MA ENERGY EFFICIENCY ADVISORY COUNCIL

→ CONSULTANT TEAM

EEAC EM&V UPDATE: RECENT HEAT PUMP-RELATED RESULTS

April, 2026

www.ma-eeac.org

RECENT EM&V STUDIES DISCUSSED IN THIS PRESENTATION

Study	Issues Addressed	Contractor, Completion Date
Heat Pump Market Effects Indicators Update 2024-2025	• Comprehensive picture of MA heat pump market as of 2024/2025 • Market and program progress • Validity of program theory • 4th annual study	NMR/DNV, Expected April 2026
2024-2025 Residential Heat Pump Price Tracking Study	• Analyze recent trends in wholesale and retail heat pump prices in MA • Assess whether program funding is affecting pricing	NMR, March 2026
Heat Pump Usage Behavior Study	• Assess participant satisfaction and comfort • Understand how participants are using heat pumps • Assess maintenance, sizing and leakage issues	Guidehouse, In Progress
Building Electrification for Large C&I Segment	• Electrification opportunities among the largest Commercial & Industrial (C&I) customers • Barriers to conversion of these opportunities • Strategies for overcoming barriers	DNV, November 2025

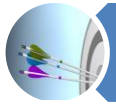
Note: many of the charts and graphs in this deck are drawn directly from the final reports by the above contractor teams.

HEAT PUMP MARKET EFFECTS INDICATORS UPDATE STUDY

- **Fourth in annual series using a range of data sources to study the market effects of heat pump (HP) programming in MA**
- **Provides as current a snapshot as possible, with most data sources focusing on 2024 or 2025**
  - Market sizing, HP market share: 2024
  - Contractor and distributor practices: 2025
- **Guided by the program theory developed by the Program Administrators (PAs)**
  - Did the PAs take the actions specified by the program theory?
  - What specific changes in the market were predicted and when?
  - Did these occur as forecasted?
  - Do the posited causal linkages between different changes appear valid?
- **Methods included:**
  - Interviews with contractors, distributors, participants and general public
  - Program tracking data and sales data

HEAT PUMP MT PROGRAM THEORY: CAPSULE SUMMARY FOR RESIDENTIAL SPACE CONDITIONING HEAT PUMPS

- **Distinguishes between:**



Activities, outputs, and outcomes

Short-term, medium-term, and long-term outcomes

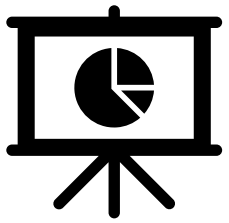
Changes on the part of end-users, contractors and distributors

- **For all of the above, posits a specific sequence of causally linked changes that occur in stepwise fashion over time**

End Users	Contractors	Distributors
Increased awareness and understanding	Training and HPIN	Program activities and other market changes
↓	↓	↓
Favorable word of mouth, leading to changes in preferences	Changes in practices, new market entrants, and business strategies	Changes in stocking practices, leading to long-term shifts in sales

OVERVIEW OF RESULTS

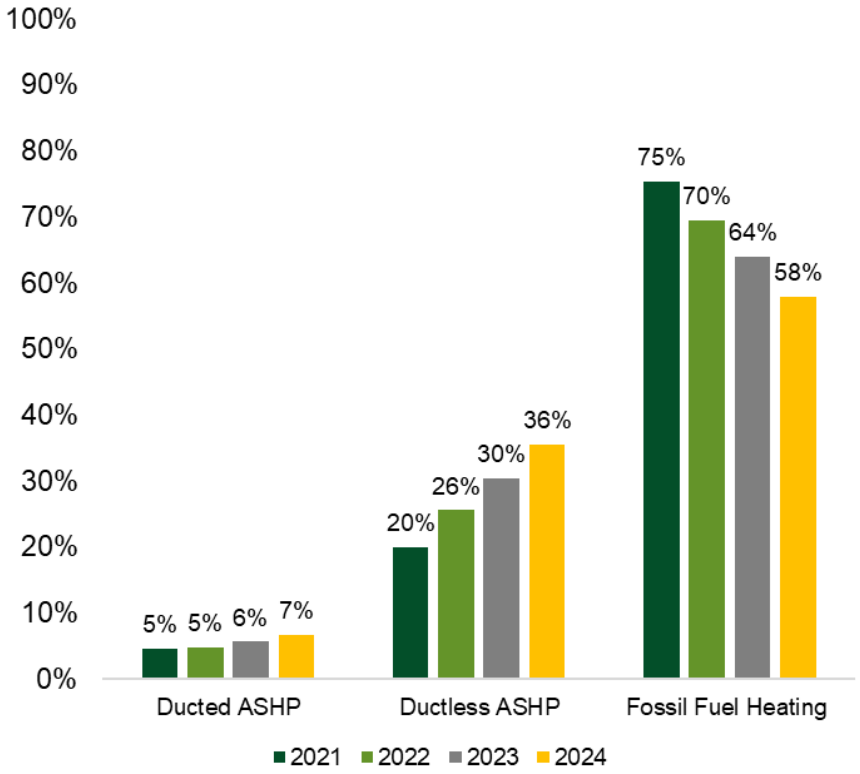
- **Recent trends in heat pump market share look quite different depending on sector, equipment type, and perspective on capacity**



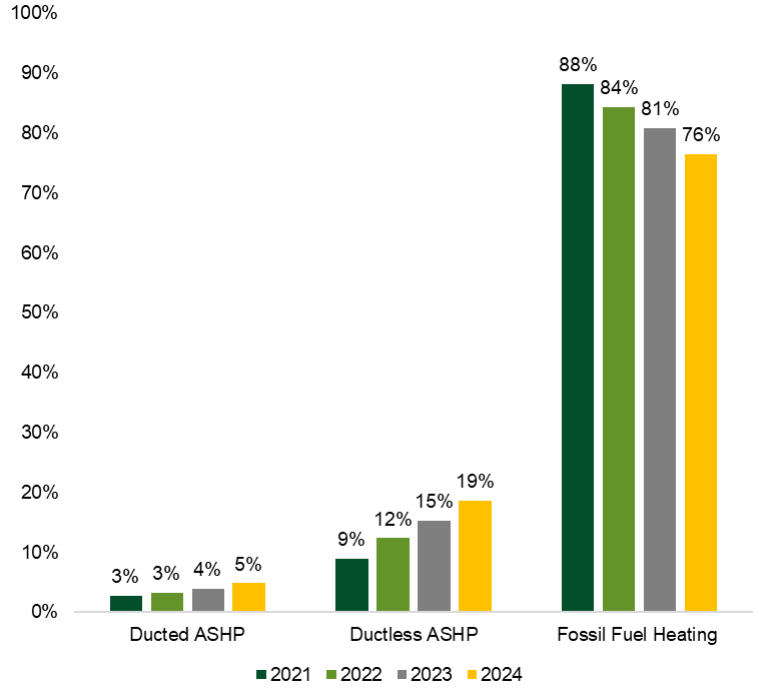
  - Sector: residential doing much better than C&I
  - Equipment type: fastest gains for ductless HPs, slower for ducted HPs and Heat Pump Water Heaters (HPWH)
  - Perspective on capacity: gains look more muted for total capacity than for number of units
- **Preponderance of evidence suggests PAs' support contributed substantially to market growth**
- **Majority of market indicators have changed in a manner consistent with program theory**
- **However, there are some exceptions that could call into question some of the hoped-for causal linkages**

