Northeast/Mid-Atlantic Heating Electrification

Market Transformation Progress Report (September 2022)

This report captures results from NEEP's annual survey of regional stakeholders to assess perceived progress in implementing the seven key market strategies outlined in NEEP's Northeast/Mid-Atlantic Air-Source Heat Pump ASHP Market Strategies Report and Variable Refrigerant Flow (VRF) Market Strategies Report. In addition to measuring implementation progress across the strategies, NEEP also presents market updates, seeks input on the evolution of the ASHP initiative strategies, and gathers suggestions on how NEEP can better incorporate diversity, equity, inclusion, and justice (DEIJ) into the Heating Electrification Initiative.

Beyond collecting survey input from stakeholders ranging from state policymakers, program administrators, manufacturers, service providers, installer/distributors, and advocates, NEEP has gathered sales data, tracked program and policy implementation, and examined various market activities seen across the region. The following report is organized into four detailed sections:

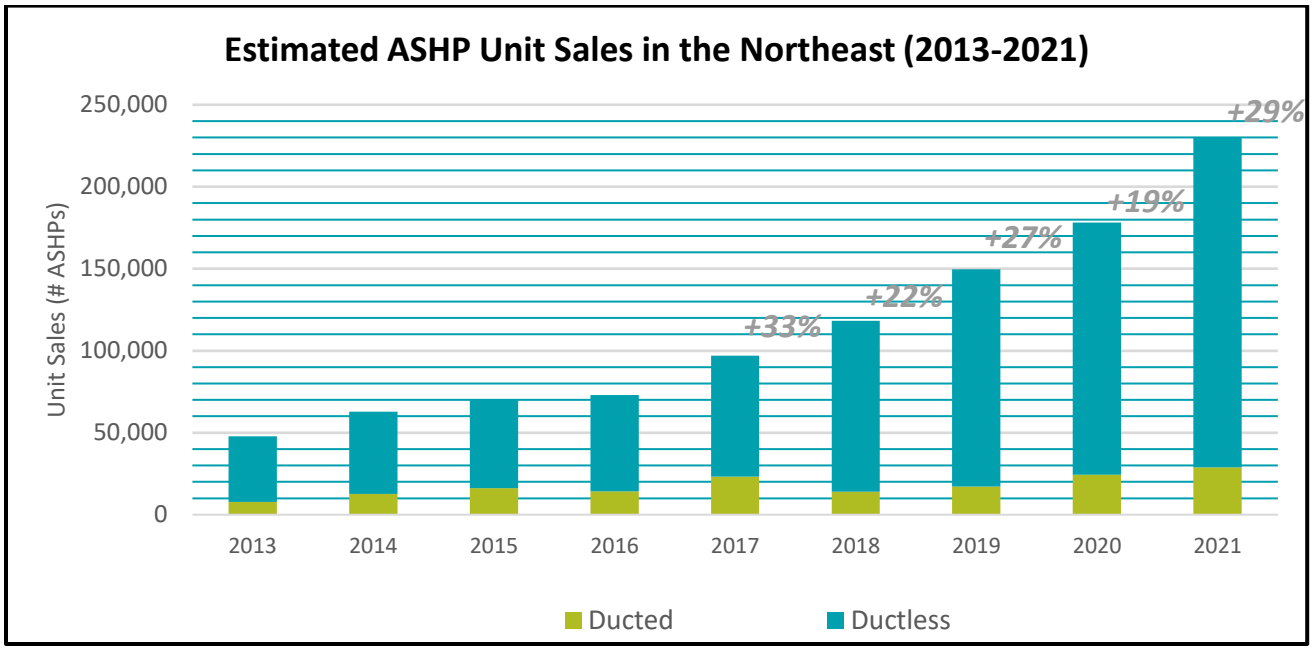
1. 2021 estimated HVAC system sales data in the Northeast;
2. 2021 implementation progress including survey results, program breakdown, policy implementation, and market activity;
3. Evolution of the ASHP market strategy areas, including opportunities for collaboration; and
4. Suggestions for incorporating DEIJ into the Heating Electrification Initiative.

