

Moving a Mountain: An Update on the Task of Shifting a Market

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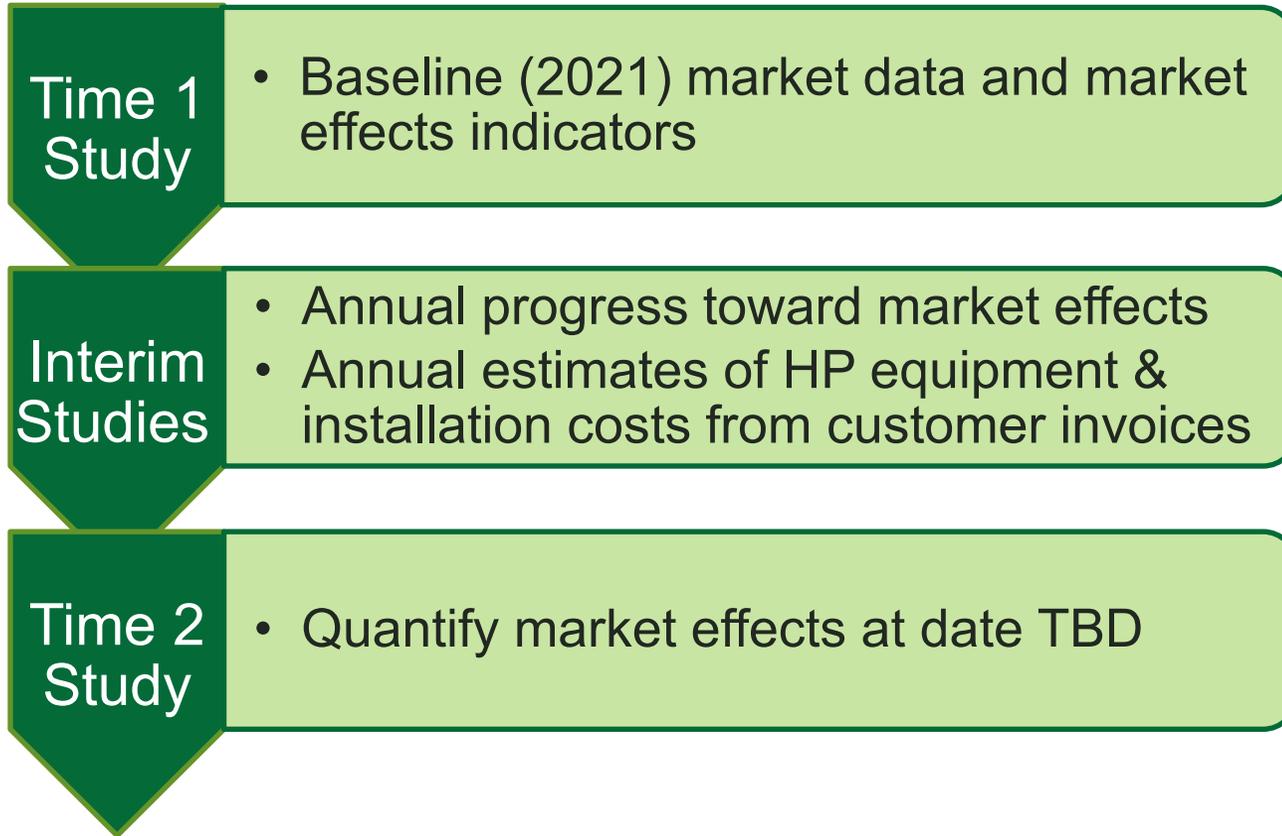
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Background

- Sponsors of Mass Save[®]
 - Berkshire Gas, Cape Light Compact, Eversource, Liberty, National Grid, and Unitil
- 2022 – 2024 MA Energy Efficiency Plan: Included GHG emissions reduction goal
 - Electrification needed to reduce carbon intensity of buildings
- Shift the entire market to favor heat pump adoption
 - Customer awareness
 - Contractor enablement
 - Manufacturer and distributor engagement
- Documentation of Program Theory and Logic Model

Market Progress & Heat Pump Invoice Studies



Completed:

- Baseline (PY2021 focus)
- Interim market effects & HP invoice studies
 - PY2022/2023 focus
 - PY2023/2024 focus
 - HP cost estimates for January 2024

In progress:

