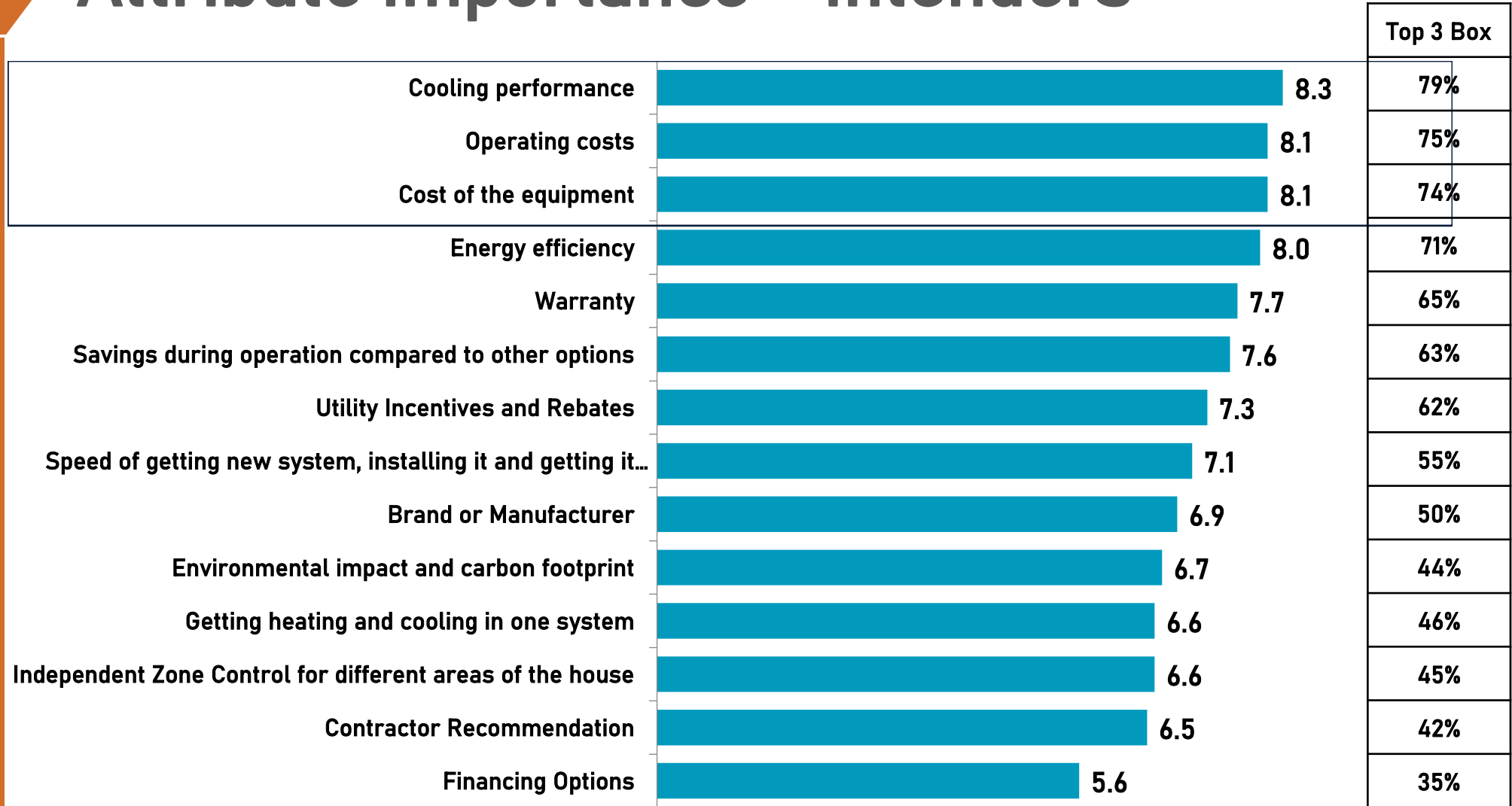
N=71

P6. The following are a list of attributes that you considered in the purchase of a new air conditioning unit or system. Please rate the importance of each item from 1 to 10, with 1 being Not at All Important, to 10 being Very Important in your selection of an AC unit:

Attribute Importance - Intenders

Cooling performance, Operating costs and Cost of equipment is most important to this group

