# Northeast High-Performance HVAC Market Assessment Report

MAY 2025

## Table of Contents


**Acknowledgments** ..... **2**
**About NEEP** ..... **2**
**Executive Summary** ..... **3**
**Introduction** ..... **6**
**Methodology** ..... **7**
**Market Characterization** ..... **8**
Key Market Actors for the Northeast Region ..... 8
Current Northeast Program Summary ..... 11
Size of Northeast Residential Air-Source Heat Pump Market ..... 19
Key conclusions: ..... 21
Northeast Air-Source Heat Pump Installed Costs ..... 22
**Opportunities to Advance the Residential Air-Source Heat Pump Market** ..... **26**
Promote a broad range of ASHP applications ..... 26
Improve the economic value proposition for ASHPs ..... 29
Drive customer demand and satisfaction ..... 32
Grow and enhance the region's workforce ..... 34
Refine ASHP program design ..... 40
Plan effectively for complementary policies and regulations ..... 43
**Conclusion** ..... **45**
**Appendices** ..... **46**
Appendix A: Survey and Interview Questions ..... 46
Appendix B: Methodology used to generate estimated HVAC sales data ..... 51
Appendix C: Table of Northeast Energy Efficiency Residential Heat Pump Program Offerings ..... 55

## Acknowledgments

This report reflects the invaluable contributions of multiple individuals.

We would like to recognize the report's lead authors, Jeff Luoma, Manager, Technology Market Transformation with NEEP, and members of Slipstream: Jon Koliner, Director of Research and Innovation, Justin Margolies, Senior Product Developer, and Sophia Seol, Researcher II. Several NEEP staff served key roles in this report's development, including Erin Cosgrove, Director of Policy and Programs, Dave Lis, Director of Technology Market Transformation, and Lisa Cascio, Director of Communications and External Relations. Editing was provided by Krysia Wazny McClain of Owl Eye Edits and formatting by Marianne Michalakis, designMind.

NEEP would like to recognize and thank the key market actors, including many that participate in NEEP's Heating Electrification Initiative, interviewed for their input in creating this document. Individual stakeholder names have been withheld in this report to help ensure candid interview responses.

Thank you also to the document reviewers for their participation in reviewing this report and providing input.

## About NEEP

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industries, and communities. Our vision is to transform the region's homes, buildings, and communities into efficient, affordable, and resilient places to live, work, and play.

Disclaimer: NEEP verified the data used for this white paper to the best of our ability. This paper reflects the opinions and judgments of the NEEP staff and does not necessarily reflect those of NEEP Board members, NEEP Sponsors, or project participants and funders.

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## Executive Summary

The residential heating, ventilation, and air-conditioning (HVAC) market in the Northeast U.S. has shown signs of transition toward high-performance equipment. The air-source heat pump (ASHP) market has seen marked growth over the past decade. From 2013 to 2021, the region composed of New England states and New York saw a nearly 400 percent increase in ASHP sales. Various market influences have driven this growth, including increased customer and contractor awareness, expansion of energy-efficiency programs, and shifts in state-level policies.

Northeast Energy Efficiency Partnerships (NEEP) partnered with regional stakeholders through its regional initiative to develop an updated ASHP market assessment for the Northeast and to explore how best to leverage the region's existing infrastructure to grow the market. NEEP's region includes Connecticut, Washington, D.C., Delaware, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia.

NEEP conducted research and interviews with key regional stakeholders involved with the high-performance HVAC market, including program administrators, manufacturers, distributors, and other subject matter experts. This report focuses on the ASHP market for single-family residences' partial and whole home space heating applications. We researched promotional program components and activity, the regional heat pump market size, and installed cost data. Unfortunately, no known data source of timely, geographically specific HVAC sales is publicly available. In the absence of current state or regional-level sales data, the research team developed estimated sales for the Northeast region.

**Key findings from the residential ASHP market characterization include the following:**

### Market size

- In recent years, estimated ASHP sales in the Northeast have outperformed the national market. Regional sales are estimated to have risen 12 percent from 2021 to 2023 (408,000 to 458,000 units), while national ASHP sales declined 8 percent over the same period (3,916,766 to 3,616,632 units).
- The combined regional HVAC market (ASHP, furnaces, boilers, central air conditioners) contracted between 2021 to 2023 from approximately 1,653,715 units to 1,421,632 (14 percent decrease). The national market contracted from 14,247,493 to 11,668,809 units (18 percent decrease). Manufacturer responses suggest that this decline has been driven by a few key macroeconomic factors related to the COVID-19 pandemic including supply chain disruptions, inflation, and high interest rates, leading to lower customer spending.
- Estimated 2023 heat pump sales in the region represent a 32 percent of residential HVAC equipment sales. This was an increase from 25 percent in 2021.
- The region should work collectively to address the lack of timely HVAC sales data.

### Program landscape

- The larger utility or state-run energy-efficiency programs in the region have some form of residential heat pump financial incentive, though amounts vary considerably. For example, market-rate incentives vary between $240 and $10,000 per residence.
- Some larger regional programs have considerably higher incentives for heat pump installations addressing whole home heating versus only adding partial heating to a building.
- Program administrators have been adjusting their rebate structure from “per capacity” or “per ton” to
- “per project” to discourage oversizing equipment and to simplify applications.
- Comprehensive home upgrade programs for low- and moderate-income (LMI) residents are increasingly offering heat pumps in addition to weatherization measures.

### Installed costs

- Whole home ASHP systems, both centrally ducted and ductless, cost $20,000 on average to install. Single-zone ductless systems cost $7,500 on average. Both have wide cost ranges primarily due to difficulty or ease of installation, equipment size, and factors such as the varying needs to upgrade electrical systems or modify ductwork.
- Prices have increased over the past few years due to various factors, including higher labor and equipment costs. Refrigerant transitions and manufacturing changes are part of the reason for higher equipment costs.

**Key opportunities to grow the regional market**

The paper also discusses opportunities for larger-scale adoption of residential heat pumps in the Northeast and provides strategies to expand and improve adoption. Strategies include the following:

### Promote a range of ASHP applications

- Both whole home and partial displacement ASHPs present significant opportunities for growth and need additional support.
- New construction and gut rehabilitation projects present compelling value propositions.
- Air-to-water heat pumps offer region a potential “drop-in” solution for hydronically heated homes.

### Improve the economic value proposition for ASHPs

- Target customers with high economic value propositions (existing delivered fuel/electric resistance customers, one-way air-conditioner replacements).
- Consider community or customer group ASHP purchases and bundling installations.
- Support financing opportunities.
- Consider electric rate structures that can improve the operational economics of heat pumps.
- Improve both upfront and operational cost transparency for customers.
- Leverage other assistance programs.

### Drive customer demand and satisfaction

- Deploy customer education through diverse marketing and engagement strategies.
- Ensure customer outreach is adaptable and strongly incorporates feedback.

### Grow and enhance the region's workforce

- Deepen collaboration on installer training and education with manufacturers and distributors.
- Foster strong partnerships with educational institutions and training providers.
- Recognize and drive the development of firms with business models oriented around ASHP installs.
- Expand the pool of businesses supporting design, sizing, and equipment installation.
- Influence contractor ASHP sizing practices.
- Drive quality installations.
- Adopt recommendations from NEEP's forthcoming *Workforce Development Best Practice Guide*.

### Refine program design

- Align and simplify rebate qualifications and ensure consistent incentive availability.
- Carefully consider midstream incentive programs.
- Differentiate program incentives by heating load offset and efficiency metrics rather than basing differences on ducted vs ductless.
- Simplify program participation and ensure safeguards for LMI customers.
- Establish measures to avoid whole home heat pump rebates going toward partial displacement projects.
- Integrate supply chain feedback into program design refinements.
- Promote partnerships and funding for inclusive local community engagement and support.
- Adopt recommendations from NEEP's forthcoming *Program Best Practice Guides*.

### Plan effectively for complementary state policy and regulation

- Provide market certainty with market targets.
- Develop timely reporting structures and data availability for heat pump sales.
- Ensure robust engagement of stakeholders during the development of new policies and regulations.
- Provide an appropriate runway for market actors to prepare for new/enhanced regulations.
- Seek consistency with regional partners (states and programs) to ease regulatory compliance.

This assessment shows that while many barriers to widespread ASHP adoption persist in the Northeast HVAC market, progress is being made and clear opportunities for regional stakeholders remain. Increasing ASHP market penetration is attainable if the region continues to invest in and implement the kinds of market strategies outlined in this report.

NEEP partners with other stakeholders in the region to provide platforms to facilitate this collaborative action across states, program administrators, industry leaders, and other key actors. This assessment can be used as a springboard for enhanced action and partnership.

## Introduction

Since 2013, Northeast Energy Efficiency Partnerships (NEEP) has facilitated a regional initiative across 12 Northeast and Mid-Atlantic states and Washington, D.C., to accelerate uptake of heat pump systems for space heating and cooling. Several strategies have guided the long-term initiative, and recent progress reports (2022, 2021, 2020) have provided assessments and input into near-term opportunities.

In those years, the air-source heat pump (ASHP) market has seen marked growth. From 2013 to 2021, the New York and New England region saw a nearly 400 percent increase in ASHP sales.[1] Various market influences have driven this growth, including increased customer and contractor awareness, expansion of energy-efficiency programs, and shifts in state-level energy and climate policies.

In 2024, 10 states plus Washington, D.C., committed to increasing heat pump adoption through the Accelerating the Transition to Zero-Emission Residential Buildings Memorandum of Understanding (MOU)[2], led by Northeast States for Coordinated Air Use Management (NESCAUM). The MOU sets a target for heat pumps to make up at least 65 percent of residential-scale heating, air-conditioning, and water heating shipments by 2030 and 90 percent by 2040 across the participating states. Seven of the 11 jurisdictions involved are in the Northeast.

Against this backdrop, NEEP partnered with regional stakeholders to explore how best to leverage this existing infrastructure and momentum by developing an updated ASHP market assessment for the region. This market assessment identifies key opportunities for continued market growth.

### Market Assessment Intent

This assessment intends to evaluate the status of development in the Northeast residential ASHP market by characterizing its current state and clarifying opportunities for the region to boost ASHP market growth.

Building on previous NEEP research, this Northeast market assessment characterizes the current residential heat pump market via primary and secondary source research. It focuses most heavily on residential air-to-air heat pumps and includes some insights into the promising residential air-to-water heat pump market. This report does not address heat pump water heaters.

The assessment focuses on the following objectives:

1. Characterize **key residential heat pump market actors**
2. Summarize **program activity** supporting high performance ASHP technology
3. Estimate the **current size** of the Northeast residential heating market met by ASHP technology and the proportion of the market served by ASHP equipment
4. Estimate **installed costs** for ASHP systems in the Northeast
5. Outline **opportunities** related to accelerated ASHP adoption

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[1] NEEP. 2022. Northeast/Mid-Atlantic Heating Electrification Market Transformation Progress Report. Available at https://neep.org/sites/default/files/media-files/2022_market_transformation_progress_report.pdf.

[2] NESCAUM. 2024. "Building Electrification." Available at https://www.nescaum.org/our-work/stationary-sources/building-electrification.

## Methodology

### Research

This assessment used primary and secondary data sources and quantitative and qualitative data. Primary data sources included direct surveys and interviews with key market actors such as energy efficiency program managers, distributors, and manufacturers. NEEP also gathered feedback on current market conditions during a "Day Zero" session at its annual in-person summit in June 2024. The session was open to members of NEEP's Working Groups.[3]

### Interviews

Table 1 summarizes the categories of market actors interviewed and surveyed for this report. Interviewed organizations were sent a survey link to answer some of the more quantitative data requests to enable the most effective use of time and focus on larger picture conversations. Survey and interview questions are noted in *Appendix A*.

**Table 1.** ***Market actors surveyed and interviewed***

| Market actor category | # Interview respondents | # Survey respondents |
|---|---|---|
| Utilities/Program Administrators | 10 | 8 |
| Manufacturers | 5 | 2 |
| Distributors | 1 | 0 |
| ASHP Contractors | 5 | 0 |
| Community-Based Organizations | 5 | 0 |

### External Review

NEEP offered several of our interviewees and other regional subject matter experts the opportunity to review and comment on the report and incorporated their feedback into the final version.

[3] NEEP. "Heating Electrification Initiative Subscription Details." Available at https://neep.org/heating-electrification/heating-electrification-initiative-subscription-details.

## Market Characterization

The following section characterizes several current ASHP market conditions, including a description of current ASHP market actors, incentive program activity in the region, the size of the ASHP market, and installed costs for ASHPs.

### *Key Market Actors for the Northeast Region*

Below are key ASHP market actors for the Northeast region. These actors have tremendous influence over the current and future HVAC market. Most of these actors interact with one another, creating a web of diverse interrelationships.

#### Manufacturers

Residential heat pump manufacturers, or original equipment manufacturers (OEMs), typically produce a variety of heating, ventilation, and air-conditioning (HVAC) equipment, including heat pumps, but some are solely focused on heat pumps. They almost always offer multiple mechanical equipment systems to match varied residential situations and needs more precisely. Most companies offer both ducted and ductless systems as well as commercial units. These manufacturers often offer other appliances and heating/cooling equipment under one or more brands.

Manufacturers have increasingly been vertically integrating their business models by acquiring businesses such as distributors. Contractors are often very loyal to a certain manufacturer/brand. Manufacturers typically engage in outreach on a regional-to-national level. Several manufacturers sell heat pumps under other brand names within an overarching company.

> *Manufacturer examples (among many):* Bosch, Carrier, Daikin, Fujitsu, Gree, Johnson Controls, Lennox, LG, Mitsubishi Electric, and Panasonic.

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) is the primary HVAC equipment manufacturers trade association.

#### Distributors

Distributors sell manufactured products in the wholesale marketplace. There are hundreds of distributor locations throughout the Northeast. Contractors can access products through distributors as they need and often use distributors for advice, with distributors serving as liaisons between manufacturers and contractors.

Distributor locations often serve as a meeting point for training, promotional programs, and meet-up sites for those involved with other aspects of construction or retrofits (architects, owners, engineers, and those involved with codes and performance). Distributors may also provide contractor credit for purchases. They coordinate with manufacturers on marketing and information to best position sales. Distributors may also sell heat pumps to builders and larger retail stores.

> *Regional distributor examples (among many):* ABCO, Carrier Enterprise, Emerson Swan, Ferguson, F.W. Webb, Johnstone Supply, and N&S Supply.

Heating, Air-conditioning, and Refrigeration Distributors International (HARDI) is the primary trade association of HVAC distributors.

### Retailers

Currently, most permanently installed heat pump purchases and installations go through distributors and contractors. Some split heat pumps are now being designed for relative ease of installation, aka "DIY" (do it yourself). Larger "big box" retailers now sell these smaller space heating units. Depending on the relationship between retailers and manufacturers, these units may or may not pass through a distributor. The potential effects of this supply chain adjustment on the quality of installation, refrigerant loss, and overall net effect on efficiency and emissions are not yet known.

Retailers handle other heat pump equipment, such as small plug-in portable and wall-mounted heat pumps, heat pump hot water heaters, and heat pump clothes dryers. These smaller, self-contained heat pumps have significantly fewer concerns for installation and refrigerant handling and are usually sold straight to customers. As heat pump technology increases the options for self-contained, plug-in equipment, we can expect this retail market to expand.

*Regional examples*: Lowe's and Home Depot

### Contractors

Contractors represent the "front line" in the ASHP marketplace. Contractors are typically responsible for the sale, installation, maintenance, and service of heat pumps. Given the complexity of most installations and the need for specific skills, contractors are critical for the success of heat pump uptake. They are often the primary and most credible source of information for customers, and contractors often cultivate customers as repeat business for maintenance, replacements, and referrals.

Many contractors offer HVAC services for fossil fuel heating systems and air conditioners, as well as installing and servicing ASHPs. Company sizes range from one person to hundreds of employees. There are many thousands of contractors in the Northeast region. Education and capacity-building for contractors are key to reaching goals for grid resilience and cost savings.

Installation contractors are also augmented by other contractors involved with preparing customers for heat pump use, including electricians, home energy assessors, and weatherization and comprehensive envelope-improvement companies.

Air Conditioning Contractors of America (ACCA) is the prominent trade association of ASHP contractors.