As NEEP and the region plans for 2023 and the coming years, this stakeholder input is valuable guidance for the strategic direction of NEEP-led activities, events, and resources to support the accelerated adoption of heat pump technologies for both the residential and commercial sectors.

1. 2021 Sales Data

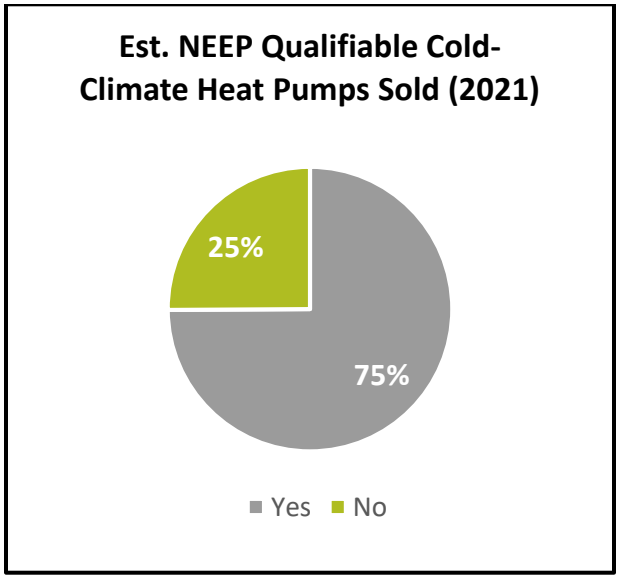
To better understand how the heat pump market is transforming, NEEP collected regional HVAC sales data that has been made available by the state of New York[1]. It should be noted that the provided information below reflects HVAC systems under 65kBtu, and does not distinguish between residential and commercial units. Additionally, all unit sales reflected below are estimations calculated by D+R International.

[1] D+R International, 2022. 2021 HVAC Market Report, prepared for the New York State Energy Research and Development Authority.

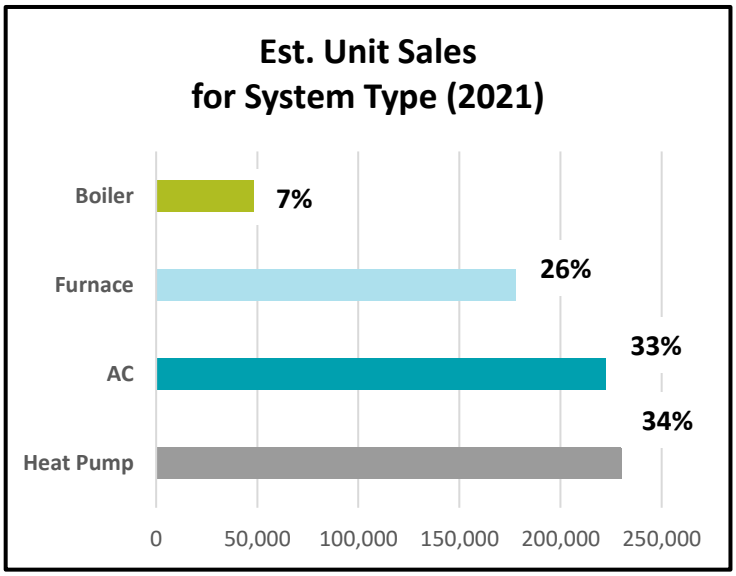


Graph 1: *Estimated ducted & ductless ASHP sales in the Northeast region from 2013 – 2021*

As seen in **Graph 1**, heat pump sales are continually growing with increased uptake each year. In 2021 alone, estimated sales increased by approximately 29 percent when compared to 2020.