- PY 2024/2025 focus
- HP cost estimates for January 2025

Equipment Types

Type	Space Conditioning	Water Heating
Heat Pump	Ducted ASHP systems (air-to-air only)* Ductless ASHP systems (air-to-air only) * Variable Refrigerant Flow (VRF) ASHP systems	Heat Pump water heaters*
Non-Heat Pump	Central Air Conditioning (all kinds) Fossil Fuel-fired heating systems	Fossil Fuel-fired & Electric Storage water heaters

* Also included in HP cost estimate study

Types & Sources of Market Progress Study Data

	Paticip. Distributors	Mfrs	Paticip. Installers	Paticip. Customers	General Customers	Program Data	2 nd ary Data
Sales of HVAC & water heating equipment by count and heating capacity*	✓						
YOY percentage changes in sales	✓						
Equipment stocking practices	✓						
Heat pump purchase & installation costs			✓			✓	
Heat pump market trends	✓	✓					
Installation sizing practices			✓				
Attitudes towards heat pumps & their efficacy			✓	✓	✓		
Awareness of heat pumps					✓		
Market progress indicators	✓	✓	✓	✓	✓		
Program penetration						✓	✓
Completed Studies							
# of times collected (up to 3 possible)	3	1	Res: 2 C&I: 1	Res: 2 C&I: 2	Res: 1	3	3
Sample sizes (min-max)	15	10	Res: 43-57 C&I: 20	Res: 716-798 C&I: 90-95	5,555**		

* HVAC equipment by heating capacity at 47°F and 5°F., water heaters by count and capacity in gallons.

** Fielded as add-on questions to a survey of general residential conducted as part of the Massachusetts Residential Building Use and Equipment study.

Estimating Market Shares

HP market shares = percentages of space conditioning and water heating sales that heat pumps comprise

Approach to estimating annual HP market shares for each end use and sector

1. Size market using data from multiple sources
2. Determine current year HP sales using participating distributor interviews
3. HP market share = $\frac{\text{current year HP sales}}{\text{market size}}$