### Customer

This key market actor category comprises residents who have acted or are acting on plans to install heat pumps in a single-family or small multifamily (two-to-four-unit) home. Awareness, interest, and practical financial management strategies for customers are essential for regionwide heat pump uptake. Homeowners and residents may be particularly open to education on heat pump options at various times, such as when an HVAC appliance fails or needs replacement, and during or shortly after purchasing a new home. Key motivators for

customers are consistent reliability of their HVAC system, comfort, price of installation, and operational costs.

Various outreach efforts can be used to educate and persuade customers: utilities can contact them as account holders to offer incentive programs, retailers within a state or region can market to them, or contractors can educate them about various options. Customers can also play a very important influential role in educating friends and family by sharing their thoughts and experiences.

### National/State/Local Policymakers

Energy and climate offices at the national level [e.g., U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA)] and state level [e.g., New York State Energy Research and Development Agency (NYSERDA)] set policies and programs that seek to encourage the uptake of energy-efficient building systems. Most states also have long-standing energy-efficiency incentive programs to support adopting certain measures, including ASHPs. These programs are considered one of the key funding sources to assist customers in adopting ASHPs.

Local policies in some municipalities opt to set higher standards than the state would otherwise require and serve as examples of forward-thinking governance.

### Energy-Efficiency Program Administrators

Ratepayer-funded energy-efficiency programs exist in every state in the region. These programs aim to promote the adoption of high efficiency products and practices in homes, buildings, and industries. Programs often achieve this through financial incentives, marketing, education, etc. In the Northeast, programs are administered commonly by electric and gas utility companies (i.e., ConEd, Eversource, etc.), while some states look to quasi-governmental agencies for administration (i.e., Efficiency Vermont, Efficiency Maine). Programs and their administrators are critical players in helping to support the adoption of high efficiency technologies like ASHPs.

### Community-Based Organizations

A community-based organization (CBO) is typically a non-profit entity operating within a specific community or geographical area. It aims to address local needs and improve the well-being of its residents. CBOs typically focus on local community issues, such as health care, education, social services, housing, and community development.[4]

CBOs are increasingly important market actors in providing information and assistance to customers, particularly in helping them gain access to affordable energy solutions. State and local governments often partner with CBOs for their local market expertise, trust within their communities, and ability to mobilize their networks.

Assessing their HVAC, home, and financial situation can often overwhelm residents. CBOs can educate and help residents navigate the decisions and points of action along the way. Particularly for lower-income residents,

CBOs can provide invaluable “concierge” service to enable housing upgrades by assisting a homeowner or

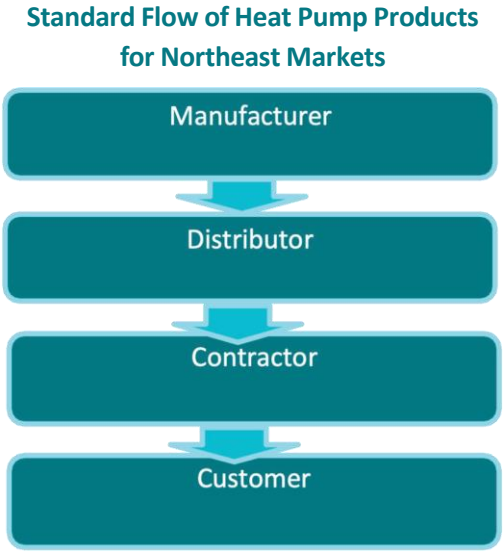
[4] PublicInput. “What Is a Community-Based Organization (CBO)?” Available at https://publicinput.com/wp/dictionary/what-is-a- community-based-organization-cbo/#:~:text=CBOs%20typically%20focus%20on%20issues,churches%20and%20immigrant%20support%20centers.

decision maker along the decision path from initial interest through installation and even post-installation follow-up to help assure smooth work and effective results.

*Examples include Clean Energy Hubs [5] in New York and ABCD[6] in Boston.*

Figure 1 illustrates the typical flow of heat pump market products.

**Figure 1.** ***HVAC Supply chain.***




## *Current Northeast Program Summary*

This section summarizes and analyzes the regional incentive program offerings focused on utility-level and state-level programs. A table detailing incentive programs as of September 2024 is included as *Appendix B: Table of Northeast Energy Efficiency Residential Heat Pump Program Offerings*. This assessment discussion is based on a snapshot of programs as of the summer 2024.

Incentives do and will change regularly. All programs adjust as they develop, particularly at established re-evaluation points such as the end of multi-year program plans. Some programs have abbreviated timeframes at the outset, and some programs with more limited funding may suspend or discontinue services when incentive funds are spent down quickly.

[5] NYSERDA. "Regional Clean Energy Hubs." Available at https://www.nyserda.ny.gov/All-Programs/Regional-Clean-Energy-Hubs.

[6] Action for Boston Community Development. "ABCD Homepage." Available at https://bostonabcd.org.

The research team compiled 19 heat pump incentive programs for residential customers across states and utilities in the Northeast and Mid-Atlantic (See Figure 2 for the region addressed). This report will reference Washington, D.C., as an entity alongside other states. This assessment did not consider some smaller local municipal utilities or electric cooperatives in the region.

Energy utilities administer most of the region's market-rate ASHP incentive programs. In most states, utilities have been directed to implement efficiency programs. Maine and Vermont (Efficiency Maine and Efficiency Vermont) are two examples of programs run by "energy-efficiency utilities" (entities appointed by the state to deliver energy-efficiency and conservation programs and measures).

**Figure 2.** ***Northeast and Mid- Atlantic states considered in assessment; includes D.C.***

Most Northeast heat pump incentive programs offer discounts directly to residents upon installation, or in some cases, through contractors to customers. Currently, incentives are heavily weighted toward customers, with occasional incentives included for participating contractors. Only a few current ASHP incentives for space heating were found for distributors, although such incentives have been considered to encourage distributors to stock and promote options. Efficiency Vermont and Mass Save both offer distributor incentives. Some programs have incorporated discounts or rebates at point-of-sale (e.g., lighting or ASHP water heaters), but this has not yet been extended to include space heating appliances.

The following explanation and discussion follow the order of data presented in *Appendix B: Table of Northeast Energy Efficiency Residential Heat Pump Program Offerings.*

### States with single-family residential ASHP incentive programs

Within the 12 regional states and Washington, D.C., all larger utility or state-level programs have some form of residential ASHP incentive for single-family residences.

### Predominant amounts, incentive ranges, and units of measure

The predominant basis of residential heat pump incentives (either whole home or partial) in a state is shown in Table 2. Currently, the most popular type of rebate offered is "per residence." A few programs refer to "per project," which implies the same idea of one main installation to upgrade a residence. The incentives offered vary widely, however, between a modest $150 per outdoor unit and $10,000 per residence for market-rate customers. This range does not include potential income-eligible additional incentives. Some areas in the region, such as portions of Pennsylvania and Maryland, have few to no incentives outside income-eligible programs.

Table 2. Predominant incentive basis for market-rate customers

| Predominant incentive measure | States predominantly using that measure | Incentive range: *Typical amount* | Approx. % regional pop. |
|---|---|---|---|
| Per residence/per project | DE, MA, ME, NY (ConEd), WV | $240 to $10,000: *$2,000* | 40% |
| Per equipment cooling capacity | CT, MD, NH, NJ, RI, VT | $150 to $2,000 per ton: *$350* | 25% |
| Per equipment heating capacity | NY (Clean Heat) | $500 to $1,600 per 10k BTU: *$1,000* | 15% |
| Per outdoor unit | DC, PA | $150 to $700: *$375* | 20% |

### Residential units as a metric for rebate amounts

Using "per residence" (or "per project") as the basis for a heat pump rebate has become more popular in recent years. This structure offers simplicity for program administrators and removes motivation for contractors to upsize or oversize systems for more incentive money. Potential disadvantages include at least two: 1) Owners of larger buildings would presumably receive a lower incentive as a percent of overall installation cost and may be less inclined to participate. 2) There may also be pressure for contractors to undersize installed heat pump equipment to offer a better "value" for the rebate provided. (As with any other installation proposal, whether or not incentives are involved, a few contractors may reduce the quality of design, installation, or product to offer a lower initial price.) Program checks and balances can help lessen disadvantages by considering tiered building categories such as building size, building use, and/or existing building conditions, as well as having adequate quality assurance and training for contractors.

### Equipment cooling capacity as a metric for rebate amounts

Cooling capacity has long been the most common way for the industry (e.g., manufacturers, contractors) to describe the "size" of an ASHP. ASHP cooling capacity (measured at 95°F) is often the same or very close to the system's heating capacity at 47°F. Many programs continue to rely on this metric to gauge the size of the heat pump and the subsequent incentive amount.

### Equipment heating capacity as a metric for rebate amounts

Equipment heating capacity most accurately reflects the equipment's capacity to meet heating loads during the coldest winter periods. Using it to determine incentive amounts can reinforce the focus on low-temperature heating capacity as an essential equipment metric for cold-dominated regions.

There is, however, potential for misunderstanding by both contractors and customers whether cooling or heating is used to determine rebates or incentive amounts. Thinking "more is better" is a misconception for heat pumps that promotes oversizing problems. If rebates provide larger incentives for larger equipment, seeing a larger available rebate for larger-capacity equipment may inadvertently promote oversizing. Sizing training for contractors, customer education, and quality assurance checks can ameliorate that issue.

### Differentiating ducted versus ductless equipment

*Ductless heat pumps* typically refer to one-to-one outdoor condensers to indoor heat exchanger units. (Ductless may include units with short duct runs.) Ductless can also refer to multiple indoor ductless units coming from one outdoor unit. *Ducted heat pumps* typically refer to a heat pump installation that covers the majority to all the house's heating and cooling loads with one larger outdoor condenser and one primary heat exchanger and that uses ductwork to heat or cool most or all of a house. Almost all programs allow either equipment type to be installed to obtain the same rebate amount. Rhode Island and Vermont incentivize both but offer higher rebates for ducted systems, as ducted system installs oftentimes require more labor and materials to adjust ductwork so the heat pumps can operate most effectively. ASHP ducted system installations are generally associated with whole home heating replacement projects, but ductless systems are also installed to meet whole home heating needs.

### Eligibility for rebates related to customers' existing fuel type or heating system

The overwhelming majority of programs do not restrict the existing fuel used or the existing type of heating system. A few exceptions include (1) limiting fuel switching situations to non-regulated fuel users (e.g., propane, wood, and coal) and (2) promoting additional rebates for or only incentivizing electric resistance heat replacement. Non-regulated fuels (such as propane, wood, and coal) are often cited as generally having better economic savings potential through replacement with heat pumps.

### Rebate tiers for partial versus whole home heating

Several incentive programs in the region offer different rebate amounts depending on whether the ASHP is sized to meet all of a home's heating load ("whole home") or only a portion of a home's heating load ("partial"). Heating loads are the amount of heat needed at a home's design temperature conditions. The Air-conditioning Contractors Association's (ACCA) Manual S directs that heating equipment provide 90-120 percent of a home's heating load.

Rebate programs with simpler structures typically offer the same rebate amounts for equipment regardless of whether it conditions the entire home (whole home heating) or just a portion of it (partial heating), so there is no extra incentive to address the heating needs of the whole house with one project.

Whole home projects can greatly reduce or eliminate the use of secondary heating systems. Addressing whole home heat pump retrofits may advance a state toward its energy and air-quality goals more effectively through higher impact, higher savings projects.

Massachusetts offers rebates for both whole home and partial displacement installations, although the incentives favor whole home installations. New Jersey (Orange & Rockland Utility) and NH Saves take a similar approach, offering more favorable incentives for whole home installations. Maine and New York are currently *only* offering rebates to whole home projects, having moved away from prior programs that incentivized partial load installs.

### Performance specifications

Performance specifications indicate what level of performance qualifies a piece of equipment for program incentives. This could be very simple (for example, a heat pump is legal to sell in the United States) or sophisticated (for example, a list of heat pumps that meet energy-efficiency requirements for operating well in cold winter conditions). Performance specifications are ideally set at the level that promotes appropriate

equipment selection for the relevant market and the efficiency goals of the program. Establishing performance specifications helps ensure incentives go toward realizing energy savings, meeting pollution reduction goals, and providing customer comfort and satisfaction. Specifications are based on many considerations: supply chain availability, demographics, costs, heat pump uptake rates, available tax credits, and what the market is already installing as a standard, among other things. Programs will adjust specifications, but they tend to change slowly. Table 3 shows aggregated performance specification criteria for programs in the Northeast region (as of 2024).

**Table 3.** ***ASHP Performance specifications required by regional programs***

| Performance specification criteria | States that typically use criteria *[approx. % of pop]* |
|---|---|
| NEEP Cold Climate Air-Source Heat Pump Specification V4.0 | NY, NJ, RI, VT [45%] |
| ENERGY STAR V6.1 Cold Climate Program Requirements for Central Air Conditioner and Heat Pump Equipment | CT, MA [16%] |
| Consortium of Energy Efficiency (CEE) North and Canada Tier | ME [2%] |
| Other Criteria set by program – Combinations of SEER, SEER2, HSPF, HSPF2, EER, EER2, COP@5 | MD, NH, RI, DC, PA, DE, NJ, WV [36%] |

### Incentive recipient

For all the incentive structures considered for single-family homes, the incentive recipient is the homeowner/ account holder. With homeowner/account holder approval, most programs allow some occasional flexibility in who receives the incentives with the approval of the initial recipient (e.g., a family member or non- profit pays for the installation and then receives the rebate). New York offers bonuses to contractors per project to incentivize projects and to cover additional expenses resulting from documentation and rebate application processes. Other regional programs—especially those with higher incentives—may also offer modest contractor participation bonuses.

### Integrated controls

Several programs in the region offer ASHP incentive tiers that require the installation of integrated controls designed to manage operation of the ASHP in conjunction with a secondary heating system. Some customers struggle to operate two separate heating systems effectively, especially when the operation of the two systems can depend on outdoor conditions. Programs with integrated control requirements have created definitions and lists of qualified products (i.e. Mass Save, New York utilities). Several programs in the region require or incentivize ICs as part of ASHP projects, including Massachusetts[7], New York,[8] [9] and Connecticut[10]. These programs specify certain IC models that have shown acceptable interaction with high efficiency heat pumps.

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[7] Mass Save. "Integrated Controls." Available at https://www.masssave.com/residential/rebates-and-incentives/heating-and- cooling/integrated-controls.

[8] NYSERDA. New York State Clean Heat Program Manual. Available at NYS CH PM_Sept_01_2024_FINAL (1).pdf.

[9] PSEG Long Island. "Frequently Asked Questions." https://www.psegliny.com/saveenergyandmoney/homeefficiency/homecomfort/heatpumps/faq#%3A~%3Atext%3DYes!%2Cused%20in%20such%20extreme%20conditions.

[10] EnergizeCT. "Residential Air Source Heat Pump Incentive." Available at https://energizect.com/rebates-incentives/heating- cooling/heat-pumps/residential-air-source.

### Decommissioning existing HVAC

Decommissioning the pre-existing HVAC system as part of a whole home heat pump installation typically involves either removing the HVAC unit and associated fuel storage or rendering it inoperable. It provides a high level of assurance that energy-efficiency targets will be met for that residence. Currently in the region, New York and Massachusetts programs either require or offer significantly higher rebates for decommissioning the pre- existing HVAC in a residence. There is still debate, regionally and nationally, over the relative efficacy of how and when to require—or more highly incentivize—the removal or disabling of a secondary heating system. Leaving secondary systems in place can result in residents continuing to use low efficiency alternatives.

### Envelope improvement incentives associated with heat pump installations

As of the writing of this report, most market-rate incentive programs in the region do not have substantial envelope improvement incentives directly associated with heat pump installations. To meet energy-reduction targets and consider other opportunities, some state and utility programs may soon opt to strengthen co-promotion efforts (or develop stand-alone programs where they do not exist). New York's Comfort Home program is a good example of a program focused strictly on weatherization and envelope improvement, offering up to $4,000 in load reduction measures. The program repeatedly encourages participants to consider heat pumps as a next step or to coordinate their installation at the appropriate time.

In addition to Weatherization Assistance Programs (WAP) available in every state, there are regional examples of weatherization assistance that can coordinate with heat pump improvements. Massachusetts has a significant associated weatherization program for income-eligible customers that is often used in conjunction with funds for heat pump installations, and New Jersey also has low- and moderate-income (LMI) assistance for weatherization. Connecticut, Delaware, New Hampshire, Pennsylvania, and Rhode Island have modest bonuses for specific envelope improvements. WAP agency programs and additional weatherization programs that are beginning to incorporate heat pump installations are outside the scope of this market assessment. However, NEEP will soon release a report titled "Co-promotion of Weatherization and Heat Pumps in Programs – Best Practice Guide" (anticipated for publication in May 2025) as one of several resources NEEP has developed on heat pumps and programs in the Northeast.