Consistency between Intenders and purchasers

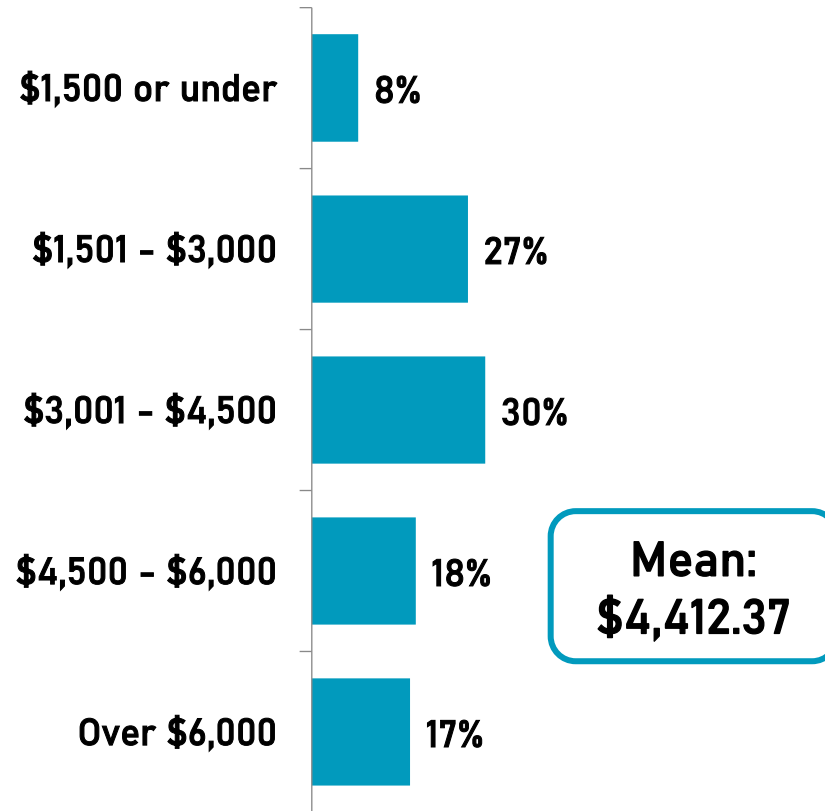


PP6. The following are a list of attributes that you might consider in the purchase of a new air conditioning unit or system. Please rate the importance of each item from 1 to 10, with 1 being Not at All Important, to 10 being Very Important in your selection of an AC unit for your home needs:

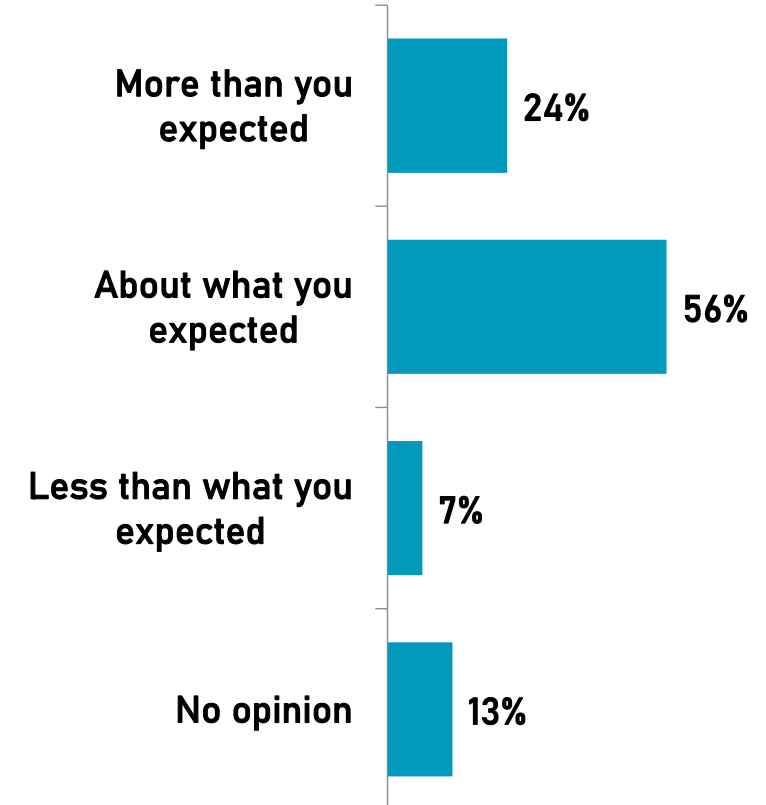
Air Conditioner Cost – Recent Purchasers

Respondents show a mean of over \$4,000 with over a third spending more than that.

There is better than a 3-to-1 ratio between More and Less than Expected, indicating a lack of knowledge with some consumers



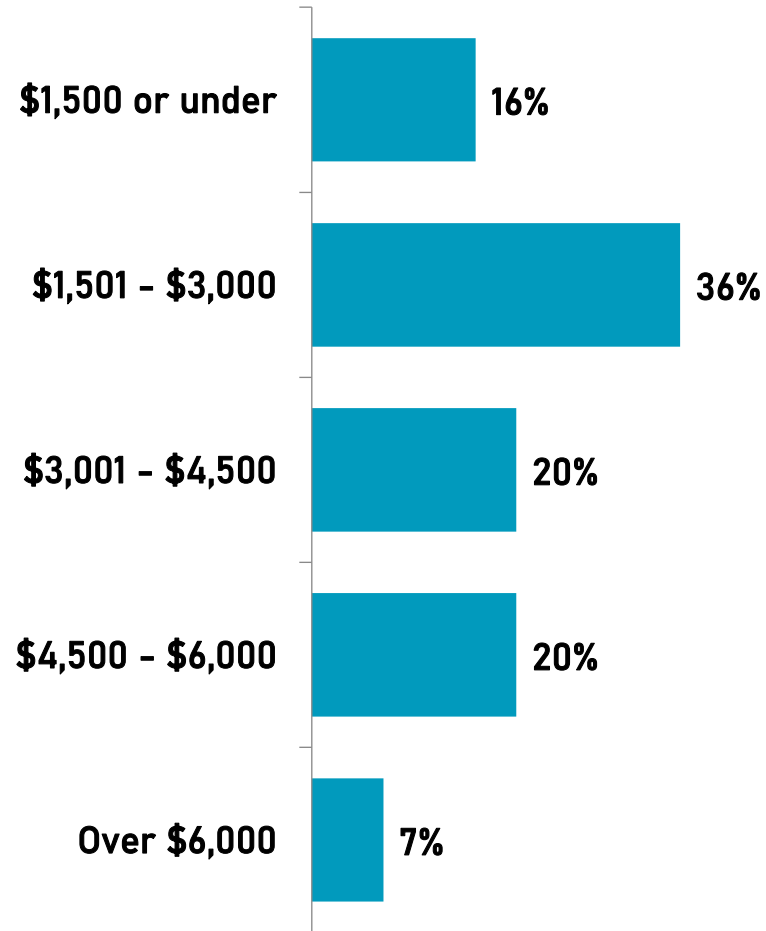
P8. How much did you new air conditioner cost?