Types & Sources of HP Invoice Study Data

Program-supported residential heat pumps

- Mass Save & Mass Clean Energy Center (CEC)
- Installed in existing homes

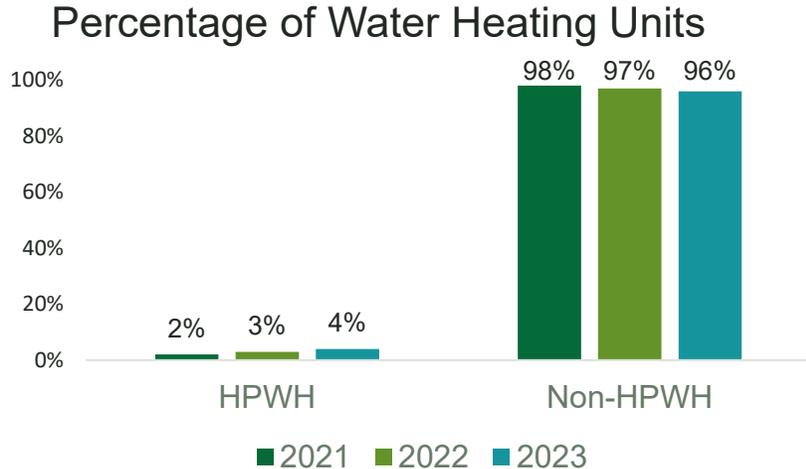
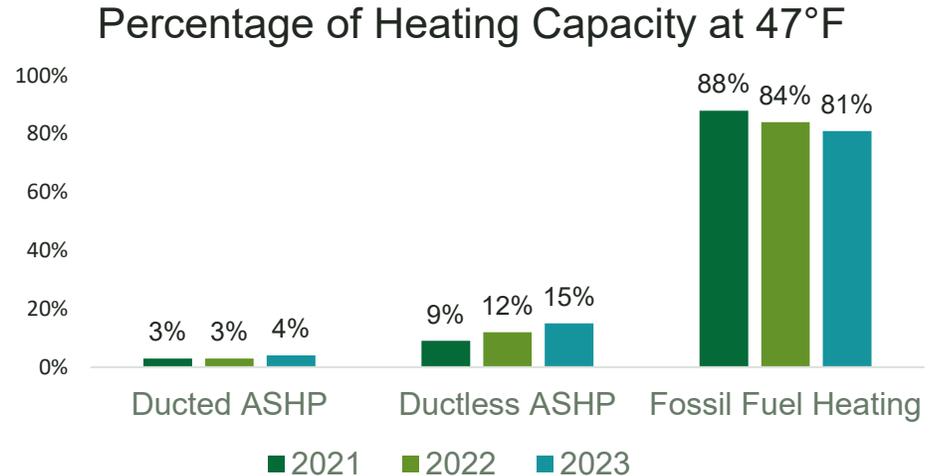
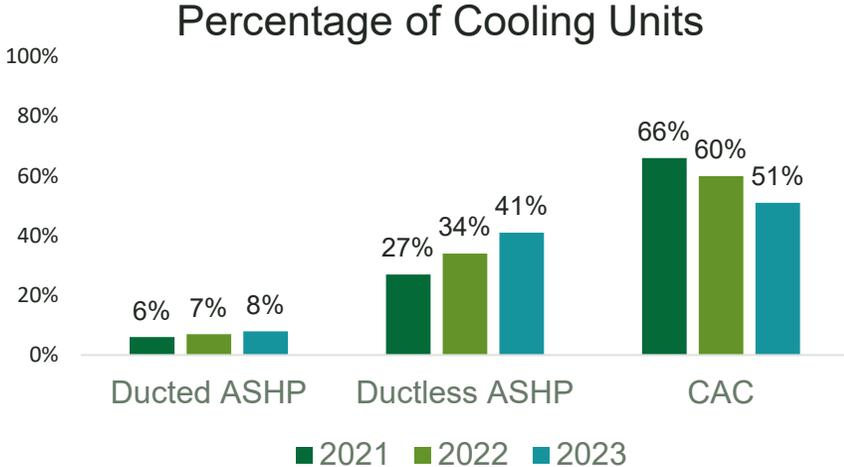
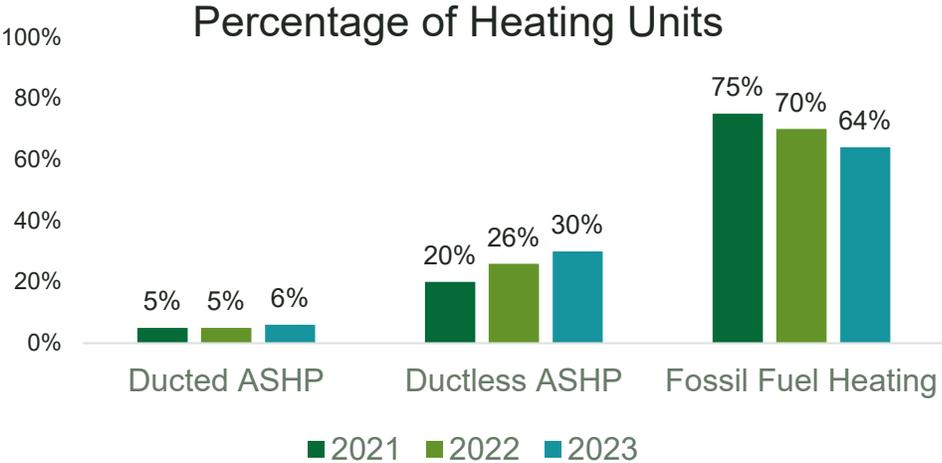
Source	Vintage	ASHP	Ducted/ Mixed MSHP	Ductless MSHP	HPWH	GSHP
Mass Save	2021–2022	227	76	414	69	7
MassCEC	2019–2021	11	2,212		–	186

Residential Results



MA Residential Heating & Cooling Market Shares 2021 - 2023

- HP shares of MA residential-duty heating & cooling equipment markets increased substantially from 2021 to 2023



Evidence of Program Influence on Residential HP Adoption

Findings suggest Sponsors' support for heat pumps contributed substantially to changes in the MA residential heating, cooling & water heating markets from 2021 to 2023

- Evidence of initial or ongoing change in direction predicted by program theory for 12 out of 16 expected residential market outcomes
- Examples of indicators moving in predicted direction
 - Increased customer awareness of HPs & their benefits
 - Increase in contractors reporting using recommended HP sizing methods
 - Contractors increasingly confident in ability to properly install HPs & increasing # of contractors installing them
 - Increased rate of contractors recommending HPs for heating or water heating
 - Increased customer reliance on HPs for heating