### Qualified contractor or distributor network

Most states (75 percent) operate a qualified contractor network for their heat pump rebate programs, awarding rebates only for projects that use contractors from the network. Qualification requirements vary by program and range from merely offering proof of a legal business to providing associated required certifications and signing a program agreement. Some extend participation requirements to various levels of additional educational and training requirements, such as heat pump sizing and design training, and building load determination. Generally, programs with higher rebate amounts contain more stringent contractor requirements. For estimates of the numbers of contractors in various programs, see Table 4. (Weatherization and home energy auditor counts in programs are included for reference.)

**Table 4.** ***Regional contractor counts within contractor networks***

| Program type | Contractor counts in programs |
|---|---|
| Total programs with heat pump contractor networks | 16 of 19 regional programs (75 percent) |
| Total contractor count for heat pump space heating/cooling programs | 6,600 (avg. 430/program) Programs vary between 6 and more than 2,000 |
| Total contractor count for weatherization-related contractors | 271 from 9 programs (avg. 30/program) |
| Total contractor count for home energy auditors | 137 from 7 programs (avg. 20) |

*Data from programs' online contractor search tools. It does not necessarily include CAP or WAP program contractors or employees.*

Participating contractors within a network may or may not use rebates in their customer transactions. Estimates range from 50 to 90 percent of the contractors in-network being actively involved and submitting rebates on a quarterly basis. Having a contractor network does not ensure a quality installation, but it does put in place a structure where problematic contractors can be removed from the network. Some interviewees noted that there are fewer customer complaints and more consistent quality installations when a program has an active network.

New York and Massachusetts have the largest number of in-network contractors—approximately 1,500 to 2,000 for both Massachusetts and New York. These totals likely include many less active and inactive contractors. Also, some networks do not distinguish between general HVAC contractors who are participating (or have participated) in fossil fuel HVAC rebates, and those specifically willing and able to install heat pumps.

### Income-eligible offerings for incentive programs

Over half of the region's ASHP incentive programs offer enhanced incentives for LMI residents; enhanced incentives for LMI customers are offered in Delaware, Maine, Massachusetts, New Jersey, New York, Rhode Island, Vermont, Washington, D.C., and West Virginia.

Some states offer additional whole home retrofit programs for income-eligible customers that support heat pump installations, such as Energize Delaware's Assisted Home Performance with ENERGY STAR, New York's EmPower+ programs, and D.C.'s Affordable Home Electrification Program. Through these, residents can receive heat pumps as part of comprehensive weatherization efforts for their homes.

Assistance programs for residents with low and moderate incomes (or who live in areas designated as disadvantaged communities) are essential to making heat pumps affordable to all types of customers. LMI assistance offers benefits to residents who may otherwise not be able to afford them. Efficient heating and cooling can significantly reduce energy bills in many situations, improve home comfort, potentially ameliorate unhealthy or dangerous HVAC issues (e.g., carbon monoxide and other combustion exhaust contaminants or fire concerns), and provide long-term cost savings by making homes more energy efficient. Those with limited capacity to address these improvements on their own often live in buildings that can most benefit from improvements, and improving these buildings contributes to health and environmental benefits by lowering overall energy consumption and local air pollution to which LMI households are often most exposed.[11] LMI households also often spend a disproportionately large share of their income on energy costs compared to higher income households.

Some states also establish program sub-metrics for the number of heat pumps deployed to income-eligible households. For example, the 2025-2027 Mass Save energy-efficiency plan proposes to support heat pumps in over 115,100 households, including over 22,200 LMI households and over 12,900 rental units.[12]

### Year-by-year comparisons of incentive program results

Table 5 and Figure 3 provide historic results from many of the regions ASHP incentive programs, some going back to 2018. Most of the program administrators provided data on rebated heat pumps through their programs from 2021 to 2023. Almost uniformly, the number of heat pumps rebated through programs in New England and New York rose from 2021 to 2023. Massachusetts and New York experienced a decrease in projects from 2022 to 2023, following a national trend, but other states saw modest to considerable increases in incentive participation over the same time.

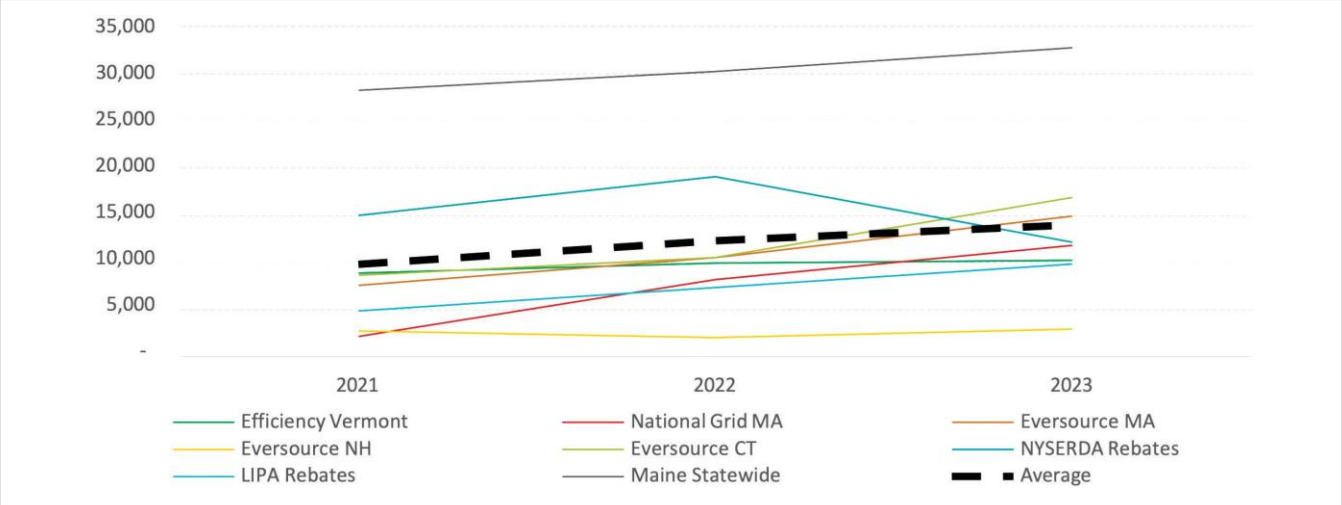
**Table 5.** ***Heat pump project results by year of several regional state-level market-rate programs***

| State | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Data Source |
|---|---|---|---|---|---|---|---|
| **Vermont** | 4,600 | | ~10,000 | ~10,000 | ~10,000 | 11,451 | Link |
| **New York** | | | 5,700 | 21,500 | 29,500 | 26,547 | NYSERDA Clean Heat Annual Reports |
| **Massachusetts** | | 11,038 | 11,545 | 16,434 | 18,363 | 28,273 | Link |
| **Maine** | | | 12,765 | 28,247 | 30,258 | 32,752 | Link |
| **Connecticut** | 3,207 | 4,515 | 5,346 | 9,869 | 9,822 | 21,886 | Link |
| *ASHP, Ducted* | *72* | *42* | *125* | *540* | *1,716* | *11,587* | |
| *ASHP, Ductless* | *3,119* | *4,450* | *5,168* | *9,174* | *7,869* | *9,867* | |
| *GSHP* | *16* | *23* | *53* | *155* | *237* | *432* | |

[11] Jbaily, A., Zhou, X., Liu, J. et al. 2022. "Air pollution Exposure Disparities Across US Population and Income Groups." Nature 601: 228-233. Available at https://doi.org/10.1038/s41586-021-04190-y

[12] MassSave. August 2024. Massachusetts Program Administrators' Update to the April Draft of the 2025-2027 Energy Efficiency and Decarbonization Plan. https://www.masssave.com/-/media/Files/PDFs/August-Plan-Update-and- Response-to-EEAC-July-Resolution-8-15-24.pdf.

**Figure 3.** ***Heat pump project results by year of several regional state-level market-rate programs, 2021-2023***




## *Size of Northeast Residential Air-Source Heat Pump Market*

Quantifying the size of the current residential ASHP market across the Northeast offers stakeholders an understanding of how the market has grown and how large a market opportunity exists going forward. Unfortunately, readily available, comprehensive ASHP sales/shipment data sources do not currently exist.

Understanding that high-quality market data are not currently available, NEEP developed estimated sales (by annual sales) and market penetration (percent of residential HVAC market sales which include ASHP, furnaces, boilers, and central air conditioners). For this analysis, ASHP sales represent numbers of outdoor units (with either single or multi-split options).

### Methodology used to generate regional sales estimates:

NEEP used the following data sources to generate regional sales estimates:

- 2021 HARDI Sales Data (New York/New England), provided by NYSERDA[13]
- New York/New England ASHP program participation trends
  – Table 5 (previously) captures program participation activity in New York and New England states between 2021 and 2023
- AHRI national HVAC shipments (2021-2023)[14]
- Highlights for space heating in U.S. homes by state, 2020, U.S. Energy Information Agency (EIA) Residential Energy Consumption Survey (RECS)[15]

[13] New York State. "HVAC Market Share by Efficiency." Available at https://data.ny.gov/Energy-Environment/HVAC-Market-Share-by- Efficiency-and-Capacity-Begin/tf22-v9nz/about_data.

[14] AHRI. 2024. "Statistics: Historical Data, Monthly Shipments, and Member Reports." Available at https://www.ahrinet.org/analytics/statistics.

[15] EIA. 2020. "Residential Energy Consumption Survey." Available at https://www.eia.gov/consumption/residential/data/2020/index.php?view=state.

See Appendix B for more detail on the methodology used to generate ASHP sales estimates from these data sources.

### Regional HVAC sales estimates

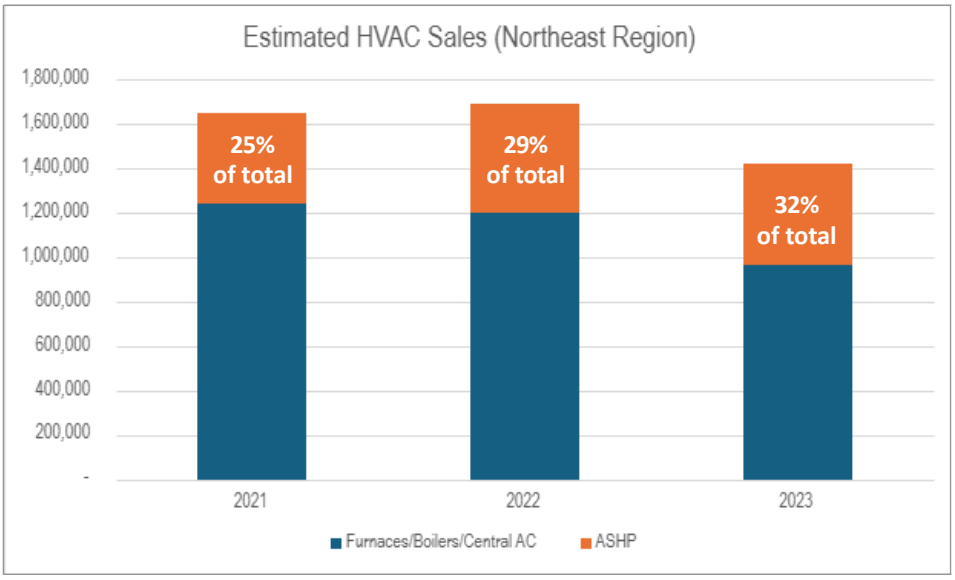
Table 6 provides estimated HVAC sales for the region between 2021 and 2023. HVAC sales include furnaces, boilers, ASHPs and central air-conditioners. ASHP market penetration was calculated by dividing ASHP sales by total HVAC sales.

**Table 6.** ***Estimated HVAC sales in the Northeast Region (2021-2023)***

| | 2021 | 2022 | 2023 |
|---|---|---|---|
| **New York/New England ASHP sales** | 230,095 | 297,127 | 294,052 |
| **New York/New England Total HVAC sales** | 678,411 | 729,159 | 640,483 |
| **New York/New England ASHP Mkt Penetration (ASHP sales/total HVAC sales)** | 34% | 41% | 46% |
| **Mid-Atlantic ASHP sales** | 178,124 | 197,120 | 164,474 |
| **Mid-Atlantic Total HVAC sales** | 975,304 | 965,349 | 781,149 |
| **Mid-Atlantic ASHP Mkt Penetration (ASHP sales/total HVAC sales)** | 18% | 20% | 21% |
| **Northeast ASHP sales** | 408,219 | 494,247 | 458,526 |
| **Northeast Total HVAC sales** | 1,653,715 | 1,694,507 | 1,421,632 |
| **Northeast ASHP Mkt Penetration** | 25% | 29% | 32% |

Figure 4 provides illustration of total HVAC sales across the Northeast region and the portion of those sales made up by ASHPs. Market penetration calculations of ASHP are overlayed.

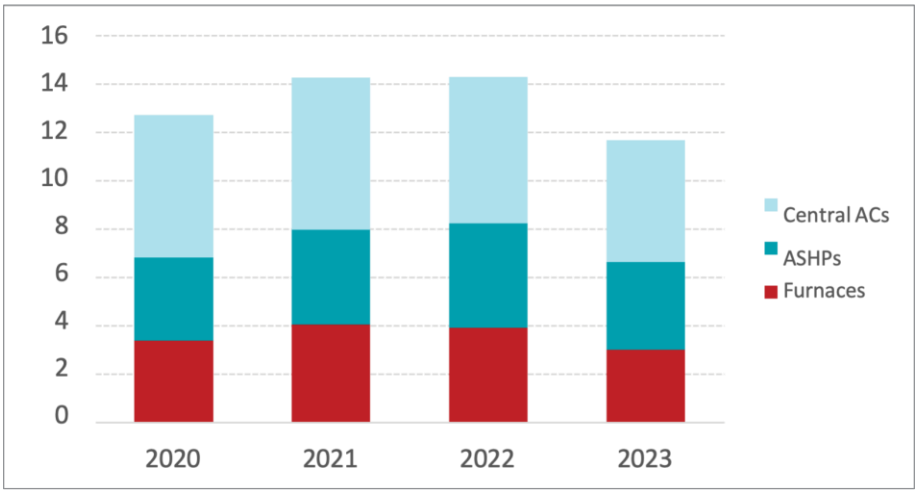
**Figure 4.** ***Estimated HVAC Sales in Northeast region (2021-2023)***



## National HVAC market data

Figure 5 provides a look at national HVAC (furnaces, ASHPs and central air conditioners) shipments according to AHRI. The national market for air-source heat pumps has evolved dynamically in recent years (2021 to 2023). While ASHPs for space heating have increased their market share consistently across those three years, total heating system sales dropped from 2022 to 2023 after eight years of steady increases, as seen in Figure 5. Manufacturer responses suggest that this decline has been driven by a few key macroeconomic factors related to the COVID pandemic, including supply chain disruptions, inflation, and high interest rates, which led to lower customer spending. Manufacturers expressed confidence that the national market-depressing factors would attenuate in 2024 and 2025 and that the national market would resume its upward trend.

**Figure 5.** ***National HVAC Shipment, in millions 2020-2023 (AHRI).***[16]




## *Key Conclusions:*

- Our estimate suggests that annual sales of ASHPs in the Northeast region increased from approximately 408,000 to 458,000 units from 2021 to 2023, a **12 percent increase**. This growth occurred during a downturn in HVAC sales nationally.
- Our overall HVAC market estimate shows that the ASHP market share by units sold has grown from **25 percent to 32 percent** from 2021 to 2023 in the Northeast, compared to 31 percent in the national market.
- Qualitative data and rebate trends suggest that market actors in the NEEP region are influencing the Northeast market, causing heat pump sales to outperform the national market in year-over-year growth. Combined with programs, this could have a multiplying effect in the NEEP region.

[16] "Statistics: Historical data, monthly shipments, and member reports." AHRI. 2024. https://www.ahrinet.org/analytics/statistics.