RESIDENTIAL HEAT PUMPS HEATING EQUIPMENT MARKET SHARE 2021-2024: TWO DIFFERENT PERSPECTIVES

Market Share - % of Units

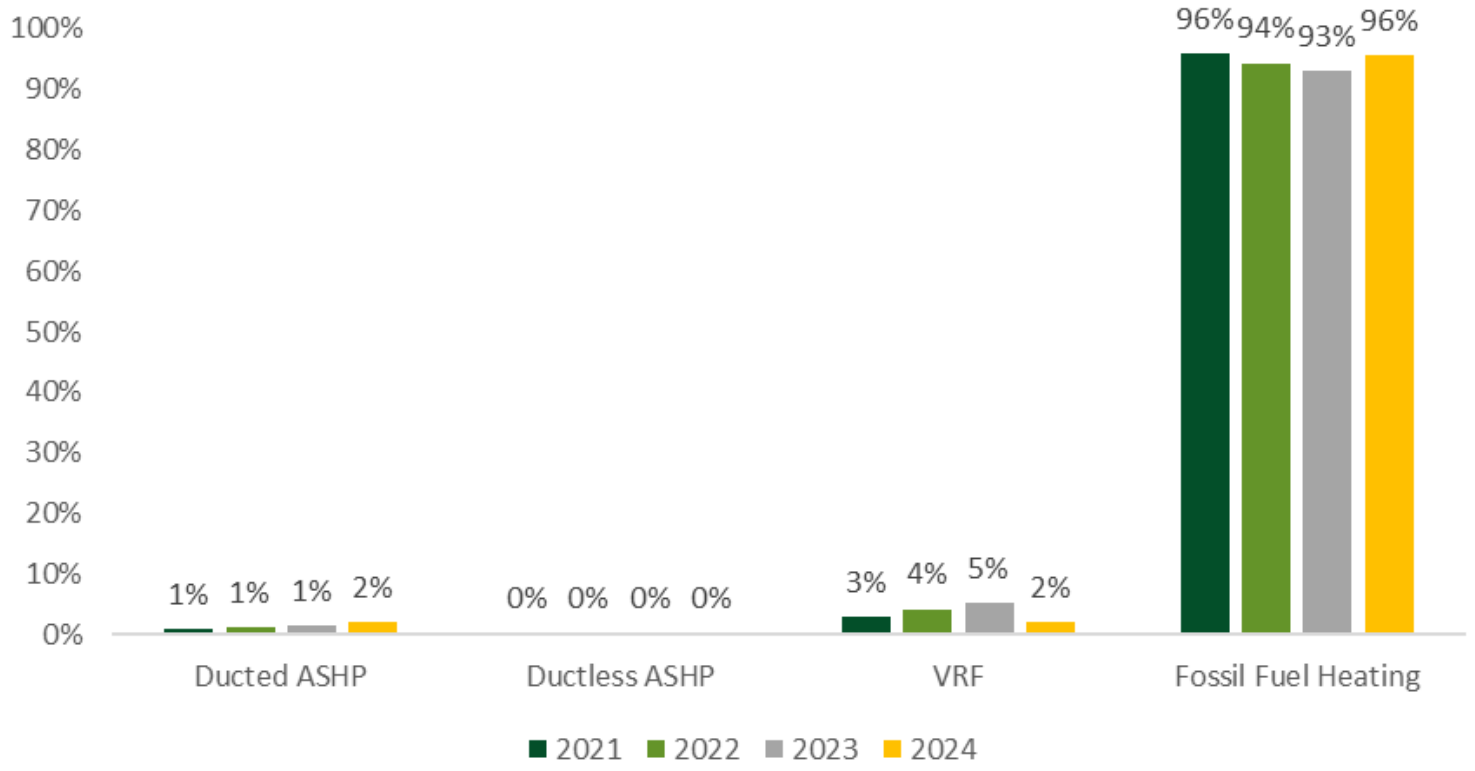


Market Share – % of Capacity at 47 degrees



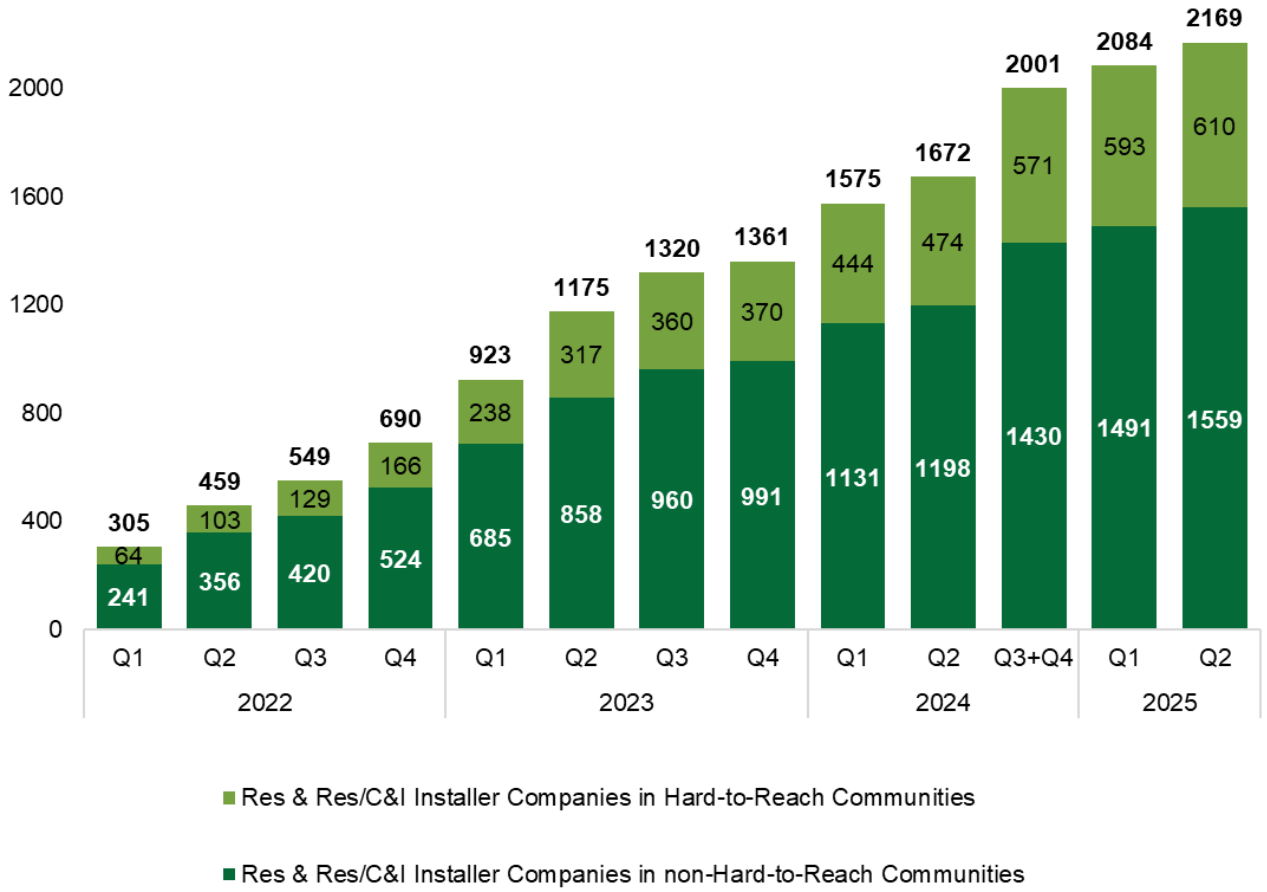
- **Residential heat pumps continue to make progress against fossil fuel heating equipment, however ducted lags ductless significantly**

COMMERCIAL HEAT PUMPS: HEATING EQUIPMENT MARKET SHARE (% OF CAPACITY AT 47 DEGREES)



- **C&I has not seen the shift in market share that Residential has, however high demand for C&I electrification in 2025 may indicate shift in trend**

EQUITY: AS OF MID-2025, PERCENTAGE OF HPIN CONTRACTORS IN UNDERSERVED AREAS HOLDING STEADY AT AROUND 28%



- **New Designated Equity Community (DEC) offers started in late 2025, may push for more installers in underserved communities**

EQUITY: HOWEVER, AS OF PY2024, IN-PROGRAM ADOPTION RATES CONTINUED TO BE FAR HIGHER FOR AFFLUENT HOUSEHOLDS

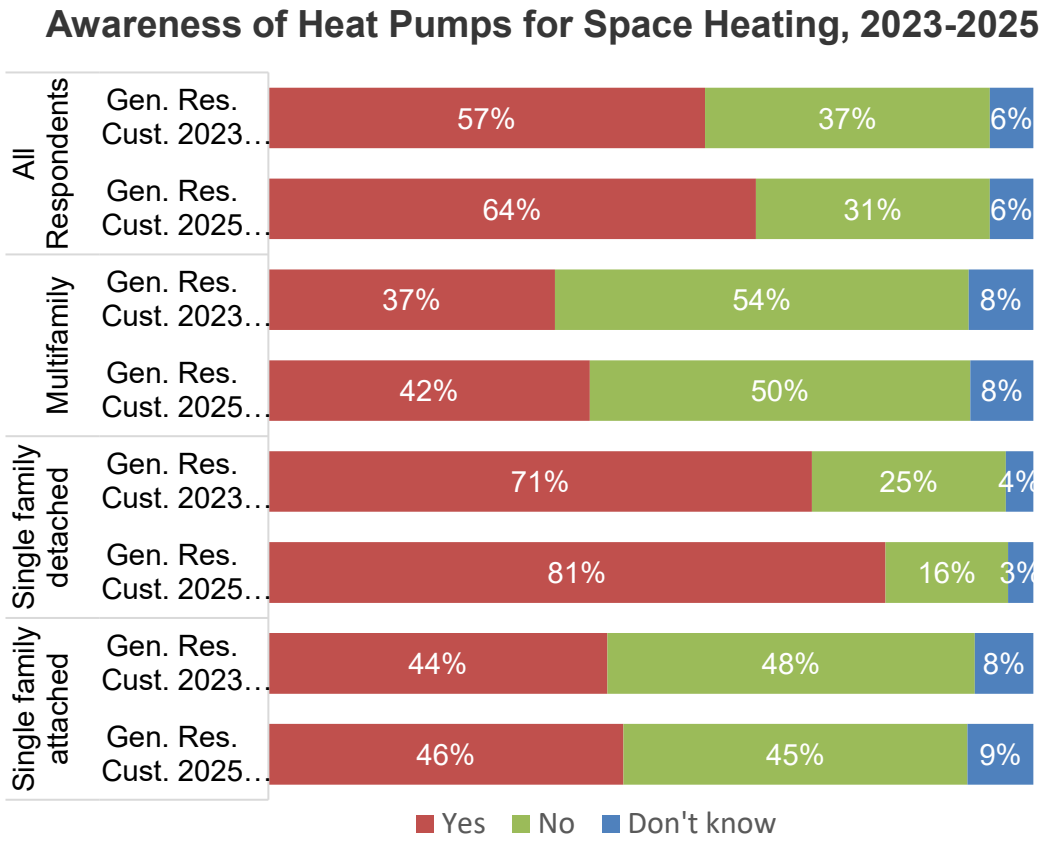
Percentage of Overall Population Adopting Heat Pump Through MassSave in 2024 By Income Category and Building Type

Measure	Low income	Moderate income	Non-LMI
Air source heat pumps	0.65%	1.05%	2.62%
Ducted air source heat pumps	0.10%	0.19%	0.82%
Ductless air source heat pumps	0.55%	0.86%	1.80%
Heat pump water heaters	0.11%	0.13%	0.33%

Measure	SF Detached	SF Attached	Multi-Family
Air source heat pumps	2.78%	0.83%	0.11%
Ducted air source heat pumps	0.80%	0.17%	0.06%
Ductless air source heat pumps	1.98%	0.66%	0.05%
Heat pump water heaters	0.40%	0.05%	0.00%

MARKET INDICATORS MOVING IN THE RIGHT DIRECTION, END-USERS

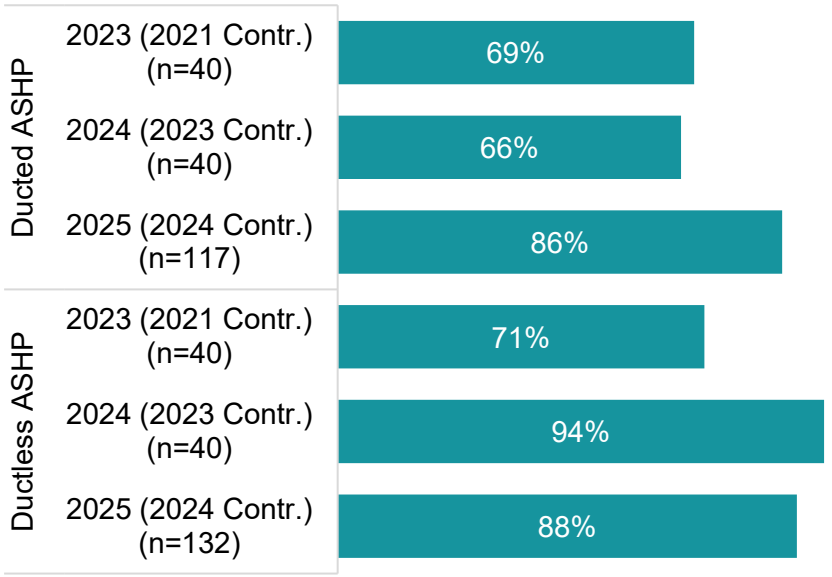
- **Customer awareness and understanding of HPs**
  - Increasing among all major groups through 2025
- **Customer reliance on HPs for heating and cooling**
  - Frequency of full displacement increasing
- **Participant weatherization before or during HP installation**
  - Rates increasing