P9. Was the amount you paid?

Air Conditioner Cost - Intenders

The mean expected expenditure for the intenders is lower than the actual expenditure by purchasers, which would indicate there is a gap in expectations that could be addressed with education



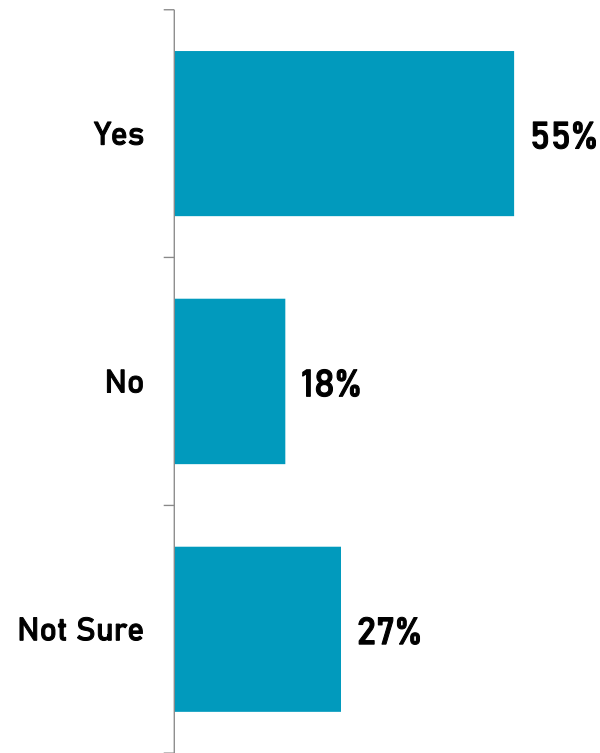
Mean:
\$3,348.86

PP8. How much would you likely spend on a new AC unit with installation?

AC Units Upgrades – Recent Purchasers

Over half the respondents are willing to pay more for lower operating costs, showing a mean of 15% premium.

They have an expectation of a six-year payback at that level



P12. Would you be willing to pay more for an air conditioning system that offered a lower cost to operate on an ongoing basis?

Mean: 14.5% more

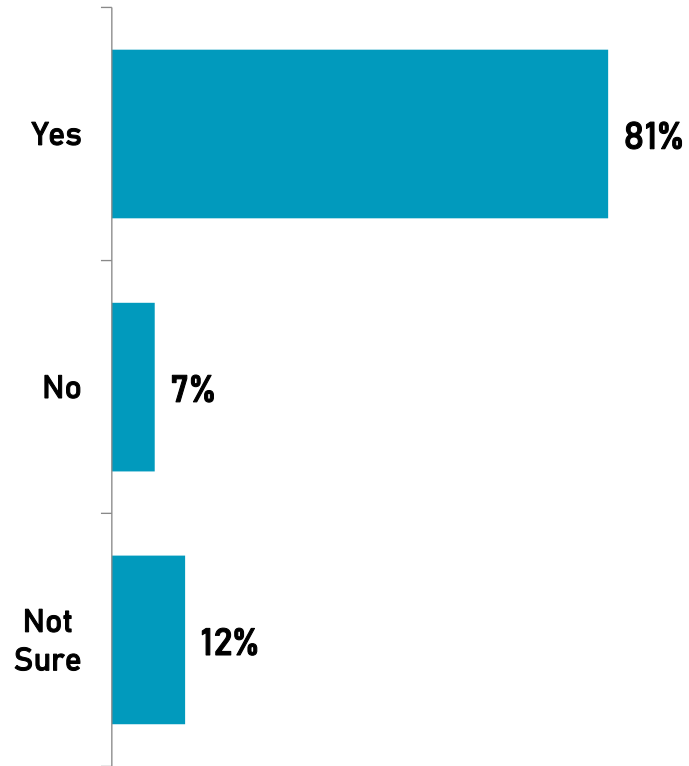
If Yes: What percent more would you be willing to pay for a more efficient option?