- This suggests that the region must roughly **double the market penetration of ASHPs from 2023 to 2030** to reach the 65 percent market penetration target that many Northeast states have committed to through the Northeast States for Coordinated Air Use Management (NESCAUM) MOU.[17] **Market penetration must roughly triple to reach the 2040 target of 90 percent.**

The estimates of Northeast market size for ASHPs provided here have been constructed from a few different data sources available to our team through publicly available program data, a sub-regional sales data set from HARDI, and quantitative estimates from program administrators. Although current sales data for heat pumps in the Northeast would be ideal for this characterization, these data are difficult to obtain for several reasons:

- AHRI provides regional estimates of equipment sales to its manufacturer members, but members are prohibited from disclosing these data to non-member entities.
- Historically, HARDI provided state-level estimates of equipment sales from distributor data but has not generated a new dataset and modeled statewide estimates since 2021. HARDI has brought on CoMetrics Partners to assist in data collection and management, but new sales estimates will not be available until 2025.
- Manufacturers will not report their own sales numbers directly, as that information is proprietary and confidential.
- Utility programs and state agencies can only capture data on rebated units, not total sales.

### *Northeast Air-Source Heat Pump Installed Costs*

One of the most well-recognized barriers to adoption is the higher installed costs of heat pumps compared to

"like-for-like" heating and cooling equipment replacements. Initial cost plays a key role in the overall economic value proposition for residential heat pumps and is often addressed by programs through rebates and financing.

Installation costs of residential ASHPs vary widely and depend on numerous factors, such as heat pump application type and size, distributor and contractor markups, and local labor costs. Installed costs also vary based on potential additional material and labor costs for modifications to ductwork, electrical upgrades (panels, breakers, wiring), electrical surge protection, and outdoor unit snow deflectors.[18]

Table 7 summarizes ASHP installed costs for reviewed projects across the Northeast, normalized to 2024, and rounded to the nearest hundred dollars.

[17] NESCAUM Press Release: Nine States Pledge Joint Action to Accelerate Transition to Clean Buildings: "Under the MOU, these states have set a shared goal for heat pumps to meet at least 65% of residential-scale heating, air conditioning and water heating shipments by 2030 and 90% by 2040 across the participating states."

[18] Example prices for electrical service and distribution panel upgrades, electrical surge protectors, and snow deflector products are included on NYSERDA's Clean Heat Connect webpage: https://cleanheatconnect.ny.gov/installer-reference-materials/.

Table 7. *Summary of ASHP installed costs with normalized costs to 2024*

| Location, Project Year(s), and Source | Average Cost per Home (2024 USD) | New Construction or Existing Homes | Whole Home or Partial Displacement? | Notes | # Projects |
|---|---|---|---|---|---|
| Massachusetts, 2023, EnergySage[19] | Centrally Ducted: $12,400<br>Ductless: $17,100<br>Both: $16,300 | Unknown | Both | Estimates include incentive reductions (thus, add $10,000 typical for MA whole home rebate) | Unknown |
| Massachusetts, 2019-2021, MassCEC Whole Home Pilot[20] | Centrally Ducted: $28,200<br>Ductless: $25,000<br>Both: $26,000 | Existing | Whole Home | Data on *single-family detached existing* homes | 53 total |
| Massachusetts, 2019-2021, MassCEC Whole Home Pilot [21] | Centrally Ducted: $14,200<br>Ductless: $12,600<br>Both: $13,200 | New Construction | Whole Home | Data on *single-family detached new construction/gut rehab* homes | 21 total |
| Maine, 2021, Efficiency Maine Trust[22] | Centrally Ducted: $22,800<br>Ductless: $14,900<br>Both: $16,300 | New Construction | Whole Home | Some ductless heat pumps had limited electric resistance in small zones | 29 total |
| Multiple, 2023, Rewiring America[23] | 1,500 sq ft home: $16,500<br>2,000 sq ft home: $18,500<br>3,000 sq ft home: $22,700 | Either | Whole Home | Modeled estimates drawing from CA Tech program and MA pilots | Unknown |
| Northeast, 2024, Crowdsourced from Reddit[24] | Centrally ducted: $18,000<br>Multi-zone ductless: $26,400 | Existing | Both | Uncertainty on whether incentives are included | 58 (18 with no back-up heat) |

[19] EnergySage. 2024. "How Much Does a Heat Pump Cost in 2024." Available at https://www.energysage.com/heat-pumps/costs-and- benefits-air-source-heat-pumps/.

[20] MassCEC. "Public Records Requests." Available at https://www.masscec.com/public-records-requests.

[21] Ibid.

[22] Ridgeline Energy Analytics. 2021. Memorandum on New Construction HVAC Pricing (revised). Available at https://www.efficiencymaine.com/docs/Memorandum_on_New_Construction_HVAC_Pricing.pdf.

[23] Rewiring America. 2023. Upfront Cost of Home Electrification. Available at https://assets.ctfassets.net/v4qx5q5o44nj/2k2vGJcV9dhuCKJswvVPuO/ef52bb846d344a-066072fe53e9ca39fc/Upfront_Cost_of_Home_Electrification.pdf.

[24] Reddit. "Heat Pump Quote Comparison Survey." Available at https://www.reddit.com/r/heatpumps/comments/raocha/heat_pump_quote_comparison_survey_this_is_a/.

Upon reviewing a variety of sources mentioned above, Table 8 and Figure 6 display the typical range of installed costs for a few residential ASHP applications in existing homes:

**Table 8.** ***Cost range of installed residential ASHP (by application).***

| | Typical Low | Typical High | Average Low | Average High |
|---|---|---|---|---|
| **Whole Home Centrally Ducted HP only** | $12,000 | $28,000 | $18,000 | $22,000 |
| **Whole Home Ductless HP** | $10,000 | $26,000 | $14,000 | $20,000 |
| **Centrally Ducted HP/Furnace Dual Fuel** | $11,000 | $28,000 | $18,000 | $20,000 |
| **Single-Zone Ductless HP** | $5,000 | $10,000 | $7,000 | $8,000 |

**Figure 6.** ***Cost Range of installed residential ASHP (by application)***

## NESCAUM Costs Report Comparison

In October 2024, NESCAUM published a report titled "Heat Pumps in the Northeast and Mid-Atlantic: Costs and Market Trends."[25] As a comparison, Table 9 presents installed cost information for similar configurations for which we developed estimates. NESCAUM found that adding or replacing ductwork added an additional $4,500 on average. Electrical upgrades (replacing panels and running new circuits) added an estimated average of $2,400.

[25] Energy Solutions. 2024. Heat Pumps in the Northeast and Mid-Atlantic: Costs and Market Trends. Available at https://otcair.org/upload/Documents/Reports/Heat-Pumps-in-the-Northeast-and-Mid-Atlantic---Costs-and-Market-Trends.pdf.

Table 9. *Comparison in cost estimates between our analysis and NESCAUM analysis*

| Typical ASHP System Configurations | Estimated installed cost (range between average low and average high) | NESCAUM report equivalent configurations | NESCAUM report installed cost (range across states analyzed) |
|---|---|---|---|
| **Whole Home Centrally Ducted HP Only** | $18,000 to $22,000 | Split Unitary HP | $12,100 to $16,800 |
| **Whole Home Ductless HP** | $14,000 to $20,000 | Mini-Multi-Split (3- zones) Ductless | $17,000 to $22,000 |
| **Centrally Ducted HP/ Furnace ("Dual Fuel")** | $18,000 to $20,000 | No Equivalency | N/A |
| **Single-Zone Ductless HP** | $7,000 to $8,000 | Mini-Split (1-zone) (Ducted)* | $15,200- $23,100 |

*Includes costs associated with compact duct installation

The following insights came from interviews with program administrators and contractors. They offer additional detail:

- Cost estimates from other state programs and contractors corroborated price ranges in the above data set.[26]
- Though multi-split systems (single outdoor units to multiple indoor ductless units) typically cost more per capacity than multiple outdoor units paired with single indoor units, costs are often comparable between the two options. (For example, two separate ductless units, each providing one ton of heating, generally cost more than one two-ton outdoor unit with two indoor heads, but the prices are often close. The unique circumstances associated with the house, heat pump model, and contractor will likely have a greater effect on cost than the difference between multi-split or separate condensers.)
- ASHP installed costs tend to be lower for new homes, partially due to their lower heating and cooling loads because of more efficient construction practices, smaller specified systems, and often simpler installations during construction versus retrofit applications.
- Systems with no backup heat skew higher in cost than those with backup heat (e.g., electric resistance or gas), presumably because systems without backup heat involve more expensive cold-climate-capable heat pumps, and the installed systems may have a smaller capacity to begin with.
- There are excellent heat pump installers throughout the region. However, some contractors are unfamiliar with what constitutes a comprehensive and quality installation or may opt not to be as diligent during the installation (i.e., commissioning for right-sizing the equipment for the building). For a given project, contractors may undercut other estimates through lower-quality installations and shortcuts that can lead to damage and/or inefficiency. Conversely, higher-quality installs may include prudent measures/items that can increase the initial cost (e.g., surge protectors, weather protection, interior repair, or highly qualified installers). This points to the customer benefits of clear proposals and adequate customer education.

[26] Centrally ducted installation costs generally did not assume additional costs for ductwork.

- Newer equipment that uses newly required refrigerants is anticipated to cost slightly more.
- Contractors interviewed acknowledged that some installers mark up prices when dealing with rebate programs to account for extra administrative time and effort.
- In addition to contractors, multiple stakeholders and interviewees shared that installed costs tend to increase when large rebates are available.

## Opportunities to Advance the Residential Air-Source Heat Pump Market

The following section describes growth opportunities for the Northeast residential ASHP market through insights gathered from research and market actor interviews. The market growth opportunities are meant to give direction to national, regional, and local stakeholders focused on ASHP market development. Most of the opportunity areas involve coordination and partnership across stakeholder groups, including manufacturers, distributors, contractors, program administrators, state and local policymakers, etc. Based on the insights collected, several themes emerged that we used to organize this section. The high-level areas of opportunity are organized under the main groupings below. For each grouping, additional details are outlined and expanded upon. The themes are as follows:

1. Promote a broad range of ASHP applications.
2. Improve the economic value proposition for ASHPs.
3. Drive customer demand and satisfaction.
4. Grow and enhance the region's workforce.
5. Refine ASHP program design.
6. Plan effectively for complementary state policies and regulations.

### *Promote a broad range of ASHP applications*

- Main recommendations include the following:
- Both whole home and partial displacement ASHP applications present significant opportunities for growth and need additional support.
- ASHP adoption could grow significantly by transitioning the residential cooling equipment market to centrally ducted ASHPs.
- New construction and gut rehabilitation projects offer compelling applications for ASHP installation
- Air-to-water heat pumps offer region a potential "drop-in" solution for hydronically heated homes.

Below are some application-specific insights stakeholders shared regarding the status of the ASHP market and opportunities in the Northeast. Application insights span a wide range of scenarios, from partial to whole home, from heating system replacement to cooling system replacement, from retrofit to new construction, and from existing ductwork to no existing ductwork.

### Both whole home and partial displacement ASHPs present significant opportunities for growth and need additional support.

ASHPs can be designed to address a portion of the home's total heating needs ("partial" application) or all of them ("whole home" application). These two options often come with a trade-off between upfront costs and energy/cost/carbon savings, with whole home applications usually entailing higher upfront costs as well as higher savings.

Ductless ASHPs that provide partial heating needs remain the most popular residential application sold in the Northeast, with a preponderance of sales of single-zone ductless equipment for partial displacement. Programs and manufacturers emphasized the challenge of heat distribution from ductless heat pumps and how the placement of indoor units is pivotal in dispensing heat most effectively and thus displacing the most fossil fuel-based heat possible.

The market for whole home heat pumps in the Northeast is still relatively immature. Several programs shared that while they have successfully supported the adoption of ASHP systems, many of those systems (partial displacement) have not been significantly used by customers as heating systems. This has resulted in fewer savings than the programs expected. One program cited that despite extensive installer and resident education on operational best practices, the desired behavioral change of using heat pumps more effectively was still not achieved.

This has led to several programs to prioritize whole home heat pumps. Some programs are refining incentive eligibility requirements to ensure that the equipment is sized and configured to be used as a whole home system. In some instances, these programs supplement, and in other instances, they replace incentives for partial applications. To further address the systematic issue of realizing whole home heat pump use and savings, Efficiency Maine, Mass Save, and Clean Heat NY have begun requiring an existing fossil fuel heating system to be disabled, disconnected, or removed to be eligible for whole home heat pump rebates.

### Transition cooling-only residential equipment to ASHPs

One strategy to drive greater adoption of partial displacement ASHPs is targeting central air-conditioner customers. In 2023, the region purchased an estimated 500,000 central air-conditioners (NEEP HVAC sales analysis). According to manufacturer input, moving these sales from cooling-only central air-conditioners to cooling AND heating centrally ducted ASHPs offers a significant opportunity to bring the benefits of ASHPs to many more customers.

Manufacturers suggested that this approach addresses the reservations held by many HVAC installers that ASHP be used as a primary heating technology in cold climates, and comes with a small incremental cost. By replacing

a central air-conditioner sale with an ASHP, the customer still receives the cooling functionality that they initially sought, but can now offset a portion of their furnace heating with the heating functionality of the ASHP. Because heat pumps operate most efficiently at more moderate temperatures, ASHPs can provide their lower cost heating before a consumer wants to switch to their furnace for heating at lower temperatures. This offers some contractors and customers a much less risky installation versus a whole home ASHP.

Programs can consider phasing out the promotion of high efficiency "one-way" air conditioners as these systems represent a lost opportunity for "two-way" ASHPs. Transitioning central air-conditioner sales to centrally ducted ASHP sales may be a more effective channel to move the "status quo" installer market, as equipment that can operate as a heat pump effectively during shoulder seasons or modestly cool temperatures still contributes to program goals.

### New construction and gut rehabilitation project offer compelling applications for ASHP installations

Whole home ASHPs in low-load new homes pose lower installation costs, and in all-electric new construction, gas infrastructure costs and fixed gas meter fees can be avoided. Many stakeholders interviewed highlighted that new homes and gut rehabilitation projects are positioned to be an early market to utilize heat pumps for whole home space heating and should be a top priority target market for programs and code officials.

### Air-to-water heat pumps offer region a potential "drop-in" solution for hydronically heated homes

Air-to-water heat pump sales for space heating are still nascent. Manufacturers and program administrators recognize the market potential in the Northeast.

The Northeast region, especially New England, is home to the highest concentration of hydronically heated homes in the country, with New York and several New England states ranging between 25 percent and 35 percent.[27] The hydronic distribution systems are typically served by gas- or oil-fired boilers. While this market has to date been largely served with ductless ASHP solutions, higher temperature ASHPs are an emerging solution with promise to serve as a more straightforward drop-in replacement for boilers.

Stakeholders shared that the uptake of air-to-water space heating heat pumps[28] has remained low, but product and incentive availability and awareness are growing. Both manufacturers and program administrators see a strong medium-to-long-term potential for air-to-water heat pumps. Limited market demand, lack of supply chain partnerships, low contractor familiarity and confidence, high installation costs, and challenges in cooling were cited as barriers that must still be addressed.[29] One program administrator shared that they see a stronger opportunity in new construction than retrofit applications due to the challenges in integrating with existing hydronic distribution systems designed for high-temperature distribution. Stakeholders recognized stronger

[27] U.S. EIA; Highlights for space heating in U.S. homes by state, 2020.

[28] NEEP. 2024. Emerging Heat Pump Technologies. Available at https://neep.org/sites/default/files/media- files/neep_emerging_heat_pump_tech_brief_final_sm.pdf.

[29] For many existing homes, there is a risk of the formation of condensation in emitters or uninsulated piping in walls, which can compromise the structural integrity or air quality in the home.

market availability of "drop-in" high-temperature distribution systems with high efficiency at cold temperatures as key to accelerating air-to-water heat pump adoption in existing buildings.

Further research is being conducted, such as the "Hydronic Heat Pump with Thermal Storage Solutions" pilot project by Efficiency Maine's Innovation Program.[30] This research is particularly important to explore the potential for air-to-water heat pumps paired with thermal storage (e.g., hot water or other medium that can retain heated or possibly cold materials). In the meantime, ductless heat pumps can meet the needs of most hydronic-heated homes, and programs are focused on continuing to scale those applications. Due to the nascent state of air-to-water heat pumps and the large overall addressable market, one program administrator emphasized that Northeast regional coordination and leadership in developing the air-to-water heat pump market will be important.