MARKET INDICATORS MOVING IN THE RIGHT DIRECTION, CONTRACTORS AND DISTRIBUTORS

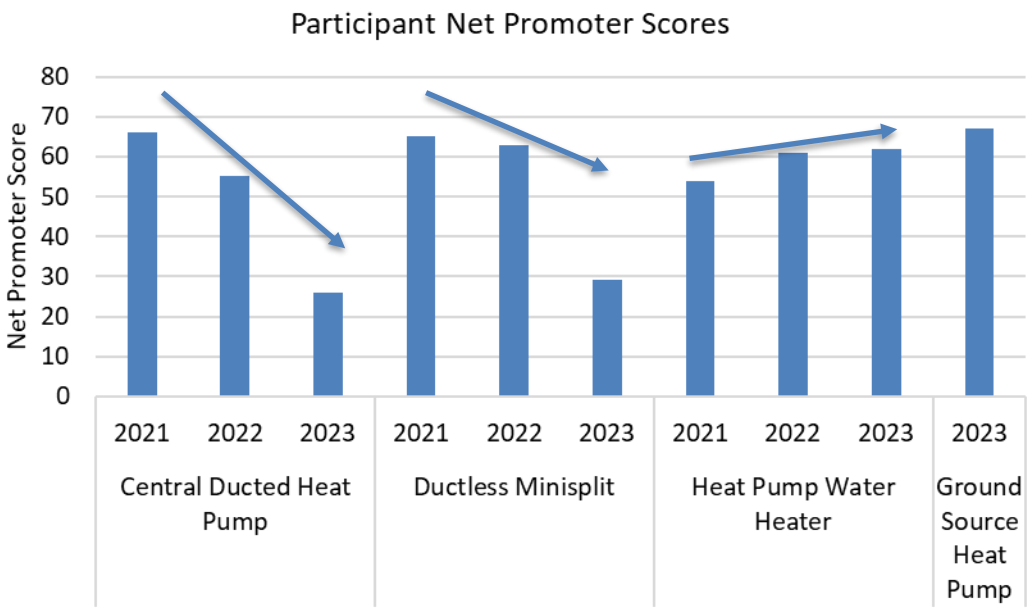
- **Contractors trained on HPs and importance of weatherization**
- **Distributor stocking practices**
  - Steadily shifted to HPs from 2021-2024

How Frequently Contractors Recommend HPs For Heating 2023-2025



MARKET INDICATORS MOVING IN THE WRONG DIRECTION

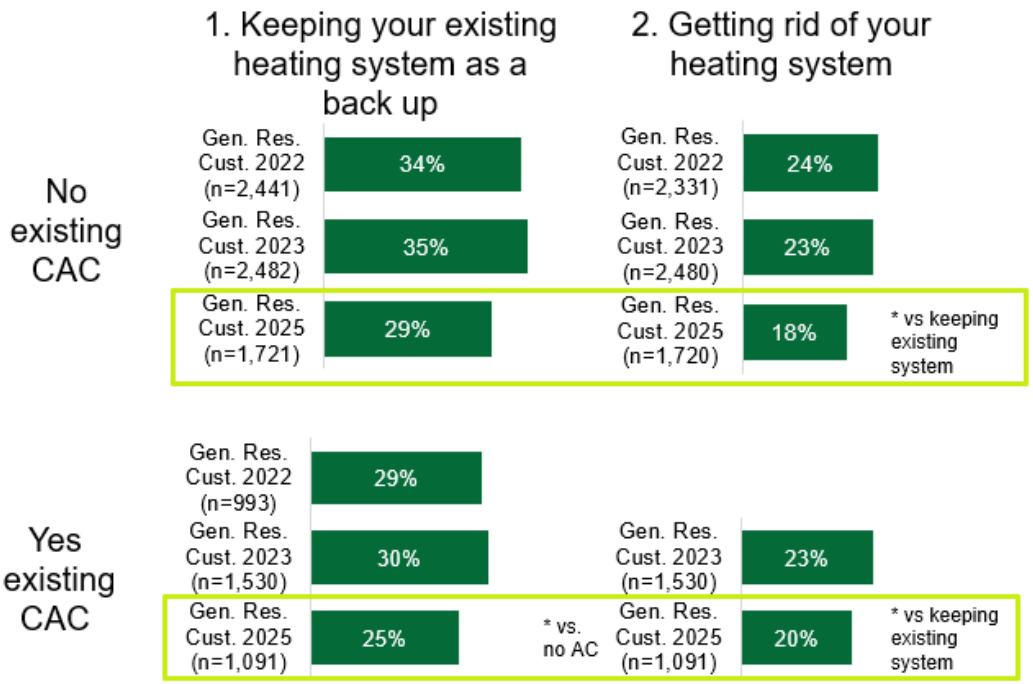
- **Participant satisfaction with air source HPs**
- **Measured by Net Promoter Score (NPS)**
  - "On a scale of 1-10, how likely are you to recommend heat pumps to a friend?"
  - Subtract % saying 1-6 (detractors) from % saying 9-10 (promoters)
  - Widely used to predict word of mouth for products and companies
  - For air source HPs, NPS declined 2021-2023
  - For participant satisfaction results after PY2023, see next study



MARKET INDICATORS MOVING IN THE WRONG DIRECTION, CONTINUED

- **Customer preference for HPs over other types of HVAC equipment**
  - Program theory calls for increases over time
  - However, from 2021-2024, general public's stated willingness to install an HP declined
  - Held true across a variety of respondent characteristics and scenarios
  - Survey done in Fall of 2025; will be repeated in 2026, after HP rate

Willingness of General Public to Install HP 2021-2024

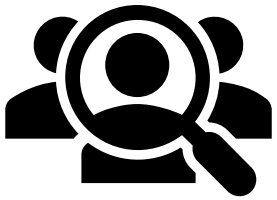


MARKET INDICATORS MOVING IN MIXED DIRECTIONS

- **Contractor confidence in HPs for space heating**
  - Percentage of contractors expressing confidence in ability of HPs to meet all heating needs
    - 2023, all air source HPs: 50%
    - 2024, all air source HPs: 43%
    - 2025, Central ducted HPs: 49%
    - 2025, Minisplits: 70%
  - Percentage of contractors saying they regularly recommend HPs for heating:
    - 2023: 48%
    - 2024: 68%
    - 2025: 70%
  - Some contractor concerns about increasing callback rates
    - Particularly among more experienced contractors
    - Particularly for ducted HPs, driven by higher-than-expected operating costs

MARKET PROGRESS INDICATORS: SUMMING UP THE EVIDENCE

- **The PAs have generally done what they committed to doing**
- **Supply-side market indicators have generally changed in the hoped-for manner**
- **However, the same is not universally true for demand-side indicators**
  - Participant satisfaction and resulting word of mouth lower than ideal
  - Trends in electric rates and the broader economy may be serving to limit public enthusiasm for adopting HPs



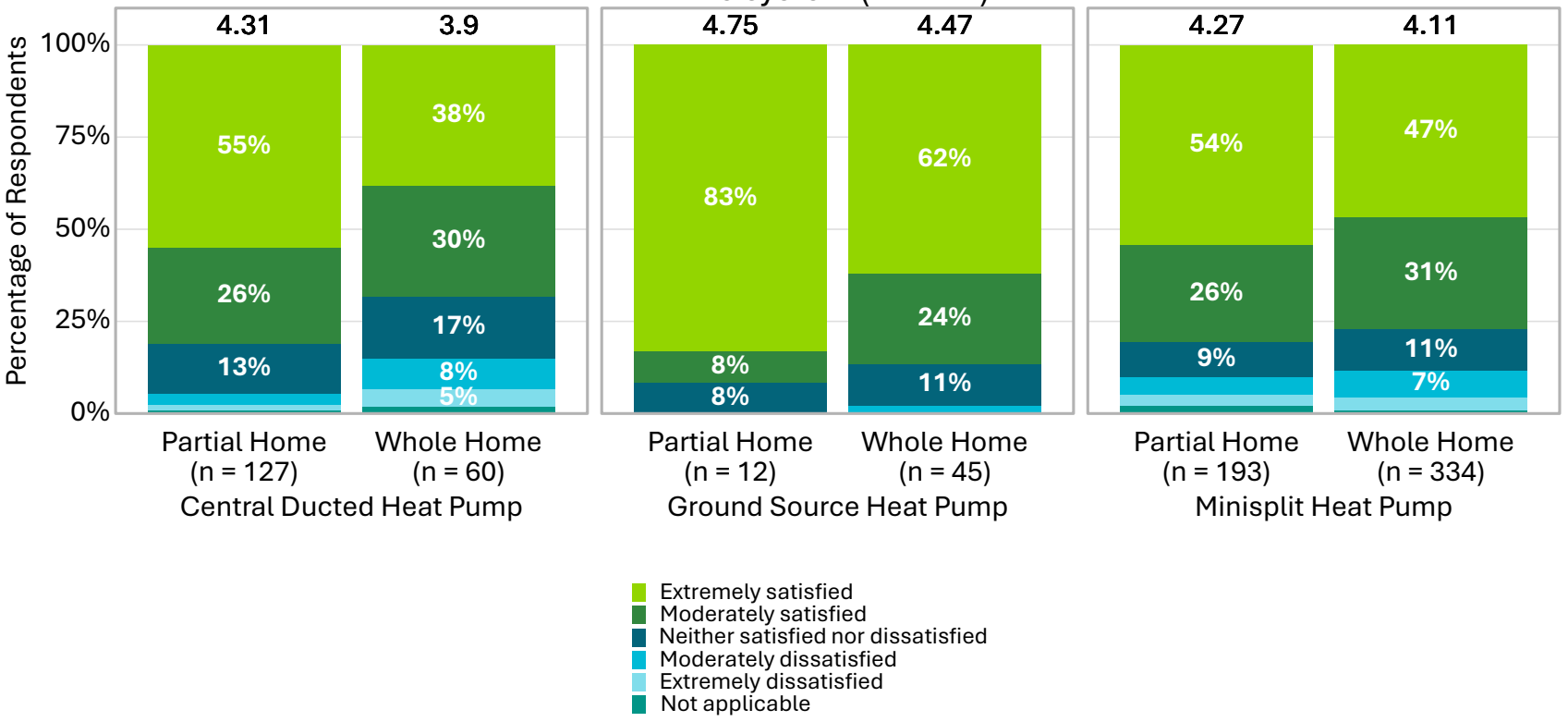
HEAT PUMP USAGE BEHAVIOR STUDY

- **EM&V's primary mechanism for tracking participants' experience with the program, including:**
  - Comfort during cold weather
  - Satisfaction
  - How new equipment is being used
  - Maintenance, sizing and leakage issues