Mean: 6.0 years

How many years would you expect it to take to recoup the difference in cost by savings?

AC Unit Upgrades - Intenders

Just over 80% would be willing to pay more to save on costs, with a mean of 21%. This is higher than purchasers



**Mean: 20.8%
more**

If Yes: What percent more would you be willing to pay for a more efficient option?

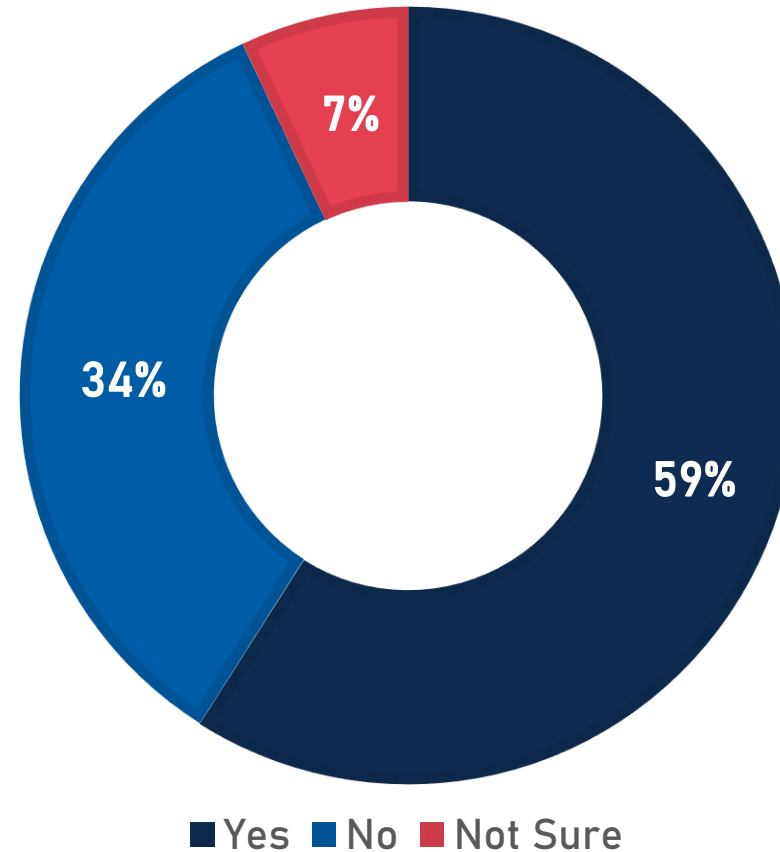
PP12. Would you be willing to pay more for an air conditioning system that offered a lower cost to operate on an ongoing basis?

N=84

N=68

Rebate Incentive – Recent Purchasers

60% received
a rebate

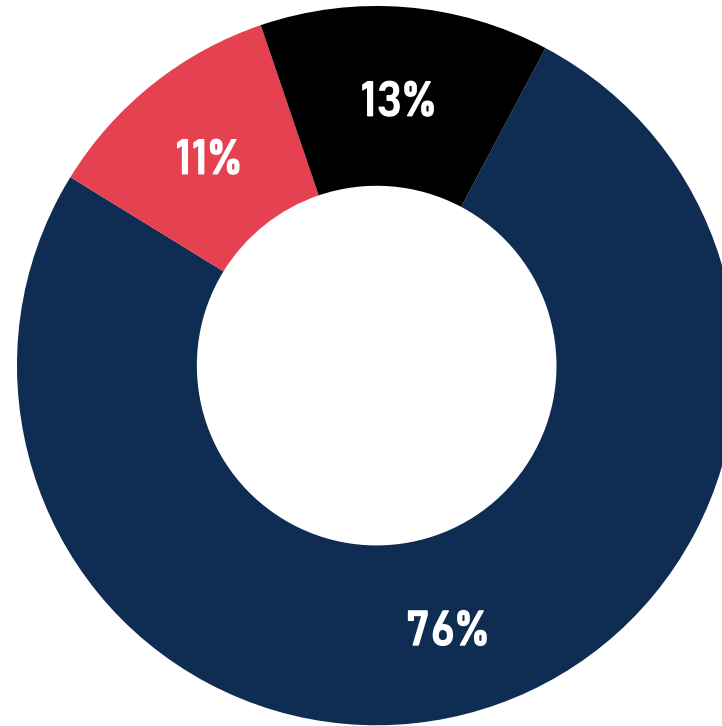


P11. Did you receive a rebate or other financial
incentive from your utility company in making this
purchase?

N=71

Finance Project / Rebate Incentive - Intenders

75% would expect to receive a rebate.