### *Improve the economic value proposition for ASHPs*

The main recommendations include the following:

- Target customers with high economic value propositions.
- Consider community or group bulk ASHP purchases and bundling installations.
- Support financing opportunities.
- Consider electric rates that can promote adoption.
- Improve both upfront and operational cost transparency for customers.
- Leverage other assistance programs.
- Provide specific assistance to and measure results for income-eligible residents.

The economic value proposition and system payback for ASHPs depend on installation costs and operational costs compared to a customer's selection of conventional heating and cooling equipment. Programs and manufacturers continue to cite high incremental installation costs and operational costs relative to conventional heating equipment as two of the largest barriers to scaling the adoption of ASHPs.

Current cost barriers (both upfront and operational) identified by programs and manufacturers included:

- Rising costs of materials and labor
- The perceived high costs of weatherization measures to lower the heating load and consequently reduce the size and installation cost of the specified ASHP. (As a reminder, this bullet point discusses what the interviewees mentioned. Some weatherization measures are relatively low cost, are highly incentivized, and have a large rate of return.)
- Hidden costs associated with installing heat pumps, such as electric panel and service upgrades
- Difficulty of comparing a range of installation cost bids from different installers, equipment, and installation quotes. Compounding this difficulty, contractors often opt to combine labor and material costs.

[30] GridWorks Consulting. "Efficiency Maine." Available at https://gridworks-consulting.com/efficiency-maine.

- The practice among some contractors of increasing the markup on their installation cost quote to a customer when high equipment rebates are available
- The lack of clear operational cost comparisons and challenges communicating the message to residential customers that when switching from a different fuel, electric bills for heating will go up but the fuel bills for heating will go down
- Lower relative costs for natural gas than electricity. Some programs cited that recent electricity price increases have weakened the economic value proposition.

In addition to ASHP rebates and low-cost financing options to lower the incremental upfront cost, there are opportunities to target, communicate, and improve the economic value proposition for customers.

### Target customers with high economic value propositions

Manufacturers and program representatives highlighted that targeting customers based on operational cost savings can be an effective strategy. A couple of programs use propensity models, and many highlighted the value in targeting ASHP applications with high-value propositions, such as whole home heat pumps for new homes and existing homes with current heating systems relying on electric resistance or delivered fuels. Overall, interviewed stakeholders indicated that the states facing the biggest challenges in scaling ASHP adoption are the ones with the highest percentage of natural-gas-heated homes, like New Jersey, New York, and Massachusetts, and that programs should target communities with high penetration of electric resistance and delivered fuel heating to drive near-term sales growth and market development.

**Figure 7.** ***Primary residential space heating fuel by state (2020).***

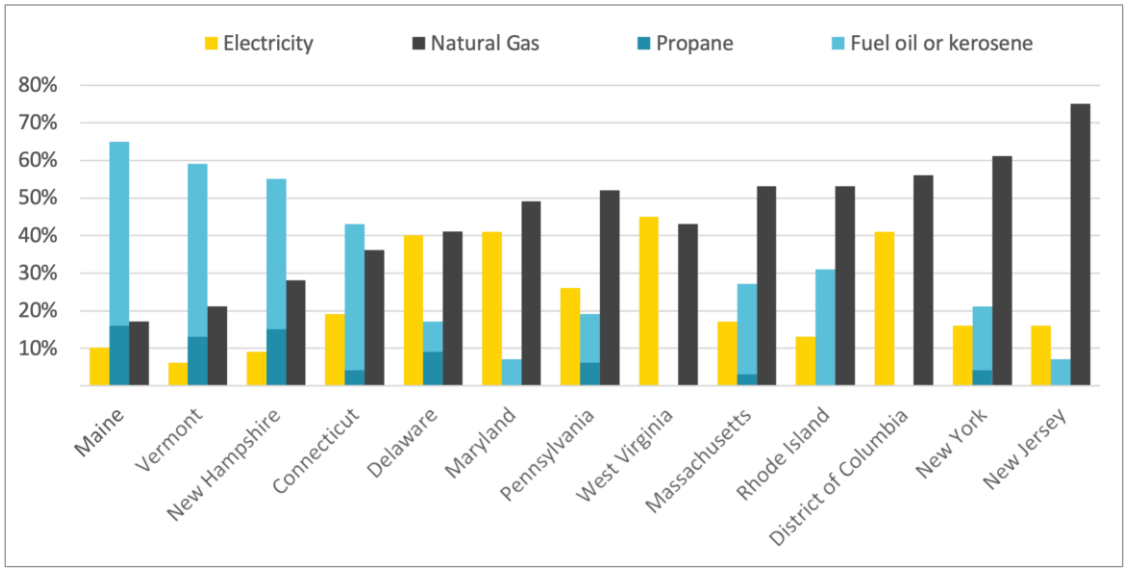


Figure 7 shows estimates of the percentage of homes in each state heating with electricity, delivered fuels, and natural gas (from EIA RECS 2020). The figure also illustrates the extreme differences in proportions of heating fuel types across the region and reinforces the opportunity for tailored programs. The chart is organized so the states with the highest percentage of homes heated by electricity and delivered fuels are toward the left, and the states with the highest percentage of natural gas are toward the right. For example, Maine and Vermont have 75 percent and 65 percent of homes heating with electricity or delivered fuels, whereas New Jersey and New York have 75 percent and 61 percent of homes heated by natural gas. Each program can fine-tune incentives to address the common barriers associated with their population's predominant pre-existing space heating fuel. (Percentages do not include wood as a fuel, and some fuel oil data with particularly low percentages were not reflected.)

### Consider community or customer group ASHP purchases and bundling installations

Contractors purchasing large volumes of equipment tend to pay lower prices, and some contractors can lower project costs with a larger consistent project volume. Communities or groups of customers might similarly be able to access lower equipment (and install) prices by pooling together. In theory, this opportunity would best be realized by groups of customers planning HVAC replacements and tied to broader weatherization and cost saving updates of their homes. A large number of projects combined with flexibility to schedule installations could allow groups of customers to negotiate meaningful price discounts with a single installer. Regional efforts to develop and disseminate templates for this model could be beneficial.

### Support financing opportunities

Low- or zero-interest loans are well-established as effective mechanisms to lower initial costs. Numerous incentive programs offer generous financing. For example, Mass Save offers zero percent interest loans up to$50,000, and these loans can include the costs of electrical upgrades associated with installing an ASHP. One manufacturer stated that a financing program they offer has made high-efficient equipment more accessible and that co-training with bank staff has empowered contractors to more effectively support a customer's decision-making process to realize the benefits of high efficiency heat pump systems and sell more efficient and higher-cost ASHPs.

### Consider electric rates that can promote adoption

Generally, the stakeholders interviewed supported a hypothesis that changes to electric rates might help drive further adoption and use of heat pumps. Many are testing or considering special rates for customers operating heat pumps. Such heat pump rates were not front-of-mind for utility representatives interviewed, but a few studies have examined how lower rates for customers with heat pumps may benefit customers sufficiently without subsidizing equipment costs for those customers[31,32] (i.e., lower energy rates alone may provide enough

[31] Sergici, S., A. Ramakrishnan, G. Kavlak, A. Bigelow, and M. Diehl. 2023. Heat Pump-Friendly Cost-Based Rate Designs. Reston, VA: Energy Systems Integration Group. Available at https://www.esig.energy/wp-content/uploads/2023/01/Heat-Pump–Friendly-Cost-Based- Rate-Designs.pdf.

[32] CEE. 2023. Developing Electric Rates for Hybrid Air Source Heat Pumps in the Midwest. Available at https://www.mncee.org/sites/default/files/report- files/Developing%20Electric%20Rates%20For%20Hybrid%20Air%20Source%20Heat%20Pumps%20In%20The%20Midwest.pdf.

economic incentive for customers to change to heat pumps). The industry and region could benefit from further discussion of ideas, pilots, and lessons learned from innovative rate design as an alternative or complementary lever to improve the economic value proposition of heat pump adoption across the Northeast.

#### Improve both upfront and operational cost transparency for customers

Numerous programs have developed or referenced generic operational cost calculators. To improve both *upfront* and *operational* cost transparency, a recent trend highlighted by the interviewed programs is the use of a quote comparison tool. Customers upload multiple quotes and receive educational support, including in-home and virtual consultations. Interviewees indicated this approach is highly effective in supporting customer purchasing decisions since customers receive personalized direct support in understanding the performance of the quoted equipment, how it aligns with their goals, and how adopting a heat pump may impact their electric bills so they can make an informed decision. One program representative communicated that they are considering offering a geographically based pricing guide so a prospective customer can get a rough idea of what an ASHP might cost in their community.

#### Leverage other assistance programs

Braiding, stacking, and bundling funding sources, which entails managing often-complex combinations of funding sources to enable a comprehensive project, is common for many organizations, especially those working with income-eligible programs. The details of how to do this can be confusing, and opportunities are constantly changing. Still, comprehensive funding may be the only path toward improving some residences, particularly for LMI residents. Organizations promoting and providing heat pumps should encourage and support this practice when feasible. If a program can only provide limited information or assistance to connect with other funding sources, it should support CBOs or other organizations that can do so. Mass Save's programs that combine comprehensive assessments, envelope measures, and heat pump installation assistance are excellent examples of braiding/stacking funding to radically improve buildings for lower-income residents.

Programs should also provide specific assistance to and measure results for income-eligible residents. An important element of many incentive programs is directed outreach to LMI individuals. This segment of the population can often benefit most from energy-efficiency upgrades and may have little financial ability to undertake major energy improvements on their own. Where possible, programs should have a planned portion of funding dedicated to income-eligible residents and incorporate feedback mechanisms and metrics to assess best if the program component is achieving its goals and subsequently adjust if it is not.

### *Drive customer demand and satisfaction*

The main recommendations include the following:

- Deploy customer education through diverse marketing and engagement strategies.
- Ensure customer outreach is adaptable and strongly incorporates feedback.

There was broad consensus among stakeholders that poor overall education and communication about ASHPs is one of the biggest barriers to uptake, although some emphasized educating the workforce and others emphasized educating customers. There was nearly universal agreement that continued investment in messaging around benefits and value propositions is needed.

Aside from the economic value proposition, individual customer demand for ASHPs depends on subjective perceptions, valuation of non-financial benefits, and behavioral motivators. These factors are partly shaped by the experiences of a potential customer's friends and family or community members who have purchased equipment, gone through the installation process, and lived with ASHP equipment.

Stakeholders interviewed highlighted the following barriers customers continue to face in the Northeast when it comes to product awareness and understanding:

- *A lack of understanding* of ASHPs and their benefits, and fear about the equipment being unable to heat their home during the coldest days of winter
- *Lack of clarity* on the amount and variety of incentives for which a customer may be eligible
- *Inconsistency in contractor messages and recommendations,* which confuses and discourages customers. Customer perspectives are largely shaped by direct interactions with contractors, many of whom have their own misconceptions about the technology, are risk averse, and have been conditioned to install like-for-like replacements.
- Educated and empowered customers still face challenges in *selecting installers who are committed, qualified, and supportive* of ASHP technology and who effectively present the benefits during the sales process.
- *A lack of time and empowerment*, particularly when a customer faces an emergency replacement scenario, combined with the ease of purchasing like-for-like drop-in replacements.
- *Lack of education on how to optimize controls and maintain a heat pump* once it's been installed.[33]

To increase customer awareness and understanding and address misconceptions surrounding heat pumps, manufacturers and utility programs have continued to invest in customer education through diverse marketing and engagement strategies, expanding scale and channels of impact. Examples include the following:

- *Program-vetted contractor lists and locator tools* to help customers find nearby contractors equipped to support their purchasing journey and offer quality installation. Multiple incentive programs cited this customer resource as their most impactful. One program representative mentioned that their contractor locator webpage, sorted by contractors with the most submitted projects and "highest likelihood to pick up the phone," is their most visited page.
- *Educational materials* to drive awareness and support the purchasing decision, such as equipment

[33] Some stakeholders shared that education on heat pump operation will not have the intended effect on savings if the core issue is poor system design and configuration—i.e., a heat pump installation that is poorly designed and configured for the residence will use more energy and may not provide adequate comfort at that point, no matter the homeowner's understanding of the new equipment.

comparison tools, quote review tools, community engagement events, case studies, and multilingual resources
- Organizing *training events with contractor networks* to improve customer education and sales, which improves the purchasing process for customers
- To raise awareness and support prospective ASHP adopters, offering *direct in-person and virtual consultations to prospective purchasers*, and offering *partnerships and training to community-based organizations and local energy advocates*
- Customer education on *heat pump maintenance and operation*, such as thermostat settings and cleaning
- *Cooperative advertising funds and marketing support* for manufacturers, distributors, and contractors

Due to the success of efforts to grow general customer awareness surrounding ASHPs, many programs are more directly addressing behavioral change. Manufacturers generally recommended that programs maintain a degree of humility and not ask too much of ASHP customers who do not fit the archetype of early adopters—i.e., keep participation requirements as simple as feasible so that they are easily understood by the general public and contractors.

In attempting to increase awareness and understanding, programs should build feedback opportunities for customers and contractors to offer their perspectives on effectiveness and efficiency. Overall, programs highlighted the need to be nimble and continue to refine customer outreach intended to change customer behavior in purchasing and living with an ASHP. Regional incentive programs and CBOs should enable a continued exchange of lessons learned. This exchange can provide strong feedback loops to align effective customer-directed efforts to address behavioral change and scale successful replicable efforts driven by a community, utility, or program. A few programs highlighted that they were increasing engagement with local groups and community-based organizations to expand their reach, particularly seeking out frontline communities to ensure access to their energy savings opportunities.

### *Grow and enhance the region's workforce*

The main recommendations include the following:

- Deepen collaboration on installer training and education with manufacturers and distributors.
- Foster strong partnerships with educational institutions and training providers.
- Recognize and drive the development of firms with business models oriented around ASHP installs.
- Expand the pool of businesses supporting design, sizing, and equipment installation.
- Influence contractor ASHP sizing practices.
- Drive quality installations.

Stakeholders shared a common view that HVAC installers played a critical role in which systems are chosen by customers. Discussions with key market actors highlighted barriers and opportunities surrounding the workforce of new installers, existing workers, and contractor firms in the pursuit of scaling quality ASHP installations. ASHP installer firm sizes and business models are diverse. Some small installers include single truck operations with one person managing all aspects of the business, whereas others have dedicated administrative, sales, installation, and service teams. One program cited a small set of ASHP-focused firms that completed a majority of rebated ASHP installations, and one manufacturer highlighted that a few firms succeeded in growing their ductless ASHP operations by hiring new, low-skilled staff who focus solely on mounting indoor wall units during the installation before working with these employees to expand their skill set and grow their career.

Most programs retain a network of ASHP installers. They specify requirements for being listed and remaining on the network, including relevant certifications and required training. Programs pointed to the value of recognizing ASHP installers, providing locator tools for customers, and driving business to contractors with the most ASHP installs.

A few of the frequently mentioned barriers surrounding workforce issues include the following:

- Contractors who are already well-established in the fossil fuel heating marketplace and are operating efficiently and profitably do not have an economic incentive to switch their model toward ASHPs, as doing so introduces risks to their business processes and ability to make payroll. Manufacturers cited examples of contractors that advertise they sell ASHPs but may not necessarily recommend ASHPs in customer proposals.
- Some contractors lack confidence in heat pump technology in the Northeast's cold climate and lean toward the cheapest equipment, even if it is not the most cost-effective overall for their customers.
- Designing and sizing ductless ASHPs for efficient operation and heat distribution remains a major challenge. Programs cited that verification of proper sizing can be a challenge due to necessary expertise and cost, with one program highlighting "we can't look at a manual J for every single project and have our rebate processor go through that…it would be prohibitively expensive."
- While contractors have the freedom to choose which manufacturer's equipment they purchase, they face friction and costs to switch due to the need to acquire manufacturer-specific training on the proper installation of their models.

Several opportunities surfaced from interviews with stakeholders to support and expand the existing workforce. These opportunities are expounded upon below.

### Deepen collaboration on installer training and education with manufacturers and distributors

Manufacturers collaborate with distributors to offer virtual training libraries and in-person training. Training reaches installation technicians and sales staff and addresses the technical and business skills contractors need to deploy ASHPs successfully. Some manufacturers also collaborate with technical colleges and schools, offering lab equipment and curriculum.