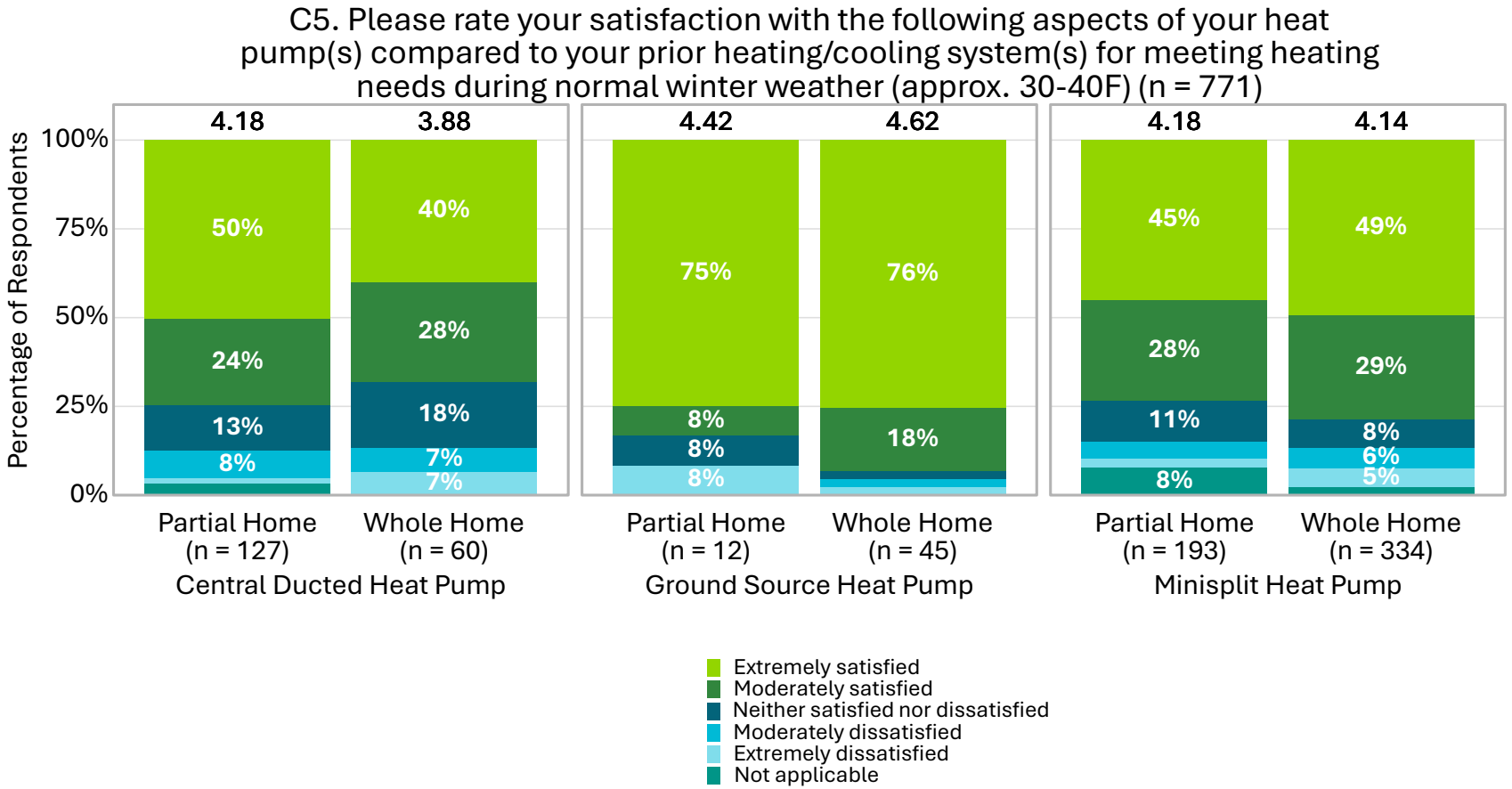
- **Includes:**
  - Comprehensive annual participant survey (administered Fall 2025, to PY2024 participants)
  - Fast feedback survey after January 2026 cold snap (PY2023-2025 participants)
- **Study is still in progress**
- **Results presented today limited to comprehensive annual survey, and to the issue of participant satisfaction**

PY2024 PARTICIPANTS WERE GENERALLY SATISFIED WITH SYSTEM RELIABILITY

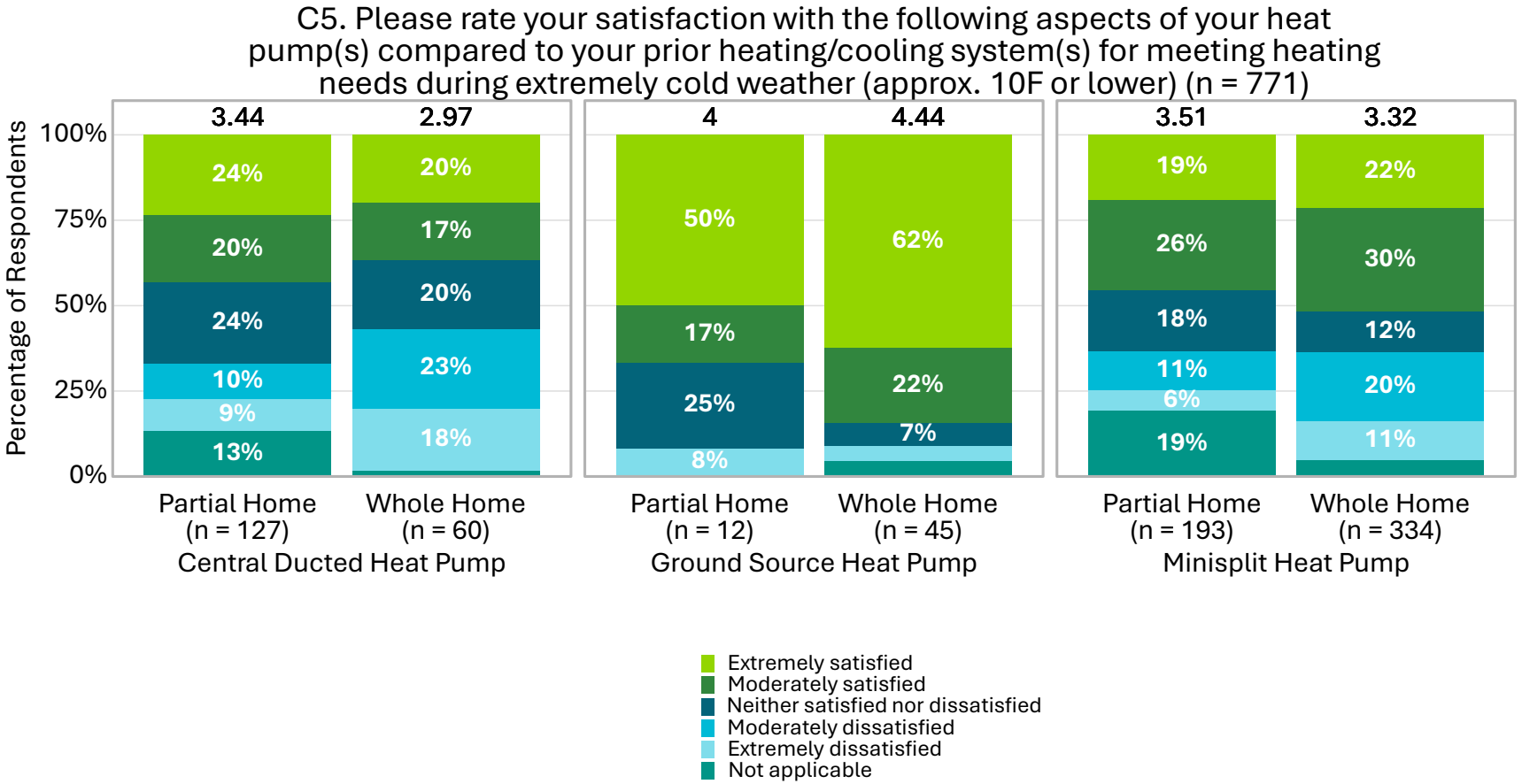
C9. Please rate your satisfaction with the following aspects of your heat pump(s) compared to your prior heating/cooling system(s): Overall reliability of the system (n = 771)