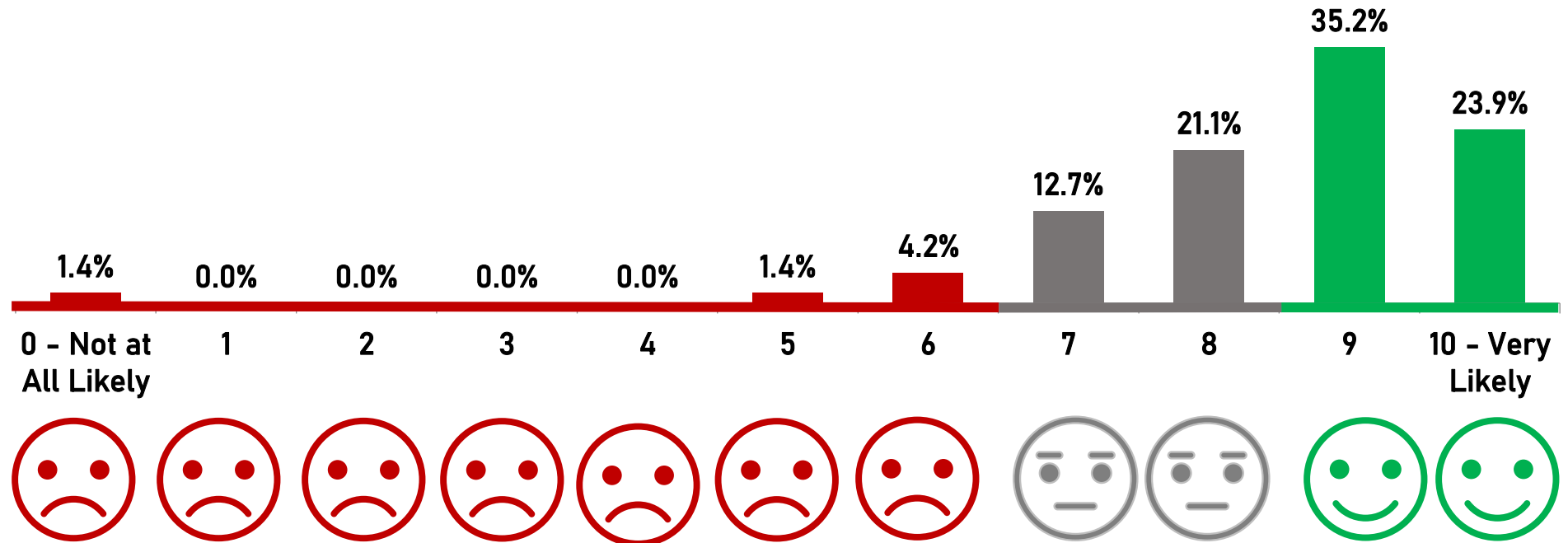
■ Yes ■ No ■ Not Sure

PP11. Would you expect to receive a rebate or other financial incentive from your utility company in making this purchase?

N=84

Recommend AC Unit – Recent Purchasers

This word-of-mouth potential can be harnessed for ASHP technology



P5. On a scale from 0 to 10, with 0 being Not at All Likely, to 10 being Very Likely, how likely would you be to recommend that AC unit to friends and relatives?

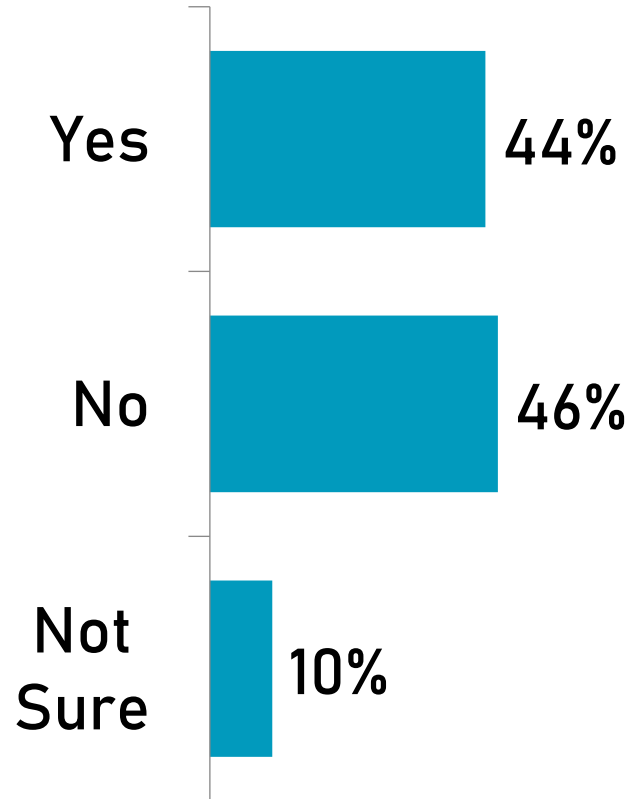


New Technology & Options

Understanding new technology

Heat Pumps - awareness

There is low to moderate awareness



Do you personally know anyone that has this as their HVAC system?

Yes: 29%
N=192

No: 61%

Not Sure: 10%

T1. Have you heard of Heat Pumps as it relates to heating and air conditioning?

Concerns with Technology

Install costs is the top issue.

Also, a concern around if it works in our climate.



T3. What concerns would you have in using this technology to cool your home?