Given the supply chain's strong training infrastructure, manufacturers cautioned that programs should be careful not to reinvent the wheel and encouraged supply chain partnerships (manufacturers, distributors, and contractors) and "train-the-trainer" activities. Manufacturers leverage their training centers as hubs for contractor education and collaborate with unions and technical colleges. To achieve and maintain "elite contractor" status in manufacturer networks, manufacturers require contractors to meet specific training and installation benchmarks. These networks serve as marketing tools for contractors and are often required to install high-end ASHP equipment like inverter-driven cold-climate-capable heat pumps.

There are opportunities to foster deeper collaborations between technical colleges and manufacturers/ distributors. Training and education involving air conditioning curricula should not be framed solely around one-way air conditioners but around the principles and functionality of heat pumps as both cooling and heating devices.

### Foster strong partnerships with educational institutions and training providers

One manufacturer highlighted that they shared curricula and donated ASHP equipment to a technical college to center heat pump technology and prepare students for jobs with ASHP contractors. However, they opined that ASHPs still do not receive enough focus in that program. A stronger focus on fostering partnership and collaboration between students, tech schools, supply chains, and contractor employers could help develop and grow a workforce for ASHP installations at scale. The Midwest ASHP Collaborative developed a model to foster workforce development through partnership collaboration cycles—a model that could be adopted in the Northeast.[34]

One Northeast distributor interviewee undertook a notable effort to drive engagement in the community and with trade schools. The distributor provided hands-on experience to students at training centers with ASHPs and adopted an intentional approach centered on increasing youth participation in trade school programs for HVAC and other trades.

### Recognize and drive the development of firms with business models oriented around ASHP installs while addressing barriers associated with "status quo" installers

#### *ASHP-Focused Companies*

One manufacturer emphasized that to meet ambitious heat pump adoption goals in the Northeast, more contractors need to focus solely or mostly on ASHP installations and that a program investment in the development of ASHP installer entrepreneurs would pay large dividends. One program attributed most of its installations to a small group of such companies. They noted that many of those contractors transitioned to installing ASHPs from another field of appliance sales. Programs can consider ways of recognizing and investing in entrepreneurs focused primarily on ASHP installations.

[34] Midwest ASHP Collaborative. Available at https://www.mwalliance.org/midwest-ashp-collaborative. (This group refers to "equitable workforce development.")

*Status Quo Installers*

Stakeholders also broadly recognized that a major barrier to scaled ASHP adoption is the large group of "status quo installers" with working business models installing conventional fossil fuel or less efficient electrical HVAC equipment. They expressed varying opinions on the effectiveness of orienting program investment toward influencing the behavior of the lower end of the installer market to at least offer partial displacement ASHPs, with many manufacturers citing the large market opportunity for hybrid/dual fuel ASHPs. Additional program training and education investment directed toward this audience may drive deeper and faster adoption of partial displacement for homes in the Northeast with centrally ducted furnaces but risks slowing down the transition to whole home heat pumps.

### Expand the pool of businesses supporting design, sizing, and equipment specification

Dramatically increasing federal investment in rebates and tax credits for home audit, envelope, and heat pump deployment has also opened new business opportunities for residential concierge retrofit and heat pump specifier businesses.

As an example, entities doing training (such as Building Performance Institute[35]) could work with contractors focused on energy audits to train the contractors to produce load calculations that support better design and sizing decisions. If so, trainers, incentive program staff, and contractors should coordinate to understand data collection needs and build in cross-platform simplicity and usefulness.

A few programs interviewed highlighted the links they are forging between audit, envelope, and heat pump programs. One program highlighted that they are adding a course targeting other trades, such as electricians, plumbers, and solar installers, on how they can add heat pumps to their businesses. Programs could incentivize and support various types of firms that integrate services such as blower door tests, scanning applications to support load estimation, and NEEP's sizing tools that can help specify heat pumps for installation.

Other examples of synergy between and within programs and the trades are worth considering. For example, one program innovation from Oregon expanded the license types specifically for the installation of water heaters, [36] lessening the burden of having two trades perform water heater installations. A similar approach for residential ASHP installations may facilitate scaling of this technology.

### Influence contractor ASHP sizing practices

Stakeholders frequently mentioned the barrier of sizing challenges surrounding ASHPs. One manufacturer estimated that only about 25 percent of installers perform load calculations. And even if a load calculation is performed, it may not have been adequately modeled. Load calculations and proper equipment specifications are key for properly sizing heat pumps. As an example, they allow a contractor and homeowner to anticipate the potential need for electric resistance backup heat at design temperature, which may then drive costly panel

[35] Building Performance Institute. "BPI Homepage." Available at https://bpi.org/.

[36] Oregon.gov. "Business Xpress License Directory." Available at https://apps.oregon.gov/SOS/LicenseDirectory/LicenseDetail/20.

and service upgrades. Proper sizing and design can avoid unnecessary oversizing while assuring comfort and expected energy savings for the customer.

One challenge in scaling quality load estimates as a ubiquitous practice is that HVAC contractors tend to provide free quotes. Load estimates require salespeople to have greater technical knowledge than is typical. Some paid tools make load calculations easier using 2D/3D scanning applications or models. One program communicated that it would consider incentivizing contractors to use load calculation tools that use 2D/3D scanning applications. Some regional contractors are beginning to use these tools during the initial visit or soon thereafter. Some home energy auditors can perform sizing calculations, which are then available to the customer to provide to contractors. This is another way to address workforce development—using a holistic approach in which a larger set of businesses provide job elements that may be lacking within an HVAC contractor's practices to facilitate quality installations. (See the next element below for more discussion.)

To address the risk of oversizing, various programs have successfully trained supply chain staff on NEEP's Sizing and Design Tool[37] and Guide to Sizing and Selecting Air-Source Heat Pumps in Cold Climates.[38] New York's Clean Heat program requires manufacturers to provide basic sizing and design training, and various programs require the submission of Manual J load calculations. Programs may leverage the Northwest Energy Efficiency Alliance's (NEEA's) load estimator as a reference point of btu/square feet guidelines according to insulation and air infiltration levels and adapt for use with variable capacity heat pumps in the cold climate of the Northeast.[39] In New York, a Heat Pump+ Retrofit toolkit has been piloted at a programmatic level.[40] Further development of innovative load estimation methods and users could be valuable at a regional level. There are opportunities to collaborate with other cold climate regions, such as the Midwest, where a DOE Building America Team is researching innovative load estimation methods to establish best practices.[41]

Various program and manufacturer representatives highlighted the challenges in sizing non-ducted mini-split heat pumps. Given the costs for detailed program verification, it may be valuable to (1) invest in training and education opportunities to address oversizing and (2) recognize installers that show proof of completed training, use strong sizing approaches, and have demonstrated successful results in the field.

It is likely that more programs will shift their incentive structures over the next few years to "per residence" incentives or similar as this structure appears to be simpler to manage and has less potential to encourage oversizing to obtain a higher incentive amount.

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[37] Tools at https://ashp.neep.org/ and explanation at https://neep.org/user-guide-cold-climate-heat-pump-sizing-support-tools.

[38] NEEP. 2018. Guide To Sizing & Selecting Air-Source Heat Pumps in Cold Climates. Available at https://neep.org/sites/default/files/Sizing%20%26%20Selecting%20ASHPs%20In%20Cold%20Climates.pdf.

[39] BetterBuilt Northwest. 2023. "Load Calculation Tools for Ductless Heat Pumps." Available at https://betterbuiltnw.com/resources/load- calculation-tools-for-ductless-heat-pumps-2.

[40] PSD. "Technology Solutions For Large-Scale Electrification." Available at https://psdconsulting.com/solutions/.

[41] DOE. https://www.energy.gov/eere/buildings/midwest-urban-envelope-retrofit-and-tri-function-air-water-heat-pump-installation

## Drive quality installations

### *Quality Assurance*

Some programs collaborate with distributor and installer networks to ensure contractors follow high-quality installation procedures and deploy both virtual- and on-site quality control (QC) inspections on rebated ASHP installations. These inspections may include validating model numbers, outdoor and indoor unit clearances, outdoor unit snow deflectors, and line sets, as well as brief discussions with the customer about their understanding of how to operate the new equipment. One program focuses quality inspections on a contractor's first few installations to verify proper techniques, and another deploys quality checks in the field for 5-10 percent of projects each year. A number of programs offer training or support resources for contractors not meeting program standards. Some programs require high-impact non-conformances to be corrected and documented by the contractor. One program representative shared that they are focusing on follow-up with contractors who are not meeting best practice standards. Another emphasized the need not just to weed out bad actors but also to provide installers with the support they need to improve.

### *Refrigerants*

One program mentioned that they see a gap in training on refrigerant leakage and are considering emphasizing best installation practices related to refrigerants. On a related note, one manufacturer representative opined that it is not reasonable to expect contractors or their technicians to make good refrigerant line connections with hand tools and that programs should require contractors to have advanced tools for making connections, such as pneumatic or gasketed press/crimp tools for flare joints.

### *"Connected Commissioning" Practices to Increase Quality Installations*

"Connected commissioning" practices enable and support installers to verify proper installation using either third-party smart tools or newly emerging embedded diagnostic equipment. Increasing installer adoption of these connected commissioning practices for residential ASHPs presents a growing opportunity for the region to improve quality installs. DOE estimates that 70-90 percent of residential HVAC systems have at least one performance-compromising fault, such as proper airflow or refrigerant charge. "Regional support to programs and the supply chain could support broader adoption of this practice."[42] ACCA recently launched a quality installation certificate program with an equipment verification standard that contractors could leverage to differentiate themselves.

NEEP is developing a best practice guide for ASHP-focused HVAC workforce development programs, which will address these issues in greater detail. The guide discusses the landscape of regional workforce development programs and provides examples of engagement, training, and support. Programs involved with ASHP workforce development should consider utilizing the guide to inform program development.

[42] ACCA. "Quality Installation Certificates." Available at https://www.acca.org/qa/prove-it.

### *Refine ASHP program design*

The main recommendations include the following:

- Align and simplify rebate qualifications and ensure consistent incentive availability.
- Carefully consider midstream incentive programs.
- Clarify and align messaging around heat pump descriptors.
- Simplify program participation and ensure safeguards for low- and moderate-income (LMI) customers.
- Establish measures to avoid whole home heat pump rebates being applied to partial displacement projects.
- Integrate supply chain feedback.
- Promote partnerships and funding for inclusive local community engagement and support.
- Utilize best practice guides.

Utility and statewide programs across the Northeast offer a variety of incentives and services to motivate the purchase of residential heat pumps and best practices related to design, sizing, installation, and operation.

Programs can be modified to better support the abovementioned opportunities for improving the economic value proposition, customer demand, and behavior. Below, we detail a few overarching themes related to program design that were shared by manufacturers and program administrators.

#### Align and simplify rebate qualifications and ensure consistent incentive availability

Manufacturers indicated that separate utility rebate programs with different types of qualifying equipment present supply chain challenges that make it difficult to have the right product in the right place at the right time. From their perspective, the ideal scenario would be to have aligned, simple criteria for qualifying equipment across the broadest geography possible. Market actors prefer programs with consistent rebate offerings and are mindful of minimizing program changes. Manufacturers also emphasized the importance of avoiding delays in rebate reimbursements to contractors and managing program incentive budgets to avoid running out of funds and creating gaps in rebate availability. One manufacturer cited an example of a contractor waiting more than three months to receive a rebate reimbursement. Holding this financial liability for such a long time caused this contractor to decide not to participate in another rebate program. While incentive program frameworks and goals vary, there may be opportunities to further align program standards and qualifying criteria across the region.

Whole home ASHP rebates based on equipment capacity can cause distortions in market behavior and drive oversizing. Rebates based on equipment capacity (tonnage installed) can drive oversizing of heating systems, given that many contractors remain concerned about callbacks based on insufficient heat and tend to be motivated to maximize program benefits to their customers. Flat rebates or rebates based on the percentage of the cost of the system can mitigate this effect, such as in Efficiency Maine, NYS ConEd, or Mass Save's whole home ASHP rebate programs.

### Carefully consider midstream incentive programs

Midstream incentive programs focus incentives at the distributor/contractor level, often having distributors sell qualified equipment at a discount to qualified contractors. While Vermont has successfully administered a distributor-based midstream incentive program for many years, distributors in other states express concern over the further rollout of midstream incentive structures. One manufacturer highlighted that their distributor partners have no interest in serving as a bank and would prefer to extract data files from their own system rather than working within a program implementer's database. Manufacturers highlighted that collecting the installation address of equipment is the biggest challenge since distributors do not typically collect that information, and contractors purchasing equipment often do not know that information at the time of purchase.

For programs considering a midstream component, NEEP is developing a forthcoming ASHP Midstream Programs Best Practice Guide. The guide will include principles for ensuring the successful development of midstream residential ASHP programs.

### Clarify and align messaging around heat pump descriptors

To improve clarity and alignment, manufacturers generally agree that market and program messaging should (a) not differentiate residential air-to-air heat pumps by outdoor unit form factor and (b) should be differentiated by heating load offset and efficiency metrics rather than the form of indoor distribution.

A few ASHP manufacturers highlighted that programs sometimes create confusion by categorizing residential air-to-air heat pumps as "unitary" versus "mini-splits." A mini-split outdoor unit simply has a smaller footprint and a side-discharge fan (rather than vertical discharge). It may be connected to a central air handler, compact ducted, non-ducted with one or more indoor distribution units, or some other multi-zone indoor configuration.

Manufacturers acknowledged that this confusion stems partly from the AHRI directory's categorization of "heat pumps and heat pump coils" versus "variable-speed mini-split and multi-split" heat pumps. Many Northeast rebate programs already treat mini-split and unitary heat pumps the same. Still, there is an opportunity for stronger alignment in states with distinct utility rebate programs and general regional alignment on messaging and nomenclature when addressing contractors and customers.

Generally, manufacturers advocated for the approach that several programs already take, treating all residential air-to-air heat pumps the same and basing incentives on the efficiency metrics and potential savings from either partial displacement or whole home solutions. For example, ductless multi-head and heat-pump-coil-only central ducted systems have lower efficiency ratings, so indirectly, those factors are accounted for rather than directly basing incentives on indoor distribution.

### Simplify program participation and ensure safeguards for low- and moderate-income (LMI) customers

Both manufacturers and program administrators highlighted that bureaucratic hurdles and complex qualification processes limit the impact of low-income programs due to the high administrative costs and barriers to participation. A couple of programs highlighted that they are developing more turnkey elements so LMI customers do not have to navigate multiple programs, and the process is facilitated end-to- end, particularly in weatherization and heat pump improvements.

Stakeholders also highlighted the importance of ensuring ASHPs do not result in higher utility bills for low-income customers. Weatherization and electrification can be combined to help address this barrier. For example, NYSERDA requires all LMI homes to receive weatherization improvements or verify that the home already meets the "heat pump ready" specification before funding a heat pump installation.

### Establish measures to avoid whole home heat pump rebates being applied to partial displacement projects

If a program focuses on whole home heat pump rebates, undersizing and using the heat pump as partial displacement of heating can be another risk. Some programs address this risk by requiring contractors to disable, disconnect, or remove existing fossil fuel systems. To confirm that ASHPs are likely being installed as whole home solutions, one program indicated that they have begun checking sizing by calculating the home's square footage, comparing that to the tonnage installed, and identifying outliers. The program uses this check to reach out to the installers in question and request further documentation of the Manual J load calculation. This method can help identify contractors who are installing partial displacement solutions and claiming "whole home" heat pump rebates.

One program emphasized the importance of "pre-install approval with underlying objective sizing calculations" and having a third party other than the installer complete the load calculations. This separation of functions can allow customers to link to home assessments or envelope contractors and programs with ASHP installers and programs.

### Integrate supply chain feedback

Strong relationships and lines of communication between the supply chain and program administrators can also improve programs over time. One program highlighted that a "best practices" working group is a beneficial venue for feedback. This group provides a quarterly forum for auditors and contractors elected from their trade ally peers to share updates on market availability and customer trends, as well as training opportunities they would like to see, and provide feedback to shape program adjustments. Another smaller program mentioned highly successful supply chain feedback obtained through holding regular meetings with selected representatives from the area's contractors. Regional support to help local and state programs establish straightforward, open channels for feedback can help local and state program actors nimbly and effectively integrate feedback and market trends into program adjustments.