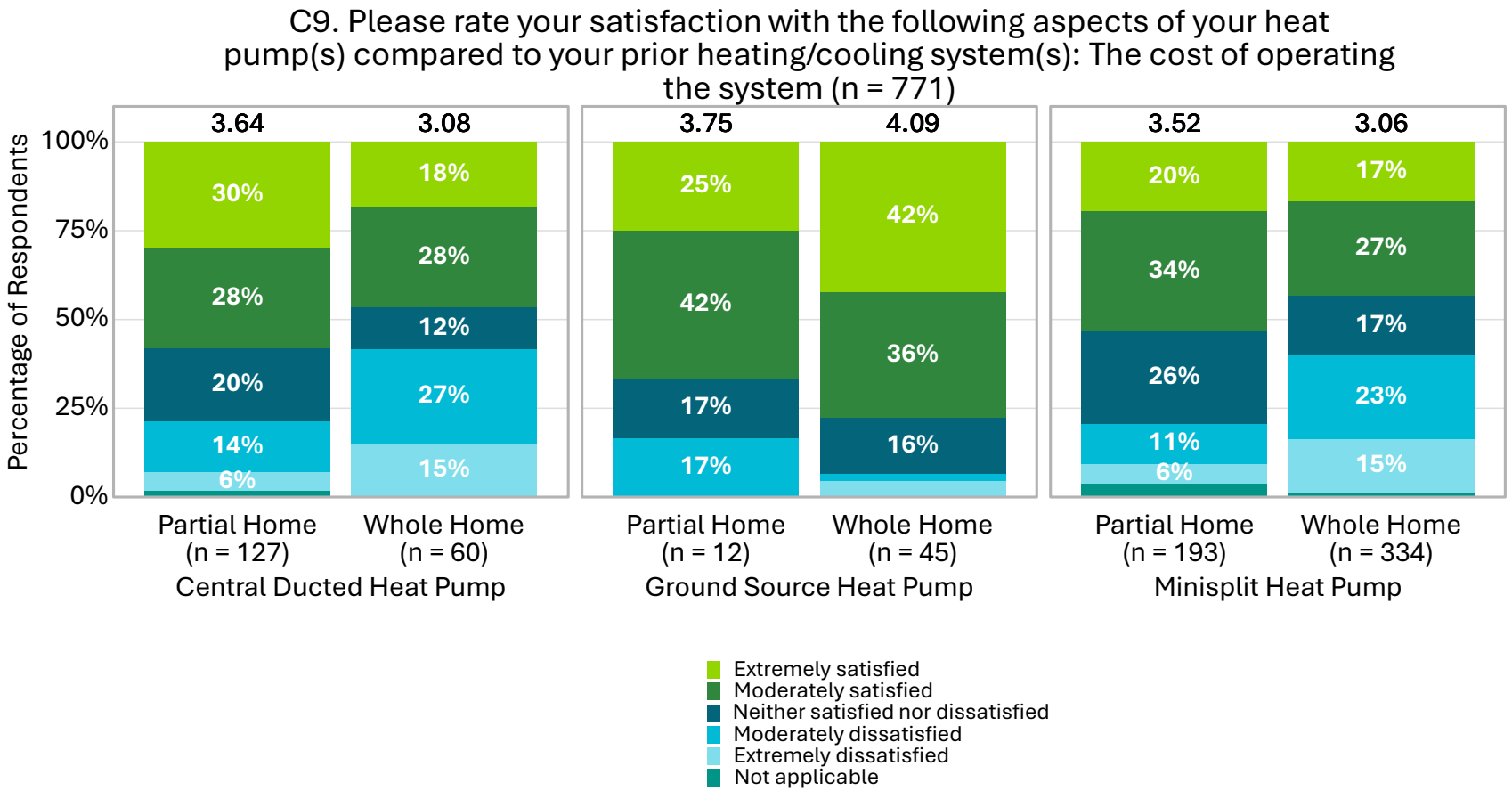
AND THEY WERE GENERALLY SATISFIED WITH THE HEAT PROVIDED DURING NORMAL WINTER WEATHER



BUT THEY WERE LESS SATISFIED WITH THE HEAT PROVIDED DURING THE COLDEST WINTER WEATHER



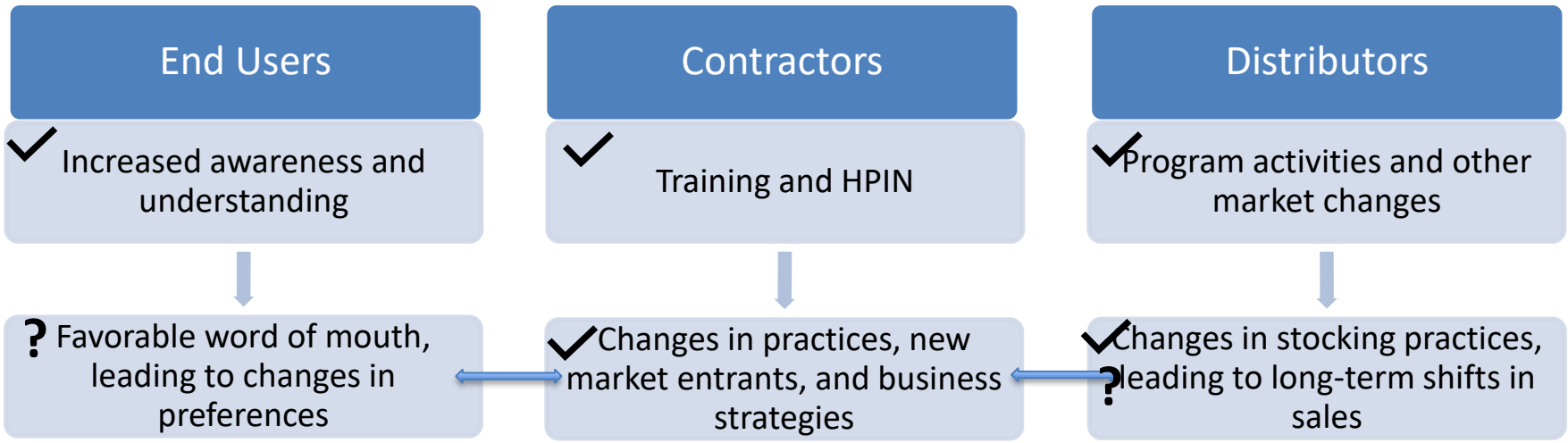
AND THEY WERE LESS SATISFIED WITH THE COST OF OPERATING THE SYSTEM



HEAT PUMP USAGE BEHAVIOR CUSTOMER SATISFACTION RESULTS: SUMMING UP

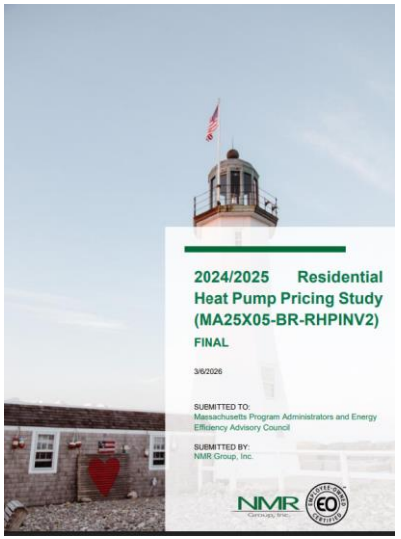
- **Results suggest the participant satisfaction issues observed by ME study for PY2023 persisted through PY2024**
- **Satisfaction issues are focused on operating cost and heat provided during the coldest weather**
- **Satisfaction with other attributes generally good**

HP ME AND HP USAGE BEHAVIOR STUDIES: DOUBLING BACK TO THE PROGRAM THEORY



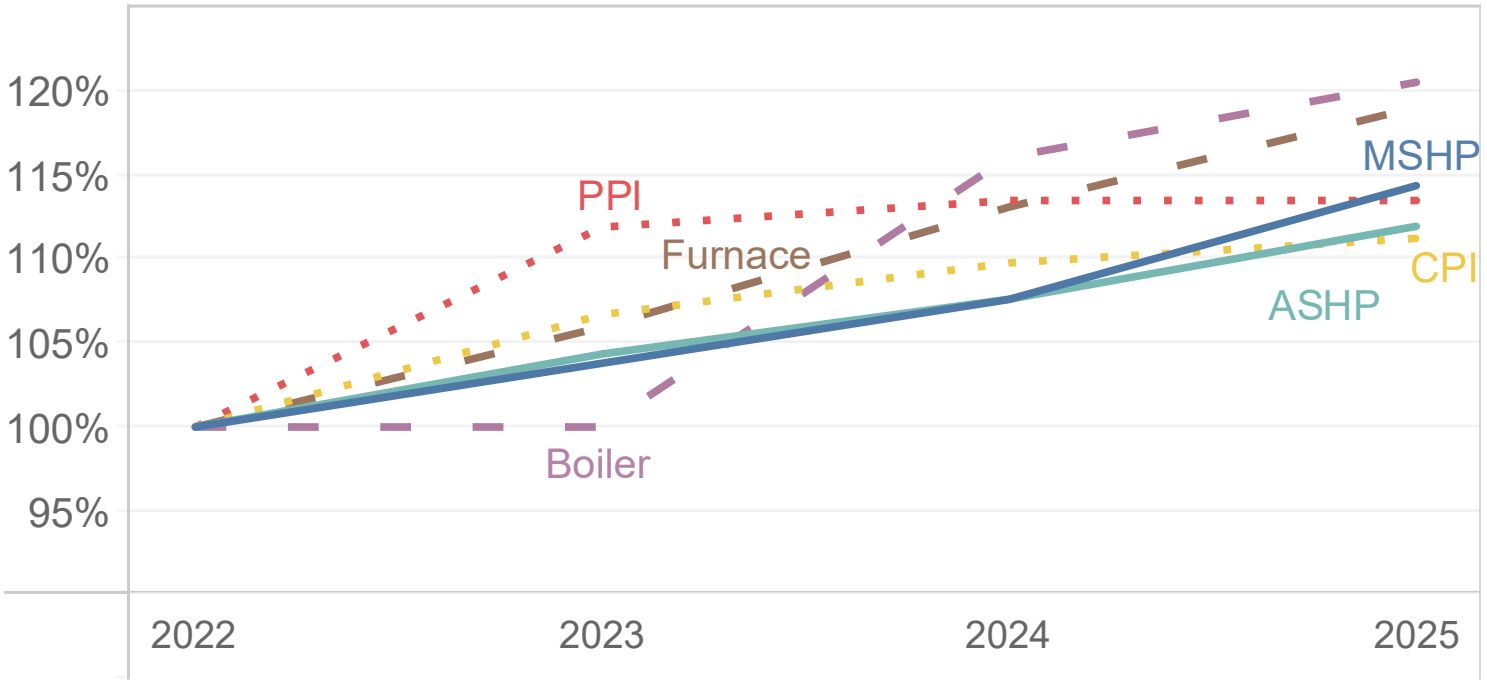
2024-2025 RESIDENTIAL HEAT PUMP PRICE TRACKING STUDY

- **The second in a series of annual studies tracking and analyzing residential heat pump pricing trends**
- **Why do we do this?**
  - Long-term beneficial effects on pricing are a part of the program theory
  - Some stakeholder worries impacts might reverse near term given the size of program incentives flowing into the market
  - After the first study, the DPU ordered the PAs to analyze and report on pricing trends on an annual basis
- **Methods**
  - Scanning and analysis of participant invoice data
  - Webscraping in MA and other states
  - Contractor and distributor interviews
  - Secondary data sources
  - Statistical analysis
  - Most analyses focused on estimated *per-ton, CPI-adjusted* prices