Evidence of Program Influence on Residential HP Adoption

Additional evidence of program attribution

- Distributors credited Mass Save for higher cold-climate ASHP sales and lower fossil fuel equipment sales
- Supply chain resources shifted toward HP markets, partly due to sponsor activities
- Other market actors also indicated that program was at least partially responsible for the growth in residential heat pump sales or installations since 2021
- ASHPs: Program-supported growth (2021–2023) outpaced overall market estimates
- HPWHs: Program-supported growth aligned with overall market estimates

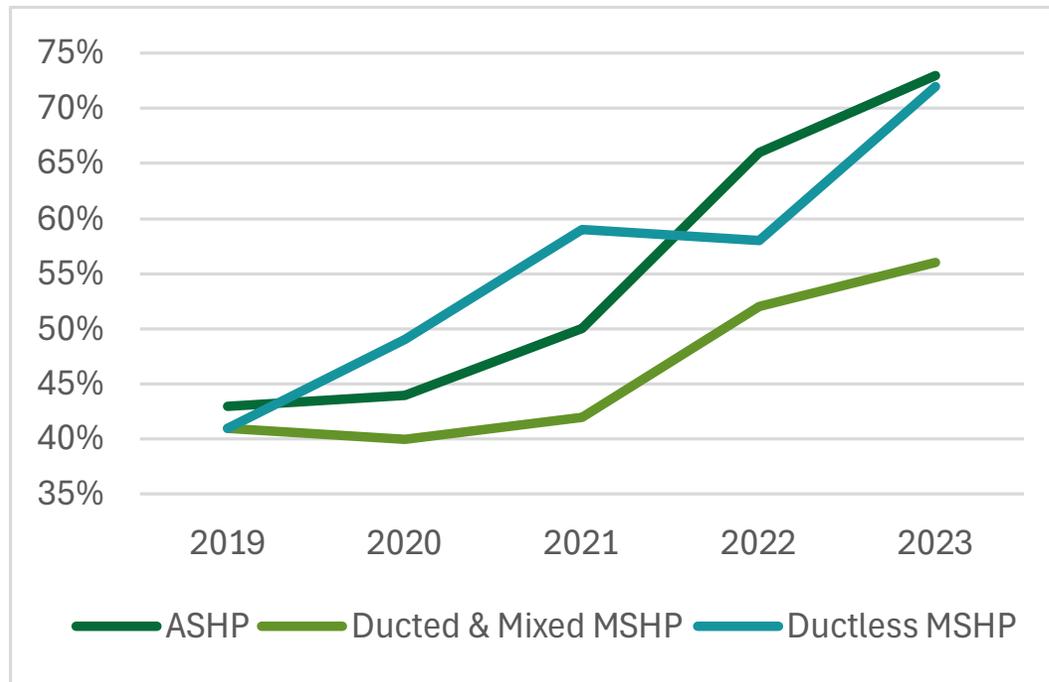
Impediments to Residential ASHP Adoption: Possible Installer Skepticism of HPs' Ability to Handle Full Space Heating Loads

- Evidence suggested in 2024 HVAC installers had less faith in cold-climate ASHPs as complete replacements for oil, propane, and gas heating systems than in 2023
- Compared to newer installers, experienced installers—especially larger ones—had significantly
 - More negative perceptions of ASHPs as full heating solutions
 - Lower satisfaction with rates of customer callbacks for ductless HPs
- Results from study in progress contradict these findings, suggest limited installer skepticism
 - Newer study better represents participating installer population than 2022 and especially 2023 results, due to larger sample sizes & more reliable data for weighting

Impediments to Residential HP Adoption: Increased Equipment Prices

- From 2019 to 2022-2023, the portion of residential HP project costs attributed to equipment cost increased
- Rise was faster than general rate of inflation (CPI)