Graph 2*: Estimated sales considered cold-climate units*



Graph 3: *Breakdown of HVAC system sales*

Graph 2 shows that out of the total ASHP's sold, 75 percent of them are estimated to be "NEEP qualifiable," indicating that a majority of the units installed are considered cold climate heat pumps. **Graph 3** highlights that heat pumps were estimated to comprise the largest share of HVAC systems sold at 34 percent. Furnaces and

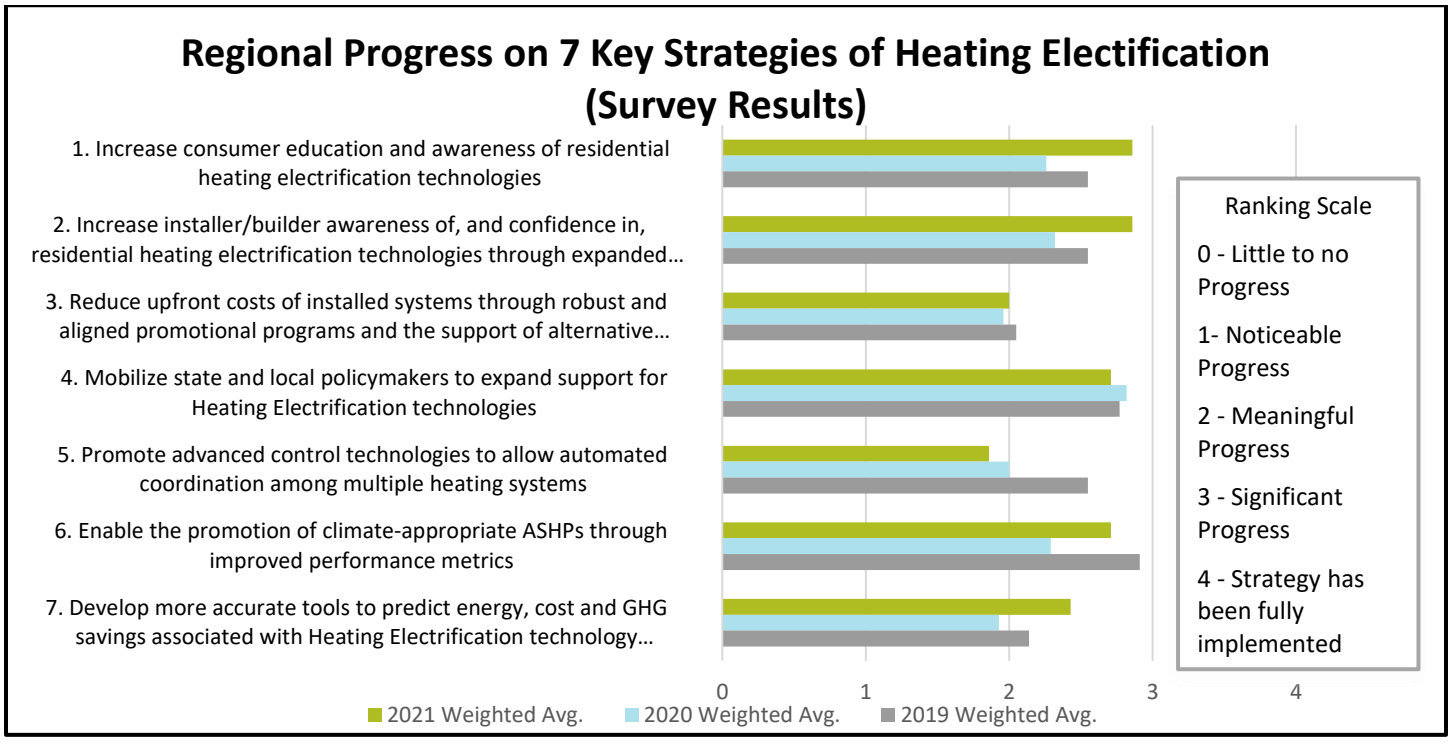
boilers combined make up approximately 1/3 of the market share, with a majority of those sales going to gas furnaces. The other 1/3 of the market is made up of air-conditioning units, which presents an opportunity to leverage this market to aid in heat pump adoption.