N=433

Open Responses Include:

Cost/Expense To Install Units - 107 Responses

Depends On Electricity/Raises Electric Costs - 29 Responses

DK/NA/Not Sure - 98 Responses

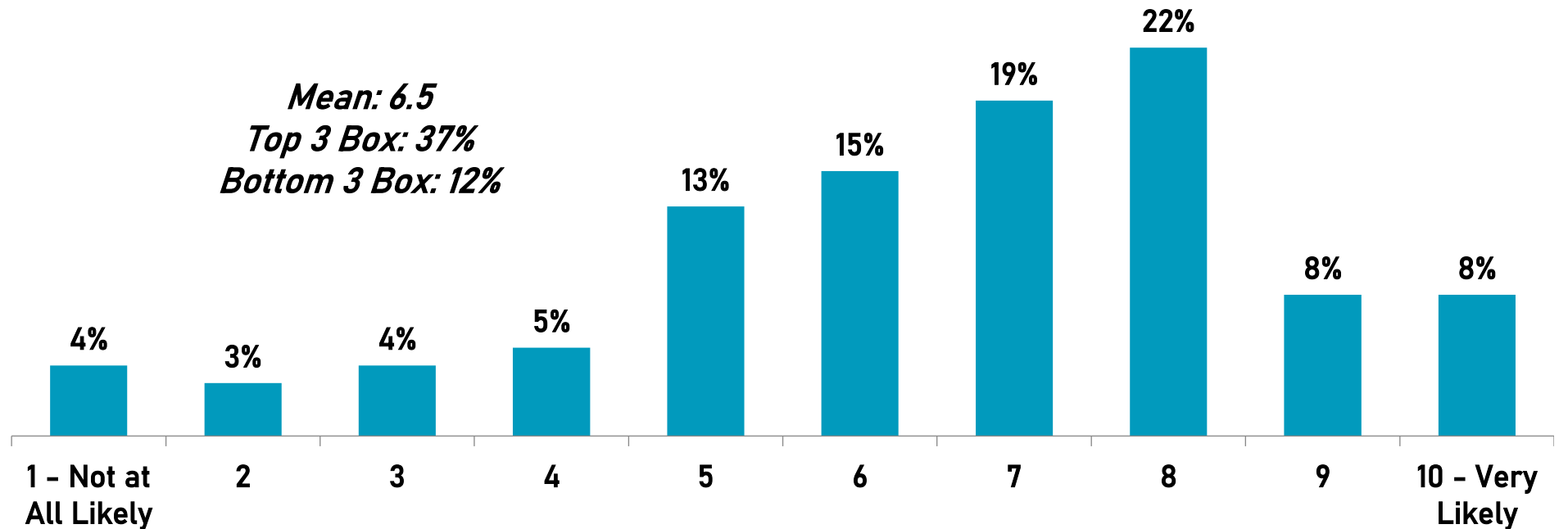
Don't Understand The Technology Behind It/How Unit Works/Too New Of Technology - 76 Responses

How Well It Works In MN Climate (COLD Winters/HOT Days) / Reliability/ Effectiveness - 99 Responses

Misc. Others - 24 Responses

Consider vs. Traditional Central Air

Result indicate moderate consideration



T6. how likely would you be to consider this technology as an alternative to AC?

Key Takeaways - Customers are Interested in “New and Better”

- Most homeowners are happy with existing systems, BUT there shows a strong interest in:
 - Upgrading to new and better technology
 - Lowering operational costs
 - Lessening environmental impact
- There is a small segment of customers (early adopters) interested in making choices based on environmental drivers
 - Don't miss out on meeting these customers needs with high efficiency ASHPs

Key Takeaways – Offer choices

- Most customers replace on failure, they want to shop carefully but may not have time to
- Most customers want to replace their AC and furnace together, BUT some prefer not to
 - Be prepared to offer choices and options

Key Takeaways - Common Sense Upgrades are Attractive

- Cooling performance, upfront cost, and operating cost are important
- Customers are willing to pay more upfront to lower their operating costs and a 6-year payback is attractive
- Rebates and financing are important tools for customers, be prepared to offer these financial tools.

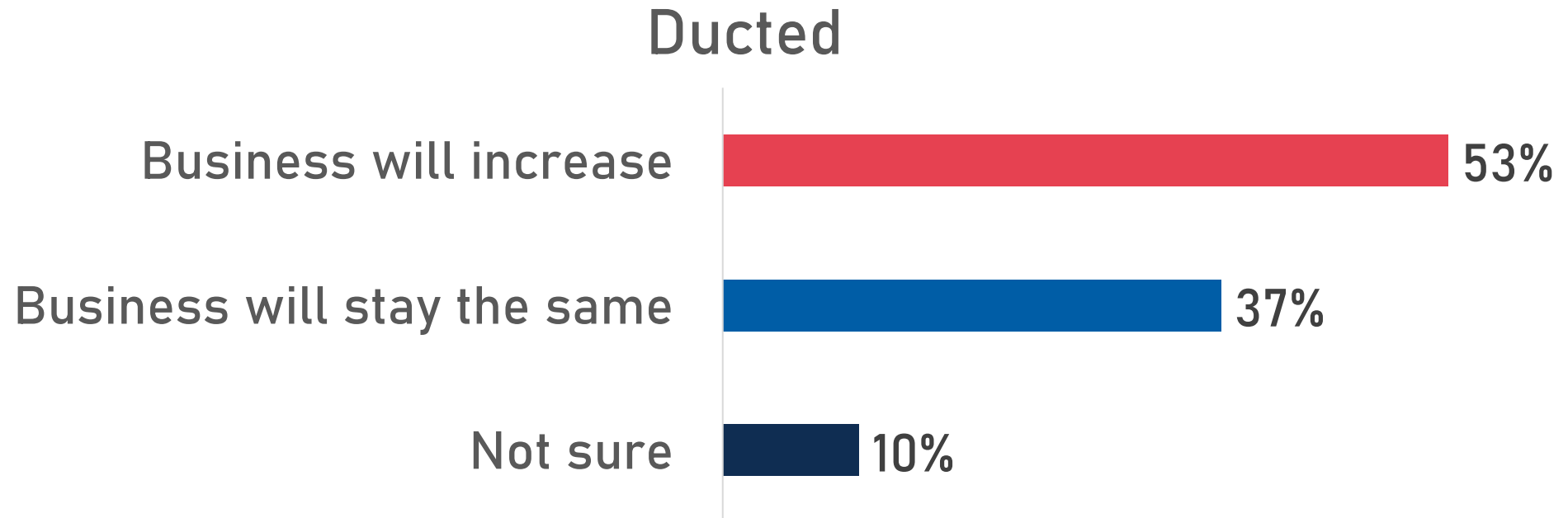
Key Takeaways – General awareness is needed as well as an education-based sales process