NATIONAL WHOLESALE PRICE TRENDS HAVE ROUGHLY PARALLELED CPI

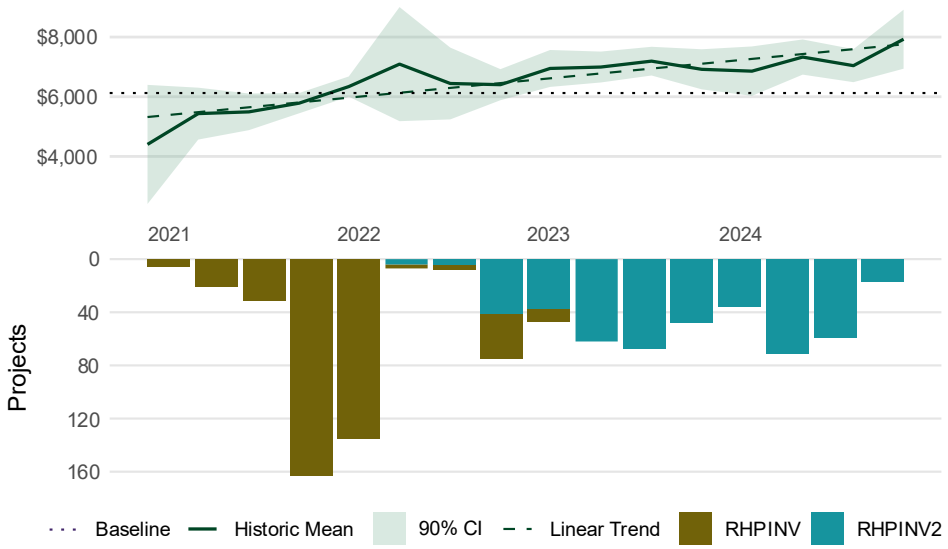
National Wholesale Price Trends vs Consumer Products Index, By Equipment Type



BUT RETAIL PRICE TRENDS FOR MA PARTICIPANTS HAVE OUTSTRIPPED CPI

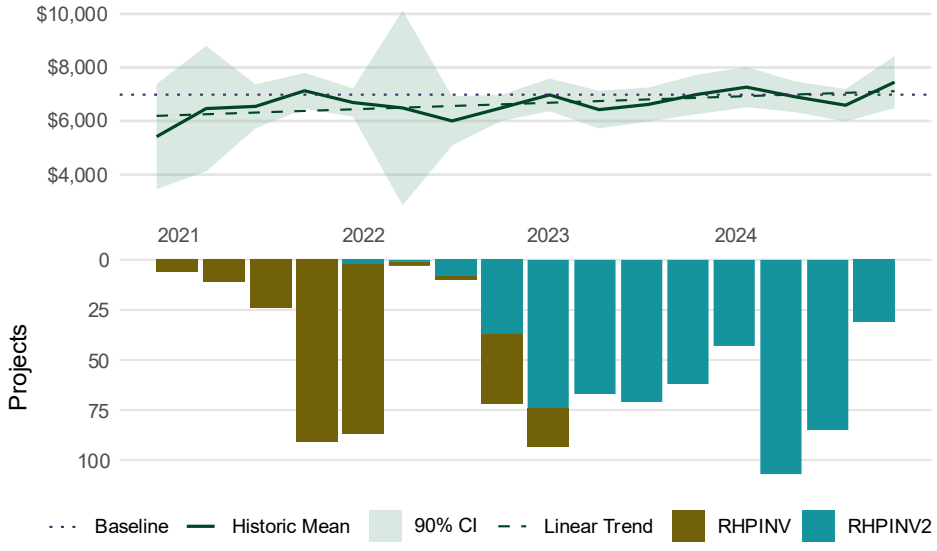
Ductless

(Aug 2025 $/ton)



Ducted

(Aug 2025 $/ton)



WEBSCRAPING FOUND WHOLESALE PRICES IN MA TO BE SIMILAR TO ELSEWHERE IN THE COUNTRY

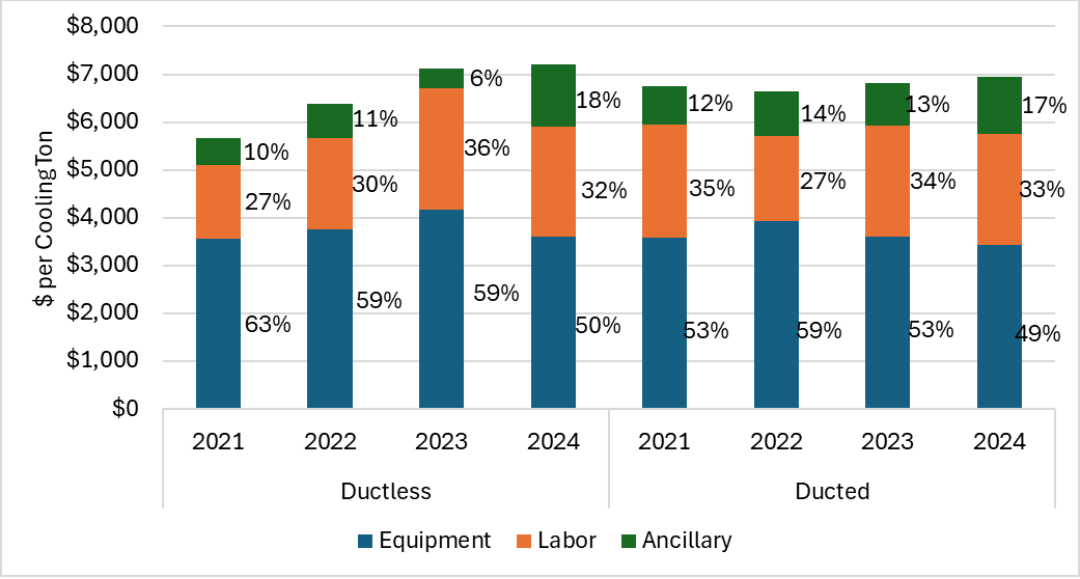
- **Featured comparison of listed wholesale equipment prices between MA and two comparison states**
  - New Hampshire and Ohio, selected due to proximity, similar climate and ratio of electric/gas prices, and lower program activity
- **As with other pricing metrics, focus was on per-ton prices**
- **Results**
  - Ducted heat pumps
    - MA: $1,292/ton
    - NH: $1,302/ton
    - OH: $1,290/ton
  - Ductless heat pumps, identical models
    - MA: $1,654/ton
    - NH: $1,651/ton
    - OH: $1,661/ton

- **Strongly suggests that above-CPI price trends in MA are due to retail rather than wholesale price differences**

RETAIL PRICE INCREASES IN MA APPEAR TO BE DRIVEN MAINLY BY LABOR AND ANCILLARY CHARGES

- **Total invoice charges were broken down into three categories**
  - Equipment (including mark-up)
  - Labor
  - Ancillary changes
    - (Electrical work, supplies, permitting, removal, processing)
- **Labor and ancillary charges increasing; equipment charges aren't**

Contribution of Equipment, Labor and Ancillary Charges to Total Invoice Charges 2021-2024



INCREASES IN LABOR COSTS: THE ROLE OF SYSTEM COMPLEXITY

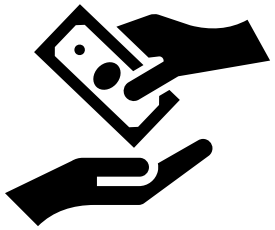
Average labor cost vs average number of air handlers per compressor 2021-2024

(Ductless systems; August 2025 $)

- **As heat pump system complexity increases, overall labor cost increases as well**

WHAT DO WE KNOW ABOUT: RETAIL PRICES FOR PROJECTS WITH AND WITHOUT A HEAT LOAN?

- **Projects known to have a HEAT loan are significantly more expensive than those for which HEAT loan status not known**
  - Ductless: 18% higher per ton
  - Ducted: 8% higher per ton



- **However, direction of causality is unclear**
- **Greater complexity for heat loan projects appears to play some role**
  - Average number of air handlers: 3.7 vs 3.5 – statistically significant but small in absolute terms
- **No significant correlations with property value, equipment efficiency or capacity**

WHAT DO WE KNOW ABOUT: CONTRACTOR EQUIPMENT MARK-UPS?

- **National HVAC industry mark-ups estimated at roughly 40%, with much variation and uncertainty**

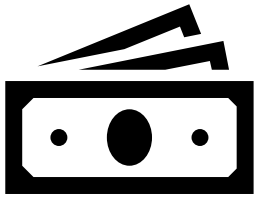
- **Mark-ups for MA participants:**
  - Ductless systems: slightly higher than national estimate
  - Ducted systems: persistently higher than national estimate, averaging 77% since 2021
    - Stability of mark-ups over time suggests that if this is a program effect, it has not been influenced by the growth in program activity since 2021

WHAT DO WE KNOW ABOUT: PRICES IN UNDERSERVED AREAS VS THE REST OF THE STATE?