### Promote partnerships and funding for inclusive local community engagement and support

Both manufacturers and program administrators recognize the opportunity to deepen local community engagement to improve communication with customers and installers and support increased program participation. One manufacturer shared that they collaborate directly with energy non-profits and housing

authorities to facilitate heat pump replacements in multifamily housing projects. NYSERDA's regional clean energy hubs offer another example, in which teams of trusted, knowledgeable, community-based organizations provide information about the benefits of clean energy, ways to reduce energy use and costs, how to make more informed energy decisions, and where to find incentives and qualified contractors. The hubs create their own local promotional events, partnerships, and activities.[43] In Massachusetts, the HeatSmart Alliance is a non- profit volunteer group that helps train trusted community members to support residents in navigating a transition to high efficiency heat pumps.[44]

Across the region, many more opportunities exist to listen to communities' needs and build trusting relationships, particularly with those who might be least familiar with and most skeptical of heat pump technologies. Significant opportunities remain to foster partnerships with community-based organizations and provide financial and technical support and energy coaches to support both residents and installers.

#### Utilize best practice guides

NEEP is developing program best practices for midstream incentive delivery, weatherization and heat pump co-promotion, and income-eligible programs. Market actors, including states, program administrators, installers, and manufacturers should consider these best practice guides in developing their programs or verifying that existing programs are addressing important elements.

### *Plan effectively for complementary policies and regulations*

The main recommendations include the following:

- Provide market certainty with heat pump targets.
- Ensure robust engagement of stakeholders during the development of new policies and regulations.
- Provide an appropriate runway for market actors to prepare for new/enhanced regulations.
- Seek consistency with regional partners (states and programs) to ease regulatory compliance.

States are tackling deployment of energy efficiency combined with high efficiency HVAC in many ways and setting ambitious goals. This will require new policies to address the building sector, in addition to the already-established climate goals, energy-efficiency programs, and building energy codes.

#### Provide market certainty by establishing long-term goals and providing an appropriate runway for market actors to prepare for new/enhanced policies or regulations

- To support long-term regional market development goals like the multi-state NESCAUM agreement (65 percent ASHP market penetration by 2030), regional actors should work collaboratively to develop timely reporting structures and data availability for heat pump sales. Methods used in this report to estimate ASHP sales are not rigorous enough to properly track state-level progress.

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[43] NYSERDA. "Regional Clean Energy Hubs." Available at https://www.nyserda.ny.gov/All-Programs/Regional-Clean-Energy-Hubs.

[44] HeatSmart Alliance. "About Us." Available at https://heatsmartalliance.org/about/.

- To create certainty about outcomes while providing flexibility for the transition, states will need to combine policies that rely on incentives and voluntary actions. For example, states could combine utility energy-efficiency programs with policies that send clear regulatory signals, such as energy codes and equipment standards. Some policies, like clean heat standards (CHS), can include voluntary and mandatory elements: a CHS can require covered entities to achieve a set reduction in emissions, but give flexibility in how requirements are met. An integrated approach to incentive- and standard-based policies will allow the marketplace to find innovative solutions while ensuring steady progress toward long-term goals.
- As states enact different policies, it will be important to consider how various requirements and incentives affect customers and market actors, such as building owners, contractors, wholesale distributors, and retailers. Policy design and implementation can be coordinated to provide a more streamlined experience and avoid duplicative administrative steps. For example, a building owner who is subject to a building performance standard might be able to access incentives from both a clean heat standard-funded program and a utility efficiency program, which could be combined behind the scenes to present a seamless customer experience.

### Seek consistency with regional partners (states and programs) to ease regulatory compliance

- Policies are likely to straddle states and agencies with different but overlapping authorities. States should look for ways to align policies and help market actors identify when new mandates, incentives, or other policies might be implemented.
- It will be important to set clear goals for all programs so that market actors can know what is coming well ahead of effective dates.

### Ensure robust engagement of stakeholders during the development of new policies and regulations

- Programs should engage robustly with regulated parties (manufacturers, program administrators, contractors, and distributors) to help ensure benefits are accessible by all.
- Seek engagement with community-based organizations, tenant organizations, and other groups that include a large percentage of LMI customers.
- An advisory group should serve as a trusted partnership between policymakers and community members to incorporate member input and transform energy-efficiency programs so that they work for everyone. Advisory group members can help define and drive clean energy policy and program decisions and outcomes. Their feedback may include developing program recommendations, identifying tracking metrics, and improving goals and performance incentives to encourage equitable program implementation. Policymakers and program administrators can stay accountable and transparent by publishing progress reports, including graphics, on a public-facing website. These progress reports should clearly define the goals, progress on the goals, and additional actions the program administrators must take to achieve those goals.

## Conclusion

This assessment makes clear that while many barriers to widespread ASHP adoption persist in the Northeast HVAC market, progress is being made and there are clear opportunities for regional stakeholders to drive growth in the market. We believe that the regional goal of 65 percent ASHP target is attainable if the region continues to invest in and implement the kinds of strategies outlined in this report.

NEEP is collaborating with partners in the region and nationally to facilitate this action across states, program administrators, industry leaders, and other key actors. This assessment can be used as a springboard for enhanced action and partnership.

## Appendices

**Appendix A: Survey and Interview Questions**

**Appendix B: Table of Northeast Energy Efficiency Residential Heat Pump Program Offerings**

**Appendix C: Performance Specification List Descriptions**

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## *Appendix A: Survey and Interview Questions*

Questions to All Market Actors
Utility Survey and Interview Questions
Manufacturer Survey and Interview Questions
Distributor Survey and Interview Questions

### QUESTIONS TO ALL MARKET ACTORS

- Has your organization been involved with promoting residential heat pumps in the past several years up until now?
- What does your organization view as the best application opportunity for residential heat pumps in the Northeast?
  - Individual heat pumps for a zone in a house (partial displacement)
  - Heat pumps to provide whole home heating (full heating displacement)
  - Heat pumps to provide whole home cooling (supplemental heat may be needed)
  - Of those three, which product types currently have the most demand?
- How important is residential heat pump adoption to your organization?
- What do you see as your role as a utility program manager?
- What does your organization view as the biggest benefits to adopters?
- What are the biggest barriers in the residential sector?
- What is your organization and/or program doing to address these barriers, and how? Who else could address these barriers, and how?

### UTILITY SURVEY QUESTIONS

The following questions will refer to your utility territory. Some of them will refer to your programs, while others will ask about the market overall. For each, please provide your estimates within your territory as a utility program manager specifically,

- Please name your utility and which state(s) are being served.
- Approximately how many residential households (both single-family and two-to-four-unit multifamily) does your utility serve?

- What percent of the market for residential air-source heat pumps does your company provide rebates through your program within your territory?
- What percent of program participants adopting air-source heat pumps are low-income?
- How many households received rebates for (a) full heating load or (b) partial load displacement with air-source heat pumps from 2021-2023? An estimate is fine.
- How many mini-split heat pumps (1-to-1, multiple heads, or short ducted units) were incentivized by your utility programs in 2021-2023?
- How many centrally ducted (high static pressure) heat pumps were incentivized by your utility programs in 2021-2023?

## UTILITY INTERVIEW QUESTIONS

- In general terms, what lessons has your program learned since beginning heat pump market interventions with the supply chain, contractors, and customers?
  – *Probe: training (i.e., contractor training, customer education, incentives, program design best practices)*

*Customer awareness and marketing*

- Explain the customer marketing, education, and outreach tactics used to drive heat pump adoption and what's been successful.
- Explain the customer marketing, education, and outreach tactics used to educate customers on best practices for living with a heat pump (i.e., maintenance).
- As the program manager, what role do your companies have in contractor training/education activities? Where are the gaps seen?
- How does your company and program address or assess the quality of installations? Are there any certification or training requirements for installers participating in the program?
- Does your company/program benefit from partnerships with the supply chain? Is anything missing? What would you, as a utility program manager, like to get out of them moving forward?
  *Probe: Who do they interact with within the supply chain of manufacturers/distributors, and which individuals (i.e., utility liaisons, local/regional sales reps, trainers)*
- Can you share any distributor contacts?
- Does your company/program offer any programs specifically geared towards heat pumps for low to moderate-income customers? What are they? How do they interact with your other programs?
- As a utility program manager, what is your perspective and experience with dual fuel (hybrid) heat pumps for partial space heating displacement?
  *Probe: Thinking surrounding dual fuel (hybrid) heat pumps and their role in reaching regional energy-efficiency goals*
- Is your company and/or program considering incorporating any special heat pump rates? (i.e., are you considering a dual fuel heat pump rate or expanding space heating rate?)

- Are there plans to expand or modify the residential heat pump rebate program in the future for your utility, and if so, what factors are considered in making these decisions? (i.e., increase or decrease rebates, downstream or midstream? Etc.)
- What gaps in energy-efficiency program best practices does your organization identify?
  *Probe: Market interventions*
- Are there other programs or organizations, regionally or nationally, that your utility program communicates with or references for program design and planning? (i.e., other utilities, Gov't organizations, NGOs, public interest/advocacy groups, etc.)

## MANUFACTURER SURVEY QUESTIONS

- Across ALL manufacturers, how many mini-split heat pumps (1-to-1, multiple head, or short ducted units) do you estimate were sold in the region in 2021-2023?
- Across ALL manufacturers, how many centrally ducted (high static pressure) heat pumps do you estimate were sold in the region in 2021-2023?
- For YOUR business, can you estimate how many heat pump outdoor units you have sold in the region 2021-2023?
- In general, what percentage of the heat pumps you sell in the Northeast are incentivized by utility programs?
- Compared to other manufacturers, how do you think your prior answer compares to the percentage of
- other manufacturers' heat pump sales that are incentivized?
- Ours is higher. Ours is about the same. Ours is lower. Don't know

## MANUFACTURER INTERVIEW QUESTIONS

### *Market Trends*

- Across the U.S. market, where does the Northeast fit in terms of potential and demand for ASHPs?
- Could you describe the current shifts you're seeing in installation costs for ASHPs?
  *Probe: equipment and labor costs*

### *Contractors*

- Currently, do you find that Northeast HVAC contractors are pushing ASHPs, or are the majority of installs due to customers demanding the technology?
- What is the biggest gap in HVAC contractor knowledge on heat pumps? What are the most common errors you see in application or installation?
- Could you share the extent of your HVAC contractor outreach, support, and education/training across the Northeast? Where, when, and how do you hold trainings?
- What has participation been like in your trainings? How do you drive participation? To what extent are your trainings in a partnership or recognized by state or utility programs?
- To what extent does the training you are willing to provide (or financially support) depend on geographic location, investment in the product line and perceived market opportunity?

*Supply Chain and Utilities*

- What is your current relationship with your Northeast distributors in driving the heat pump market forward, and how do you see it evolving moving forward? Do you recommend any high-volume distributors that we should interview?
- Besides utilities, contractors, and distributors, do you see any other organizations playing a major role in the heat pump supply chain? (i.e., community-based organizations, local governments, larger businesses or institutions) [For each] How do they impact product availability and adoption?
- Which utility/state programs have been easier or more challenging to work with regarding heat pump incentives? Why?
- How could utilities or regional organizations support an increase in heat pump adoption over the next year and a half? (i.e., incentive levels, change product eligibility, promote fuel switching, training support)

*Questions if there is still time. Lower tier.*

- Aside from state and utility incentive programs, are there other organizations you work with to promote heat pumps in the region? (e.g., community-based organizations, local government, retailers, community action organizations, contractor groups)

## DISTRIBUTOR SURVEY QUESTIONS

- What state or states within the region do you distribute to?
- Approximately how many contractors in the region do you distribute to?
- Which heat pump brands does your organization sell across the Northeast? Which are more prominently sold?
- In thinking about the overall market in the states you serve within the region, how many heat pumps were sold in total in 2021-2023?
- Of those totals, please estimate how many were mini-splits (1-to-1, multi-split, or short duct) versus central units (high static pressure). A rough estimate or percentage of each is fine for 2021-2023.
- When it comes to space heating (furnaces, boilers, heat pumps for heating), what percentage of products that you sell are heat pumps?
- Compared to other distributors, how do you think your prior answer compares to the percent of their space heating products sold as heat pumps?

  *Ours is higher. Ours is about the same. Ours is lower. Don't know*
- In general, what percentage of the heat pumps you sell in the Northeast are incentivized by utility programs?
- Compared to other distributors, how do you think your prior answer compares to the percentage of their incentivized heat pumps?

  *Ours is higher. Ours is about the same. Ours is lower. Don't know*

## DISTRIBUTOR INTERVIEW QUESTIONS

*General and market trends*

- What is your current relationship with heat pump manufacturers, and how do you see it evolving moving forward?
- Do you anticipate product supply constraints being a problem over the next year or two?
- Could you describe the current shifts you're seeing in installation costs for ASHPs?
- Probe: equipment and labor costs
- Do you have territory managers who are actively driving HPs in their conversations with contractors?
  *Probe: If so, is this TM in a specific region with a particular population included for adopting heat pumps, or does it access the whole service area?*

*Contractors*

- Do you provide any resources for contractors on eligible matched heat pump systems that are stocked and meet the Northeast utilities' requirements for their incentive programs?
  *Probe: Do your staff, the utilities, or manufacturers make these?*
  *Probe: Do you see contractors reaching heat pump equipment program eligibility?*
- What do you find is the biggest gap in contractor knowledge surrounding heat pumps? What are the most common errors you see in application or installation?
- Do you offer sales and installation training classes on ASHPs? If so, how often, what is the average class size, and which manufacturer provides training?
- Have you invested in training via a training calendar, access to labs with technology, and multiple training centers? Or do you just host lunch-and-learns where manufacturers provide training and leave literature or bring training trailers?

*Partnerships*

- Do you partner with any trade schools, and what does that partnership look like?
- What can utilities/statewide programs do to help increase the adoption of heat pumps?
  *Probe: What impact do you think the incentive offerings have on ASHP adoption/program participation?*
  *Probe: How can utilities/statewide programs best support contractors in installing and submitting more ASHP applications and incorporating best practices in applications and installation?*

*Questions if there is still time. Lower tier.*

- Aside from state and utility incentive programs, are there other organizations you work with to promote heat pumps in the region? (e.g., community-based organizations, local government, retailers, community action organizations, contractor groups)
- Have you partnered or do you partner with any other groups, such as a trade union, institution, non- profit, etc., to promote or provide heat pumps?

## *Appendix B: Methodology used to generate estimated HVAC sales data*

Appendix B provides a more detailed explanation of how NEEP estimated state-level HVAC sales. Due to varying data availability, we generated regional sales estimates by considering three Northeast sub- regions: New York, New England (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut), and Mid-Atlantic states (New Jersey, Pennsylvania, Maryland, Delaware, Washington, D.C., and West Virginia). Estimated sales for each sub region were then combined to develop total sales estimates for the Northeast region.

### New England/New York Market Size Estimate Method

Table B1 provides 2021 sales data for New York and New England. The data includes sales of ASHP, furnaces, boilers, and central air conditioners.

**Table B1.2021** ***HVAC sales in New York/New England (HARDI data)***

| HVAC type/Region | New York | New England | Combined |
|---|---|---|---|
| Air-source heat pumps | 138,527 | 91,568 | 230,095 |
| Furnaces | 119,934 | 58,074 | 178,008 |
| Central AC | 135,679 | 86,535 | 222,214 |
| Boilers | 33,171 | 14,923 | 48,094 |

Since HARDI data was unavailable beyond 2021, we utilized ASHP program participation trends to project statewide ASHP sales to 2022 and 2023 (see Table 5). ASHP program trends differed between New England and New York, so each sub-region was projected based on its unique program participation trends. This provided statewide ASHP sales estimates for 2022 and 2023.

**Table B2.** ***Year-over-year ASHP program growth rates (2021-2023) in New York/New England***

| State | ASHP program participation growth rate: 2021 to 2022 | ASHP program participation growth rate: 2022 to 2023 |
|---|---|---|
| New York | 34% increase | 17% decrease |
| New England | 22% increase | 25% increase |

To estimate sales of furnaces, boilers, and central air conditioners in 2022 and 2023, we projected 2021 HARDI data based on the national sales trends for these categories (AHRI shipment data). Without a specific category for boilers in the national shipments data, we assumed trends for boilers were in line with furnaces. Table B3 provides national growth rates for furnaces, boilers and central air conditioners.