- **Awareness of this technology is low to moderate**
- **Utilities and customer word-of-mouth can play a powerful role in increasing awareness**
- **Customers need to know that it will work in our climate and that the technology will make economic sense.**

Zoom in on Contractor Perceptions



Do you think you will be selling more ASHP's in the future or the same amount as now?

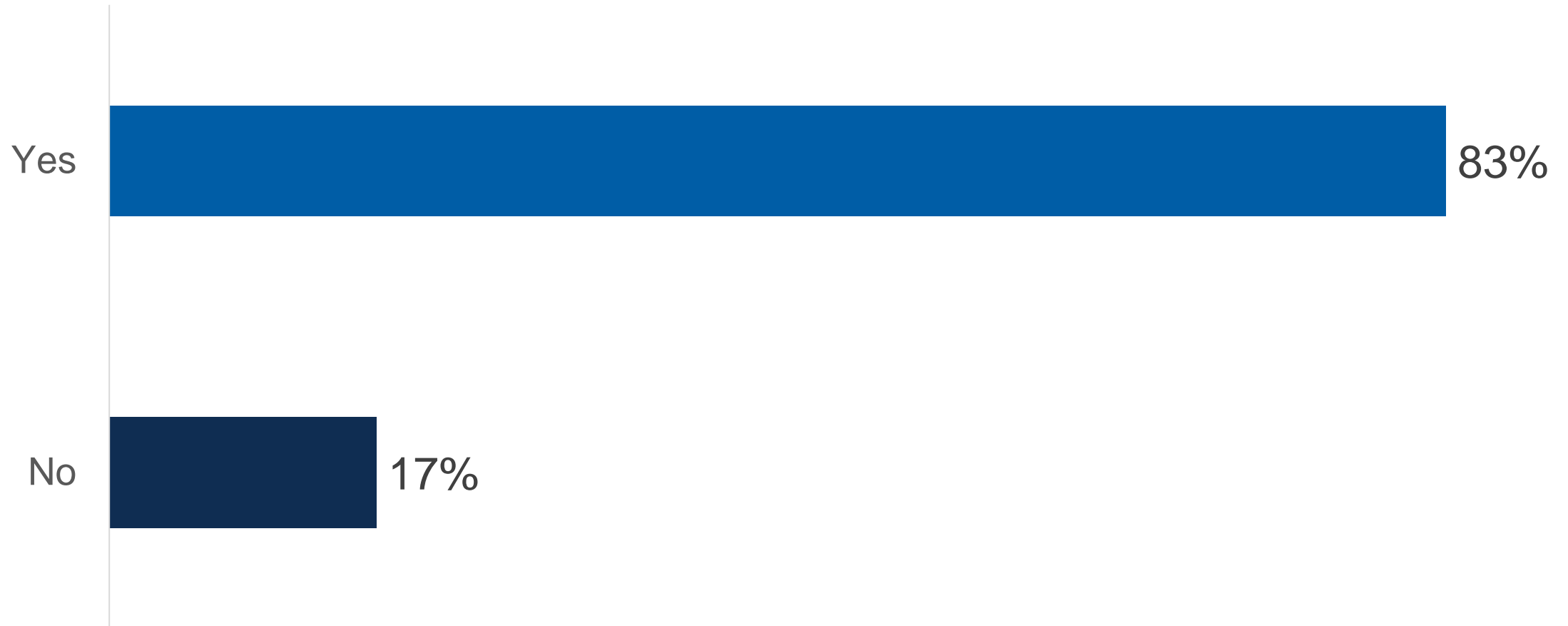


How often do you replace equipment on failure?