- **Ductless system prices are significantly lower in communities classified by DPU as "Hard to Reach"**
  - $6,483/ton in HTR vs $7,040/ton in total sample
  - Difference not explained by any known differences in system characteristics
- **For ducted systems, no statistically significant differences in prices between underserved areas and the rest of the state**

HEAT PUMP PRICING STUDY: CONCLUSIONS

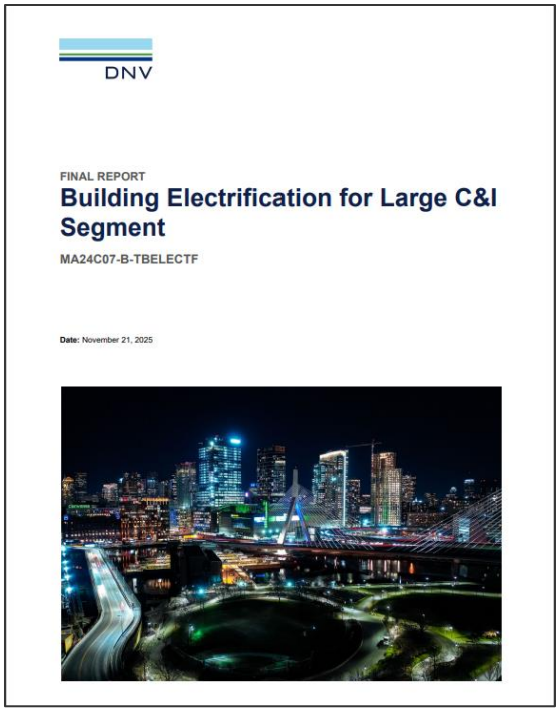
- ***Wholesale prices***
  - Over the mid- to long-term, roughly tracking the CPI
  - There are no indications to date of any program-induced pricing effects



- ***Retail prices***
  - Total prices per ton paid by HP participants are increasing faster than CPI
  - One key driver of this trend is increasing system complexity, leading to increasing labor costs
  - Projects with a HEAT loan cost more per ton than those without
    - Differences in system complexity play some role in this but seem unlikely to fully explain it
    - No other observable differences in system characteristics
  - For ducted systems only, contractor mark-ups on participating projects appear to be persistently higher than typical industry practices
    - Stability of mark-up percentages since 2021 suggests that any program effect would have to have occurred before then

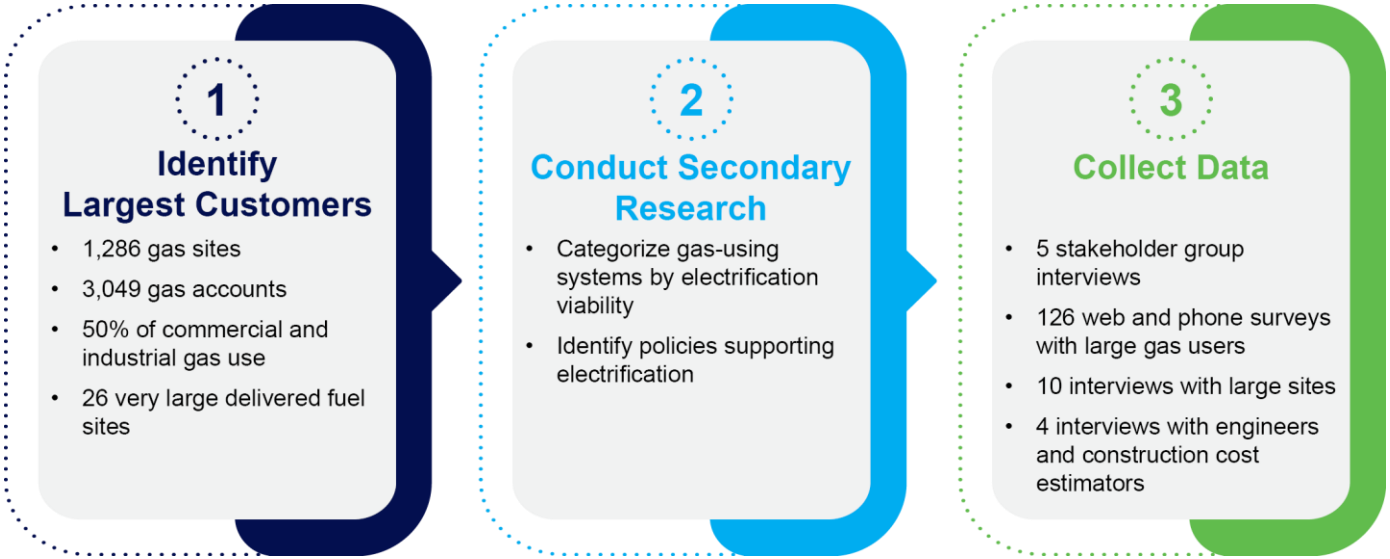
LARGE C&I BUILDING ELECTRIFICATION STUDY OBJECTIVES

- **Characterize the market**
  - Businesses
  - Fossil fuel driven systems and end uses
- **Understand barriers**
  - Technical
  - Economic
  - Non-technical
- **Identify opportunities to advance electrification**



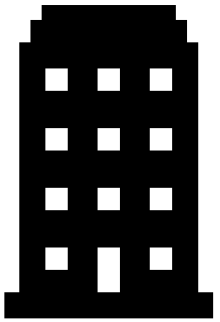
Building Electrification for Large C&I Study Link

METHODOLOGY AND APPROACH



LARGE GAS CUSTOMER CHARACTERISTICS

- **Commercial**
  - 50% of sites are over 250k sq ft and represent 82% of gas consumption
- **Industrial**
  - 55% of sites are over 100k sq ft and represent 80% of gas consumption
  - 20% of industrial sites are small (less than 20k sq ft) with over 10% of consumption

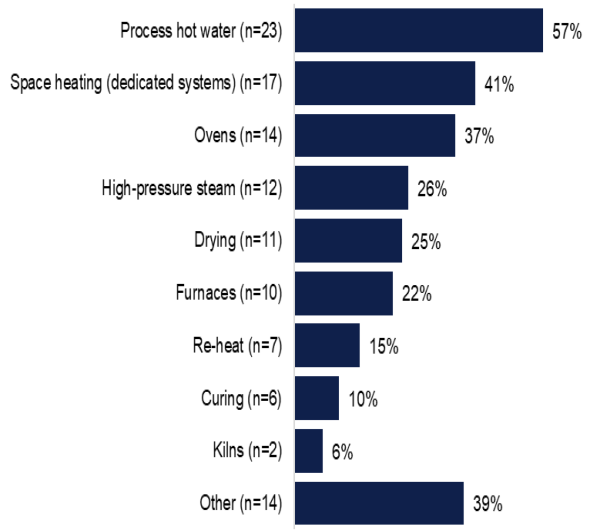


- **Over half have policies, are inventorying GHG emissions and/or have considered electric alternatives**
  - Orgs with GHG inventories are more likely to consider electrification
- **Customers are uncertain about electrification-related policies in the current economic and political environment**
- **Reducing energy/operating costs is primary driver for energy efficiency and decarbonization projects**

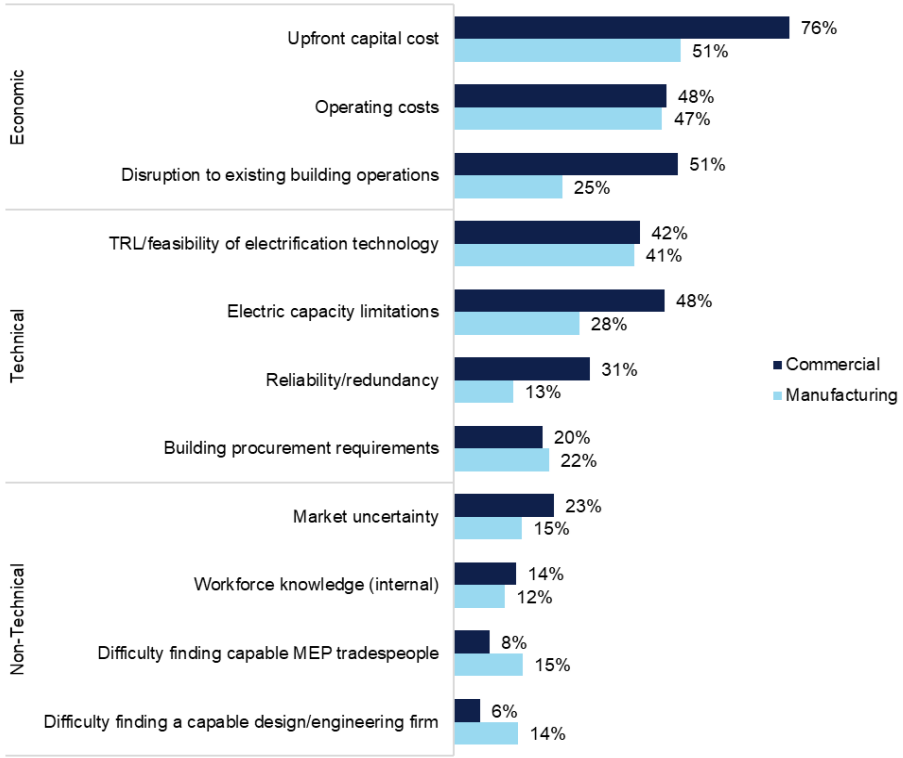
PRIMARY SYSTEM TYPES

- **Commercial Building Systems**
  - Heating
    - Hot water (hydronic) distribution 55%
    - Steam distribution (23%)
    - Direct fired (gas) air handlers - air distribution 11%
    - Other (PTAC, PTHP, IR Heat, VRF) 11%
  - Cooling
    - Chillers 71%
      - 50% simultaneous heating and cooling
  - Domestic hot water
  - Kitchens