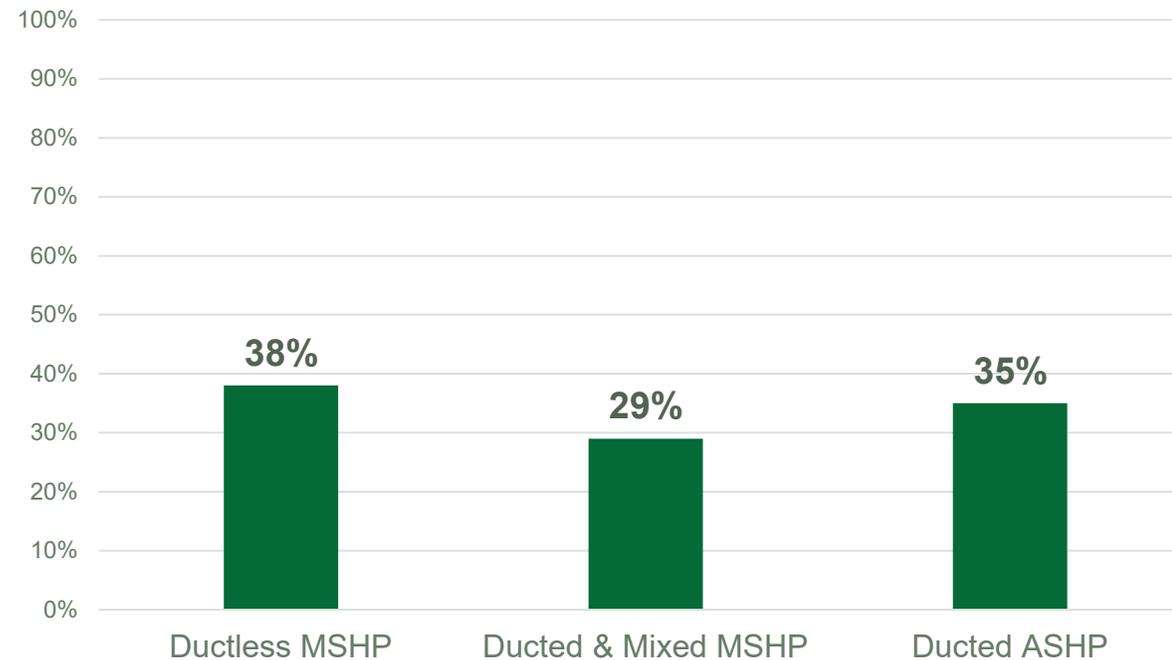
Heat Pump Portion of Total Project Cost



Impediments to Residential HP Adoption: Increased Equipment Prices

- From 2022 to 2023, ASHP equipment costs rose 35% - 38%

**Change in Equipment Costs of Sampled Program Invoices, 2022 to 2023,
in January 2024 \$**

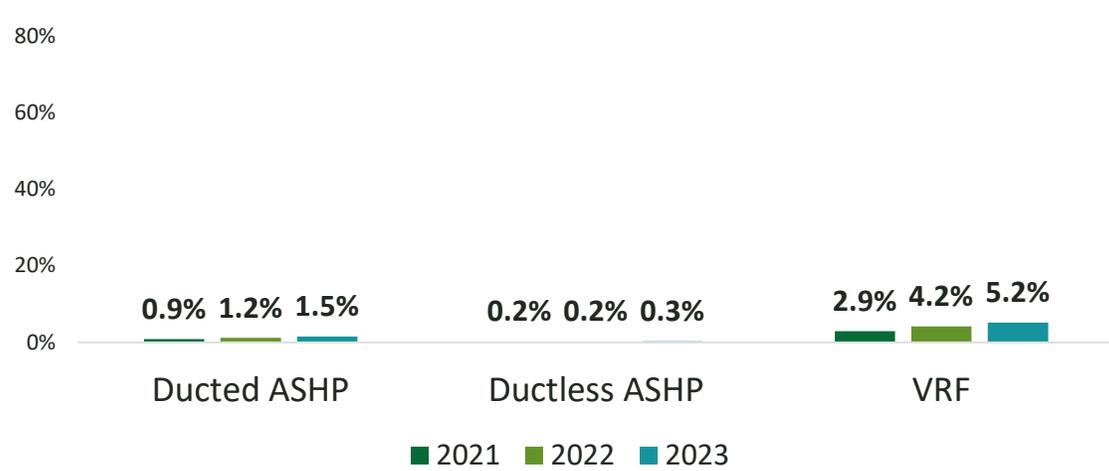


C&I Results



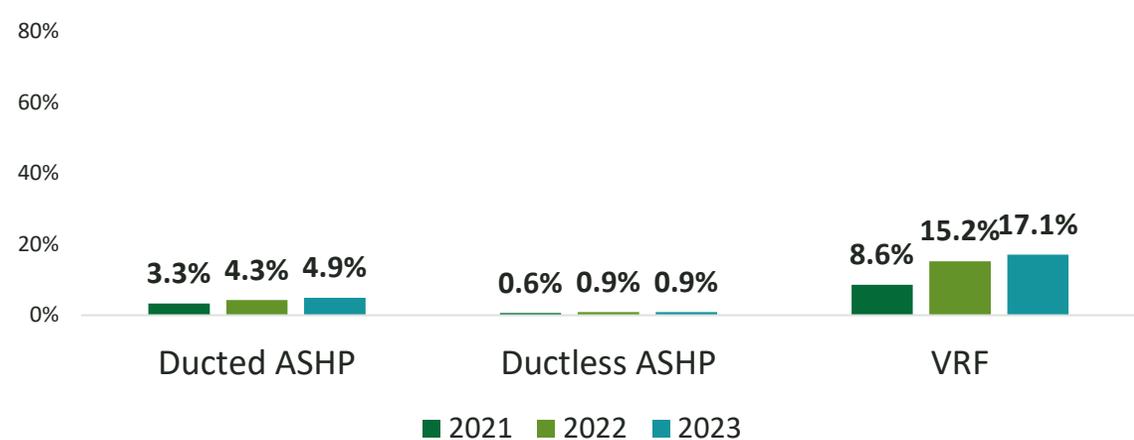
MA C&I Heating & Cooling Market Shares 2021 - 2023

Percentage of C&I Heating Capacity at 47°F

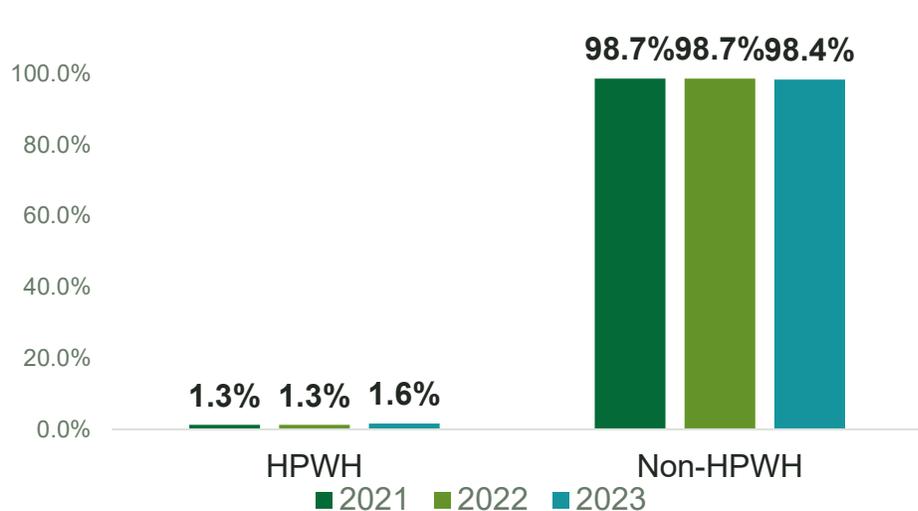


- HPs remained a relatively small portion of the MA commercial heating & water heating markets from 2021 to 2023

Percentage of C&I Cooling Capacity



Percentage of C&I Water Heating Capacity



Program Influence on C&I HP Adoption; C&I HP Prices

- Findings provide some support for attribution of C&I market changes from 2021 to 2023 to Sponsors' support for C&I HPs, but evidence is weaker than for residential
- Based on C&I customer reports, HP installation costs appear to have increased by ~50% from 2021 to 2023
 - Substantially more than the 17% inflation rate in this period
- Customers who installed program-supported HPs reported paying on average more than those who installed program-supported fossil-fuel-fired space heating

Conclusions

- Studies continue to show early evidence of effectiveness of MA's HP MT efforts
- Substantial impediments to HP adoption remain
 - Electricity prices higher than gas
 - Loss of IRA funding
 - Federal administration stance on climate change
 - HP equipment prices rising faster than inflation or competing equipment
- Ongoing need for state & local program support for electrification
- New heat pump market effects & invoice studies delve into the causes of additional barriers
 - Sources of HP price changes
 - Insights into drivers behind changes in HP equipment and installation costs
 - Effects of tariffs on business practices
 - Feedback on program changes meant to facilitate electrification
- Studies offer insights, tools, and resources for other jurisdictions