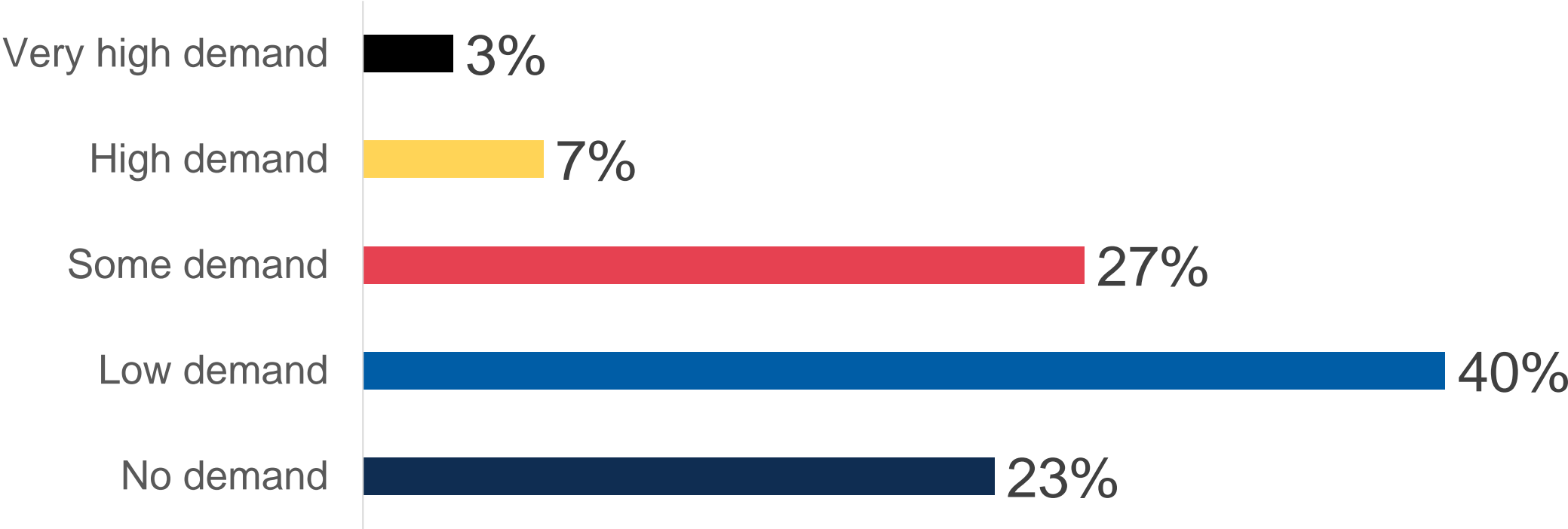
How often do you replace both furnace and AC?

Scenario	Average frequency
“How often do you replace an AC when it has failed?”	67% of the time
“When an AC has failed, how often do you also replace the furnace?”	50% of the time
“When a furnace has failed, how often do you also replace the AC?”	51% of the time

Do you ever recommend a ducted ASHP when replacing a furnace or AC?



What is the customer demand for replacing an AC with an ASHP?



Key Learnings from Contractor Interviews

- Customer demand for ASHP's as an AC replacement is low.
- Education is needed to make the sale.
- There is a strong sense that ASHP business will increase in the future.
- Rebates that make ASHP's cost-competitive with traditional AC's are a key driver of installs.
- Many contractors consider the heating economics and viability of ASHP's when weighing them as AC replacements.

Zoom in on
Distributor and
Manufacturer
Perceptions



Technology Benefits- Distributors

Customer benefits:

- Fuel choice
- Flexibility
- Shoulder season comfort
- Reduced environmental impact
- High tier product – quieter, better dehumidification, longer life, better warranties

Contractor benefits:

- Stay competitive at the kitchen table
- Better margin product with little technical difference
- Good differentiator,

Distributor benefits:

- Be the leader
- Some see this as a high value opportunity to pursue

Barriers – Distributor Perspective



Inventory

Variations in specs. and ratings make it hard to carry proper inventory



Low consumer awareness and interest

Right now, contractors need to tell the story and have a deep educational sales process

This slows down sales and makes it less attractive to contractors

Key Takeaways -Distributors

- Vast majority of current sales are in the mini split category
- Demand for centrally ducted heat pumps replacing AC is coming from the utility and efficiency industry but not from customers
- Contractors are receptive but not yet actively pushing
- ~10% of customers always pick the top option presented – this would apply if heat pumps were offered over AC

Key Takeaways - Manufacturers

- All manufacturers acknowledged the market is transitioning from fossil fuels to heat pumps.
- Generally agreed that HP as AC replacement products will be helpful in transition to all electric.
- Four of the five manufacturers interviewed either already have a variable speed HP as AC replacement product or were planning to launch one (within the next year)
- Manufacturers interviewed with clear decarbonization goals only produce inverter-driven products

So, What Does it All
Mean?

Conclusions



The market believes this segment will grow in the future



Customer awareness is moderate; awareness building is needed

An educational sales process is needed



Early adopters are out there and want this solution: never miss the chance to offer it



Upfront cost is critical to customers, leverage rebates, financing



Operational cost matters and customers are willing to pay more upfront for savings



Not all customers want to replace their heating and cooling at the same time: be prepared to offer solutions to these customers

Q&A

Thank You