- **Industrial Systems**



BARRIERS TO ELECTRIFICATION



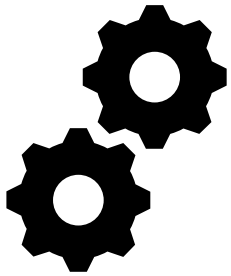
TRL – Technology Readiness Level

MEP – Mechanical, Electrical, Plumbing

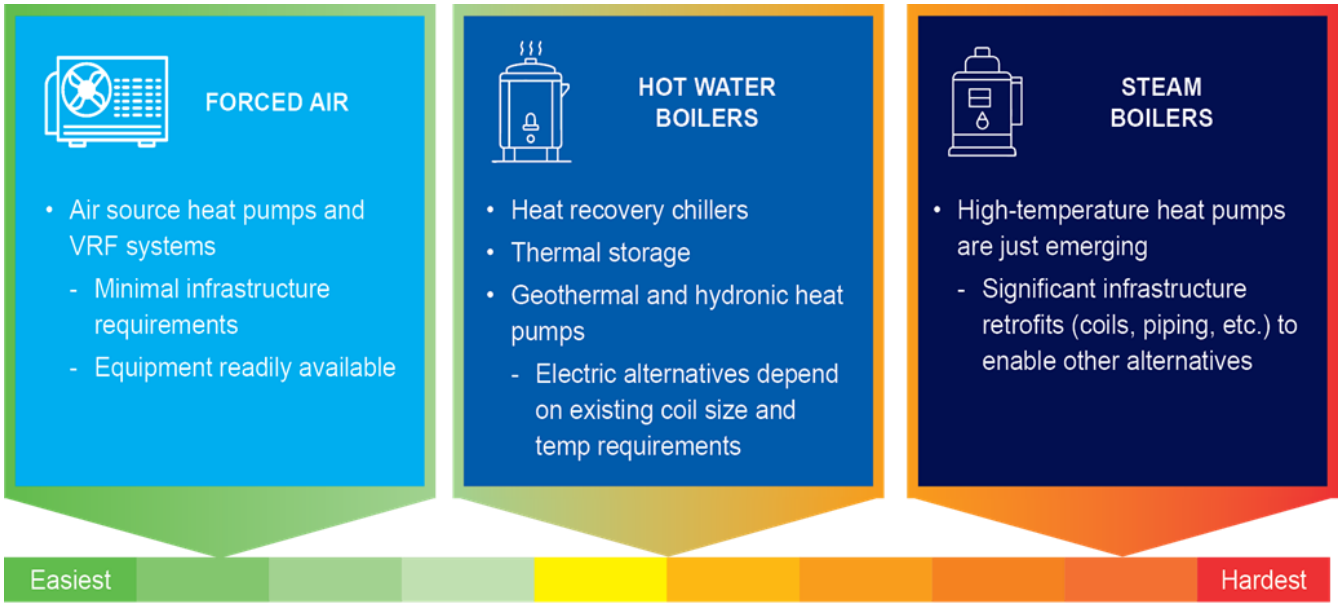
VIABLE ELECTRIC ALTERNATIVE

OPPORTUNITIES

- Technical solutions
- Pathways to electrification
- Market education
- Technical assistance
- Financial assistance



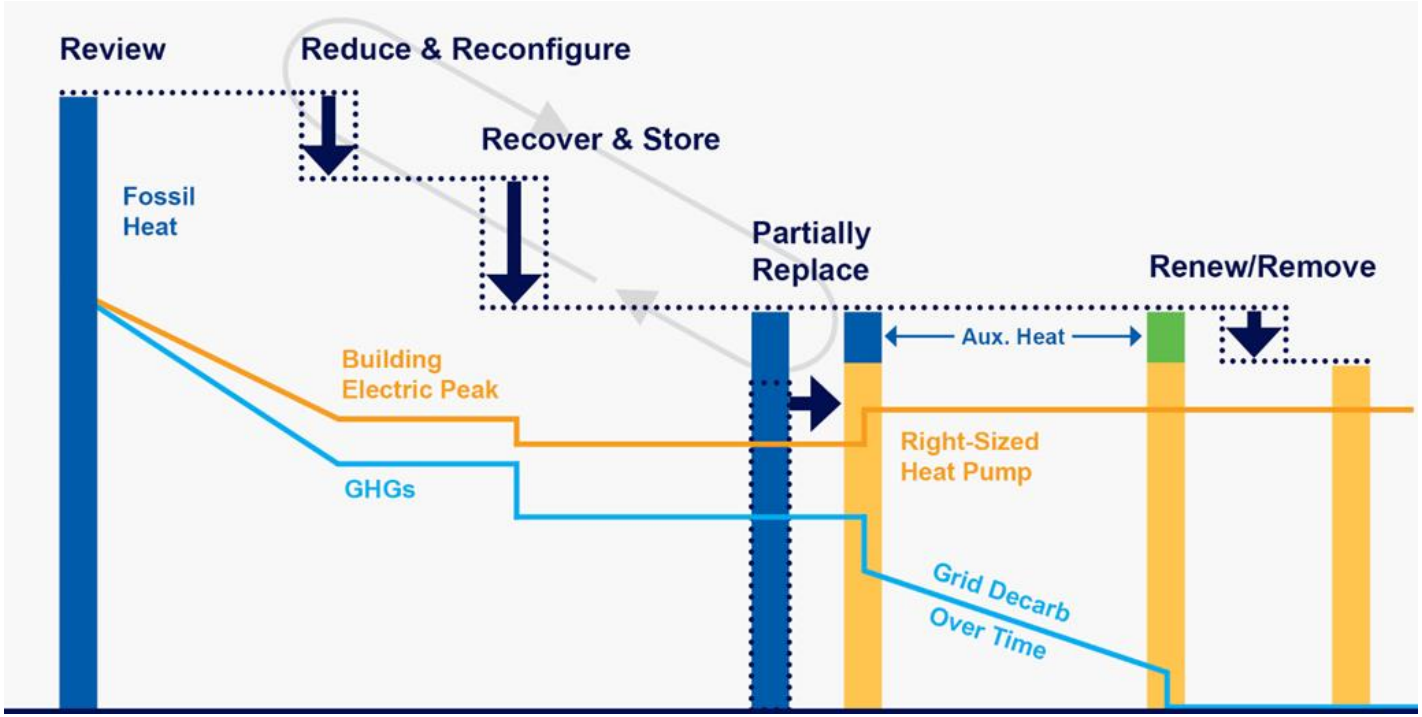
TECH SOLUTIONS: HEATING SYSTEM ELECTRIFICATION



TECH SOLUTIONS: INDUSTRIAL PROCESSES

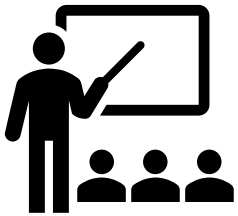
Process type	Temp range	Key electrification technologies	Challenges
Hot water heating	120–180°F	Waste heat recovery, heat pumps	Space for storage, peak demand sizing
Steam generation	212–400°F	Steam generating heat pumps, electrode boilers	Electrical infrastructure, water treatment
Ovens and dryers	160–570°F	Infrared heaters, resistance coils, high-temp heat pumps	Proprietary designs limit retrofit pathways
Furnaces and kilns	400–2000°F+	Induction heating, resistance heating, microwave and RF heating, plasma or arc heating	Material compatibility, extreme temperatures, custom engineering
Curing systems	200–600°F	Infrared, RF, microwave heating, heat pumps (for low-temp applications)	Uniformity, process-specific requirements
Indirect fluid heating	375–400°F	High-temp heat pumps, immersion heaters	Proprietary designs limit retrofit pathways

PATHWAYS TO ELECTRIFICATION



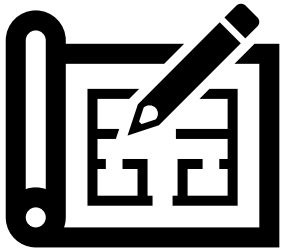
MARKET EDUCATION

- **Increase collaboration and partnerships**
- **Build confidence:**
  - Provide transparent, accessible data on how natural gas and electric grid capacities are forecast
  - Actively debunk misinformation about grid reliability and expansion
  - Develop a variety of case studies
- **Target customers with education about solutions for relevant end uses**
- **Provide strategy development and technical guidance**
- **Invest in workforce capacity**



TECHNICAL ASSISTANCE (ENGINEERING STUDIES)

- **Continue, expand and enhance study offerings to include**
  - Clear design options, performance expectations and next steps
  - Project alignment with customer planning cycles
- **Prioritize load reduction and building readiness**
  - Energy efficiency
  - Heat/energy recovery
  - Thermal storage
- **Decarbonization**
  - Partial decarbonization solutions
  - Resiliency
  - Full decarb over time



FINANCIAL

- **Capital Expense**
  - Incentives
  - Financing
- **Operating Expense**
  - Rate design

Fuel type (unit)	$/unit	$/MMBTU	Rate relative to natural gas
Natural gas (therms)	$1.93	$19.29	1.00
Electricity (kWh)	$0.30	$87.85	4.55
Propane (gallons)	$3.59	$39.23	2.03

RECOMMENDATIONS AND CONSIDERATIONS

- **Recommendation:**
  - Review findings to identify areas where program design changes are warranted
- **Considerations:**
  - Work with survey respondents interested in electrification
  - Promote heat recovery and thermal storage as a step in the decarbonization process
  - Target outreach to large multifamily properties which are over 10% of the largest gas users
  - Market all benefits associated with electrification

Thanks!

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April 15, 2026

APPENDIX

BROADER CONTEXT:
MAJOR STUDIES COMPLETED SINCE EARLY 2025;
STUDIES DISCUSSED TODAY HIGHLIGHTED BY RED FONT

RESIDENTIAL AND CROSS-CUTTING

- Heat Pump Market Effects 2023-2024 Study (February 2025)
- 2013-2023 Residential Profile (March 2025)
- Multifamily Census Refresh (May 2025)
- Multifamily Market Opportunity Study (March 2025)
- CLC CVEO Evaluation (July 2025)
- Single Family Market Opportunities Study (August 2025)
- RNC Program Theory and Logic Model Study (September 2025)
- Residential Baseline Study Phase 8 (February 2026)
- LMI Delivered Fuel Heat Pump study [February 2026
- Residential Thermostat DR Participation Study (March 2026
- Heat Pump Invoice Tracking 2024-2025 Study (March 2026)
- Heat Pump Water Heater Impact Evaluation (Match 2026)
- Heat Pump Market Effects 2024-2025 Study (April 2026)

COMMERCIAL

- C&I Small Business Market Opportunities Phase 1 Report (February 2025)
- 2023 C&I Profile (May 2025)
- C&(Socioeconomic Deep Dive Study (June 2025)
- Advanced Lighting Controls Quick Hit Study (September 2025)
- Refrigerant Leak Repair Baseline Practices Research (October 2025)
- Custom Gas and Electric Impact Evaluations (October 2025)
- Energy Optimization Model Short-Term Update (November 2025)
- C&I Heat Pump NEI Study (November 2025)
- Building Electrification for Large C&I Segment (November 2025)
- Compressed Air ISP study (November 2025)
- Custom Express Wx Took Study (December 2025)
- C&I Baseline Framework Update (December 2025)

Additional Studies can be found at: https://ma-eeac.org/studies/