**Table B3.** ***Year-over-year growth rates in national sales for furnaces, boilers, and central ACs***

| Equipment Category | National Sales growth rate: 2021 to 2022 | National Sales growth rate: 2022 to 2023 |
|---|---|---|
| Furnaces | 4% decrease | 23% decrease |
| Central AC | 4% decrease | 17% decrease |
| Boilers | 4% decrease | 23% decrease |

Table B4 captures 2021-2023 sales estimates for New York and New England (NE). The estimates were derived by taking 2021 HARDI data (Table B1) and projecting these levels into 2022 and 2023 using program participation growth rates in the case of ASHPs (Table B2) and national market trends in the case of furnaces, boilers and air conditioners (Table B3).

**Table B4.** ***Estimated HVAC Sales in New England and New York (2021-2023)***

| Equipment Category | 2021 | 2022 | 2023 |
|---|---|---|---|
| NY ASHP | 138,527 | 184,996 | 153,547 |
| NY Furnaces | 119,934 | 115,591 | 89,234 |
| NY Central AC | 135,679 | 130,740 | 108,850 |
| NY Boilers | 33,171 | 31,963 | 24,612 |
| NE ASHP | 91,568 | 112,130 | 140,505 |
| NE Furnaces | 58,074 | 55,971 | 43,208 |
| NE Central AC | 86,535 | 83,385 | 69,424 |
| NE Boilers | 14,923 | 14,383 | 11,103 |
| **NY/NE HVAC Totals** | **678,411** | **729,159** | **640,483** |

## Mid-Atlantic Market Size Estimate Method

These states had no HARDI sales data or program data but did have relevant RECS data and national AHRI shipment data. (While NYSERDA made HARDI data available for New York and New England states, no other entity similarly secured the data for Mid-Atlantic states.)

Table B5 provides national shipments data from AHRI for ASHP, furnaces, and central AC (2021-2023).

**Table B5.** ***National Shipments of ASHP, furnaces, central ACs (2021-2023)***

| Equipment Category | 2021 | 2022 | 2023 |
|---|---|---|---|
| ASHPs | 3,916,766 | 4,334,479 | 3,616,632 |
| Furnaces | 4,048,442 | 3,901,838 | 3,012,135 |
| Central air-conditioners | 6,282,285 | 6,053,575 | 5,040,042 |

To create Mid-Atlantic-specific estimates from the national shipments data, we developed two projection factors. Table B6 calculates adjustment factors that we use to project national ASHP shipment data to Mid-Atlantic states.

According to 2020 EIA RECS data, the Mid-Atlantic region represents 10 percent of national households, so we first applied a straight 10 percent adjustment factor to the national shipment data to estimate shipments to the Mid-Atlantic states.

Based on 2020 EIA RECS, 15 percent of households in the country have installed heat pumps as primary or secondary heating systems. Seven percent of households in the Mid-Atlantic states have installed heat pumps

as primary or secondary heating systems. To account for this variance between the national and Mid-Atlantic rate of installed HVAC systems in 2020, we applied a second projection factor to the national shipment data to better reflect the prevalence of likely heat pump sales. We calculated the same ratios for furnaces and central air conditioners.

**Table B6.** ***Mid-Atlantic ASHP shipment "adjustment" factors***

| | % of households with ASHP (Mid-Atlantic/national) | Adjustment factor |
|---|---|---|
| ASHP adjustment (Mid-Atlantic/national) | 7%/15% | 0.45 |
| Furnace adjustment (Mid-Atlantic/national) | 37%/43% | 0.86 |
| Central AC adjustment (Mid-Atlantic/national) | 43%/67% | 0.65 |

To generate 2023 ASHP sales in the Mid-Atlantic states (Table B7), we started with national shipment data (Table B5), applied a 10 percent reduction factor to account for the portion of national households in the Mid-Atlantic states and then a second adjustment (from Table B6) that accounts for the prevalence of ASHP in the installed base compared to the prevalence of ASHPs nationally.

**Table B7. Mid-Atlantic ASHP sales**

| 2023 national ASHP shipments | Portion of national households in Mid- Atlantic states | Mid-Atlantic rate of installed ASHP/national rate of installed ASHP | Estimated ASHP shipments to Mid- Atlantic states |
|---|---|---|---|
| 3,616,632 | 10% | 0.45 | 164,474 |

This method was used to project sales for ASHP, furnaces, and central AC for the Mid-Atlantic region between 2021-2023. These projections are captured in Table B8. Boiler sales were assumed to mirror those of the New York/New England region, corrected by household comparison (89 percent).

**Table B8.** ***2021-2023 HVAC Sales Estimates for Mid-Atlantic States***

| | 2021 | 2022 | 2023 |
|---|---|---|---|
| **Mid-Atlantic ASHP** | 178,124 | 197,120 | 164,474 |
| **Mid-Atlantic Furnaces** | 348,900 | 336,266 | 259,590 |
| **Mid-Atlantic AC** | 405,477 | 390,715 | 325,299 |
| **Mid-Atlantic Boilers** | 42,804 | 41,248 | 31,786 |
| **Mid-Atlantic HVAC Totals** | **975,304** | **965,349** | **781,149** |

## Estimated Total Market Size for Northeast (2021-2023)

To create sales estimates across the entire Northeast region, New York/New England estimates (Table B4) were combined with Mid-Atlantic state estimates (Table B8) in the Table B9 below ASHP market penetration was calculated by dividing ASHP sales by total HVAC sales within a given region/sub-region.

**Table B9.** ***Northeast HVAC sales estimates (2021-2023)***

| | 2021 | 2022 | 2023 |
|---|---|---|---|
| **New York/New England ASHP** | 230,095 | 297,127 | 294,052 |
| **New York/New England Total HVAC** | 678,411 | 729,159 | 640,483 |
| **New York/New England ASHP Mkt Penetration** | 34% | 41% | 46% |
| **Mid-Atlantic ASHP** | 178,124 | 197,120 | 164,474 |
| **Mid-Atlantic Total HVAC** | 975,304 | 965,349 | 781,149 |
| **Mid-Atlantic ASHP Mkt Penetration** | 18% | 20% | 21% |
| **Northeast ASHP** | **408,219** | **494,247** | **458,526** |
| **Northeast Total HVAC** | **1,653,715** | **1,694,507** | **1,421,632** |
| **Northeast ASHP Mkt Penetration** | **25%** | **29%** | **32%** |

## *Appendix C: Table of Northeast Energy Efficiency Residential Heat Pump Program Offerings*

The following pages include data compiled from the primary energy-efficiency heat pump incentive programs in the Northeast region during the summer of 2024.

Program information from some smaller area service providers is included, but not all smaller electric service providers are represented. If a utility or service provider was investigated and no heat pump incentives were found, we did not include it in the chart.

The chart does *not* include Weatherization Assistance Programs or other state or local agencies primarily providing subsidized weatherization services to lower-income residents.

| State | Incentive Program Administrator | Rebate Amount | Unit of Measure (per) *Cooling capacities are @95F | Ducted vs Ductless Systems (or ATW) | Fuel Switching constraints? Eligibility related to customers existing fuel/ heating system | Partial vs. Whole House (installed capacity to bldg load) | Income-Eligible Program Component ? | Equipment Specification Criteria | Incentive Recipient May also include unidentified contractor incentives | Integrated Controls Required? If fossil fuel system not removed | Decom-mission Existing HVAC Required? | Envelope Improvement/ Wx Bonus for Heat Pumps | Contractor or Distributor Network? May involve qual's beyond min. business req's. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CT | Energize CT | $750 (max $15,000) | Ton Cooling cap. | Either | No restrictions | Either | No | Energy Star cold climate | Customer | Yes | No | *ADD insulation = +$500 to HP | Contractors |
| DC | DC Sustainable Energy Utility | $375 or $700 | Outdoor Condenser | Either | No restrictions | Either | Free for LMI Must enroll in Solar for All | SEER2/HSPF2/EER2 | Customer | No | No | No | No |
| DE | Energize Delaware | $550 to $3,300 | Project/ Residence | Either | No restrictions | Either | LMI bonus | SEER2/ HSPF2/ EER2 | Customer | No | No | Air sealing + HP ($300) | Contractors |
| MA | Mass Save | $10,000 | Project/ Residence | Either | Some NG restrictions in localities. | Whole house (90-120%) | LMI bonus | Energy Star Cold Climate | Customer | Not applicable | Yes | Rebate requires bldg meets Wx standards. | Contractors |
| MA | Mass Save | $1,250 (max $10,000 | Ton Cooling cap. | Either | Some NG restrictions in localities. | Partial (<90%) | LMI bonus | Energy Star Cold Climate | Customer | Yes | No (partial only) | N/A | Contractors |
| MA | Mass Save | *Air-to-Water* $10,000 | Project/ Residence | Not Applicable | Some NG restrictions in localities. | Whole house (90-120%) | LMI bonus (+$6k) | Mass Save QPL | Customer | Not applicable | Yes | Rebate requires bldg meets Wx standards. | Contractors |
| MD | BGE | $250 (currently on hold) | Ton Cooling cap. | Either | Elec or no heat only | Either | No | BGE criteria | Customer | No | | No | Contractors, Distributors |
| ME | Efficiency Maine | 40% (max $4,000) | Project/ Residence | Either | No restrictions | Whole house (100%) | Any | CEE North | Customer | No | No | No | Contractors |
| ME | Efficiency Maine | 60% (max $6,000) | Project/ Residence | Either | No restrictions | Whole house (100%) | Moderate | CEE North | Customer | No | No | No | Contractors |
| ME | Efficiency Maine | 80% (max $8,000) | Project/ Residence | Either | No restrictions | Whole house (100%) | Low | CEE North | Customer | No | No | No | Contractors |
| NH | NH Saves (Eversource, etc.) | $250 | Ton Cooling cap. | Either | No restrictions | Either | No | Energy Star Cold Climate | Customer | No | No | No | No |
| NH | NH Saves (NHEC) | $250 | Ton Cooling cap. | Either | No restrictions (+$1,000/ ton for elect bsbd) | Either (+$250/ ton for 80+%) | No | Energy Star Cold Climate | Customer | No | No | +$250/ton w/ prev Wx | No |

| State | Incentive Program Administrator | Rebate Amount | Unit of Measure (per) *Cooling capacities are @95F | Ducted vs Ductless Systems (or ATW) | Fuel Switching constraints? Eligibility related to customers existing fuel/ heating system | Partial vs. Whole House (installed capacity to bldg load) | Income-Eligible Program Component ? | Equipment Specification Criteria | Incentive Recipient May also include unidentified contractor incentives | Integrated Controls Required? If fossil fuel system not removed | Decom-mission Existing HVAC Required? | Envelope Improvement/ Wx Bonus for Heat Pumps | Contractor or Distributor Network? May involve qual's beyond min. business req's. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NJ | PSEG | $240 to $600 | Project/ Residence | Either | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No | No | No | Contractors |
| NJ | Rockland Electric Company | $500 | Outdoor Condenser | Either | No restrictions | Partial | No | NEEP ccASHP | Customer, Contractor | No | No (partial only) | No | Contractors |
| NJ | Rockland Electric Company | $1,600 | 10k BTU/h@5F Heating cap. | Either | No restrictions | Whole house (100-120%) | No | NEEP ccASHP | Customer, Contractor | No | No | No | Contractors |
| NY | Clean Heat (ConEd) | $1,000 to $2,500 | Project/ Residence | Either | No restrictions | Whole house (100-120%) | DAC bonus ($1k to $2k) | NEEP ccASHP | Customer, Contractor | Yes | No | No | Contractors |
| NY | Clean Heat (ConEd) | $4,000 to $8,000 | Project/ Residence | Either | No restrictions | Whole house (100-120%) | DAC bonus ($1k to $2k) | NEEP ccASHP | Customer, Contractor | Not applicable | Yes | No | Contractors |
| NY | Clean Heat (Other Joint Utilities) | $500-$800 | 10k BTU/h@5F Heating cap. | Either | No restrictions | Whole house (100-120%) | No | NEEP ccASHP | Customer, Contractor | Yes | | No | Contractors |
| NY | Clean Heat (Other Joint Utilities) | $700-$1,000 | 10k BTU/h@5F Heating cap. | Either | No restrictions | Whole house (100-120%) | No | NEEP ccASHP | Customer, Contractor | Yes | No | No | Contractors |
| NY | Clean Heat (Other Joint Utilities) | $1,000-$1,400 | 10k BTU/h@5F Heating cap. | Either | No restrictions | Whole house (100-120%) | No | NEEP ccASHP | Customer, Contractor | Yes | Yes | No | Contractors |
| NY | Clean Heat (Other Joint Utilities) | *Air-to-Water* $10,000 | 10k BTU Heating cap. A5W110 | Not Applicable | No restrictions | Whole House (or remainder using ASHP) | No | Clean Heat AWHP QPL | Customer, Contractor | Unclear | Unclear | No | Contractors |
| NY | PSEG Long Island | $1,000 | Ton Heating cap. @17F | Either | No restrictions | Whole house | LMI Enhanced Rebate | NEEP ccASHP | Customer | Yes | No | No | Contractors |
| PA | PPL; PECO; First Energy | $150 to $450 | Outdoor Condenser | Either | No restrictions | Either | No | PPL HP | Customer | No | No | Insul + Air seal + HP ($350) | No |

| State | Incentive Program Administrator | Rebate Amount | Unit of Measure (per) *Cooling capacities are @95F | Ducted vs Ductless Systems (or ATW) | Fuel Switching constraints? Eligibility related to customers existing fuel/ heating system | Partial vs. Whole House (installed capacity to bldg load) | Income-Eligible Program Component ? | Equipment Specification Criteria | Incentive Recipient May also include unidentified contractor incentives | Integrated Controls Required? If fossil fuel system not removed | Decom-mission Existing HVAC Required? | Envelope Improvement/ Wx Bonus for Heat Pumps | Contractor or Distributor Network? May involve qual's beyond min. business req's. |
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| RI | RI Energy | $150 | Ton Cooling cap. | Ductless | No restrictions | Either | No | multiple | Customer | No | No | No | Contractors |
| RI | RI Energy | $350 | Ton Cooling cap. | Ducted | No restrictions | Either | No | multiple | Customer | No | No | No | Contractors |
| RI | RI Energy | $1,250 | Ton Cooling cap. | Either | Electric resistance heating only | Either | No | multiple | Customer | No | No | No | Contractors |
| RI | RI Office of Energy Resources | $1,000 (max $10,000) | Ton Cooling cap. | Centrally ducted | Nat gas, propane, or oil only | Either | LMI bonus for propane or oil | NEEP ccASHP | Customer | No | No | No | Contractors |
| RI | RI Office of Energy Resources | $1,000 (max $10,000) | Ton Cooling cap. | Mixed | Nat gas, propane, or oil only | Either | LMI bonus for propane or oil | NEEP ccASHP | Customer | No | No | No | Contractors |
| RI | RI Office of Energy Resources | $1,000 (max $10,000) | Ton Cooling cap. | Non Ducted | Nat gas, propane, or oil only | Either | LMI bonus for propane or oil | NEEP ccASHP | Customer | No | No | No | Contractors |
| RI | Block Island Utility District | $150 to $250 | Ton Cooling cap. | Either; rebate varies | No restrictions | Either | No | NEEP ccASHP | Customer | No | No | $250 for HP + Wall Insul. | Contractors |
| VT | Efficiency Vermont | $1000 (<2 ton) | Ton Cooling cap. | Ducted | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No (bonus $600 for IC) | No | No | No |
| VT | Efficiency Vermont | $1,500 (2-4 ton) | Ton Cooling cap. | Ducted | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No (bonus $600 for IC) | No | No | No |
| VT | Efficiency Vermont | $2,000 (>4 ton) | Ton Cooling cap. | Ducted | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No (bonus $600 for IC) | No | No | No |
| VT | Efficiency Vermont | $350 (<2 ton) | Ton Cooling cap. | Ductless | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No (bonus $600 for IC) | No | No | No |
| VT | Efficiency Vermont | $450 (>2 ton) | Ton Cooling cap. | Ductless | No restrictions | Either | LMI bonus | NEEP ccASHP | Customer | No (bonus $600 for IC) | No | No | No |
| VT | Efficiency Vermont | Air-to-Water $1,000 (<6 ton) | Ton Heating cap. A5W110 | ATW (Air-to- Water) | (Must have water- based distribution) | Either | LMI bonus | Eff VT specs | Customer | No | No | No | Contractors |
| WV | Appalachian Power | $700 | Project/ Residence | Either | Non-regulated fuel only (propane, wood, coal, etc.).Excludes nat gas | Either | LMI bonus | Energy Star Certified | Customer | No | No | No | Contractors |