2. 2021 Implementation Progress

To distinguish the progress that has been made over the past year, NEEP circulated the market transformation survey to regional stakeholders, documented policy implementation, tracked program updates, and market activities. Below you will find the results of the NEEP's research and survey responses.

Residential Survey Results

Using 2021 as a baseline, section 1 of the survey asked respondents to rate implementation progress through the first half of 2022 for each of the seven market strategy areas.



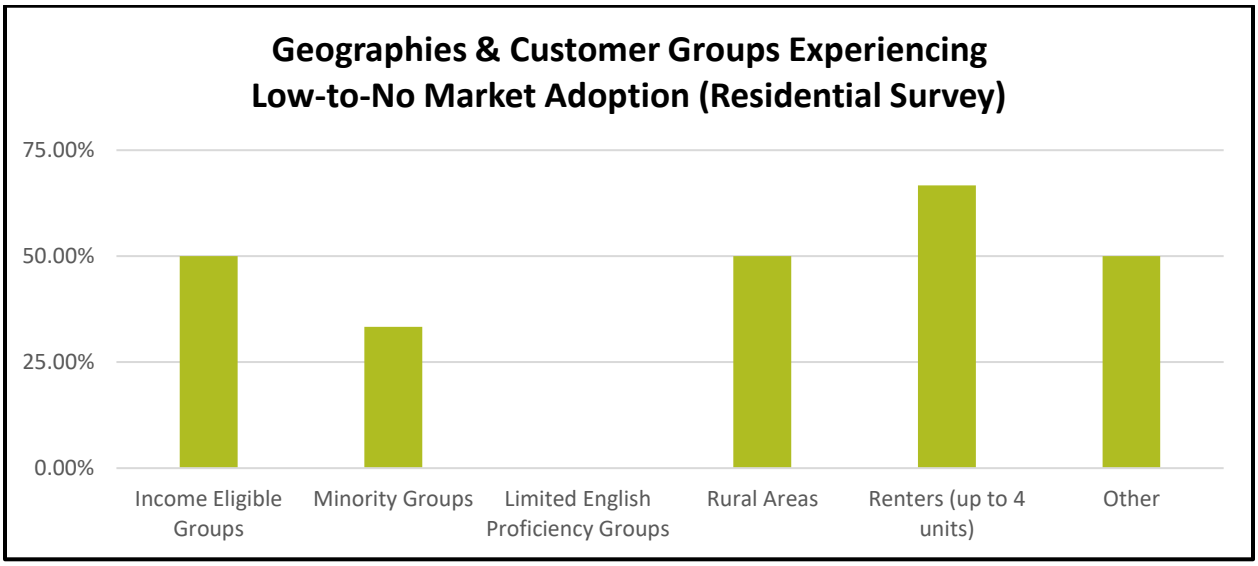
Graph 4: *Rated Progress by Market Transformation Strategy Area, 2020 & 2021 Weighted Averages*

Overall, the weighted results of the survey respondents indicate an increase in perceived progress of strategy implementation in 2021, when compared to 2020. There is a slight decrease seen in strategies regarding policy support and the promotion of advanced controls. When looking at unweighted results, it should be noted that

some stakeholders documented that there was “Little to No Progress” in the promotion of advanced controls in 2021.

Comparing 2021 to 2019, a year without COVID-19 complications, we can see that progress was made across three strategies: consumer education, installer/builder awareness & confidence, and development of tools for energy prediction, cost, and green-house gas (GHG) savings. This is important to note because 2020 saw a decrease in progress across all seven strategies, except for mobilizing policymakers, when compared to 2019.

Stakeholders were also asked to weigh in on what customer groups and geographies they were noting as experiencing low-to-no market adoption.

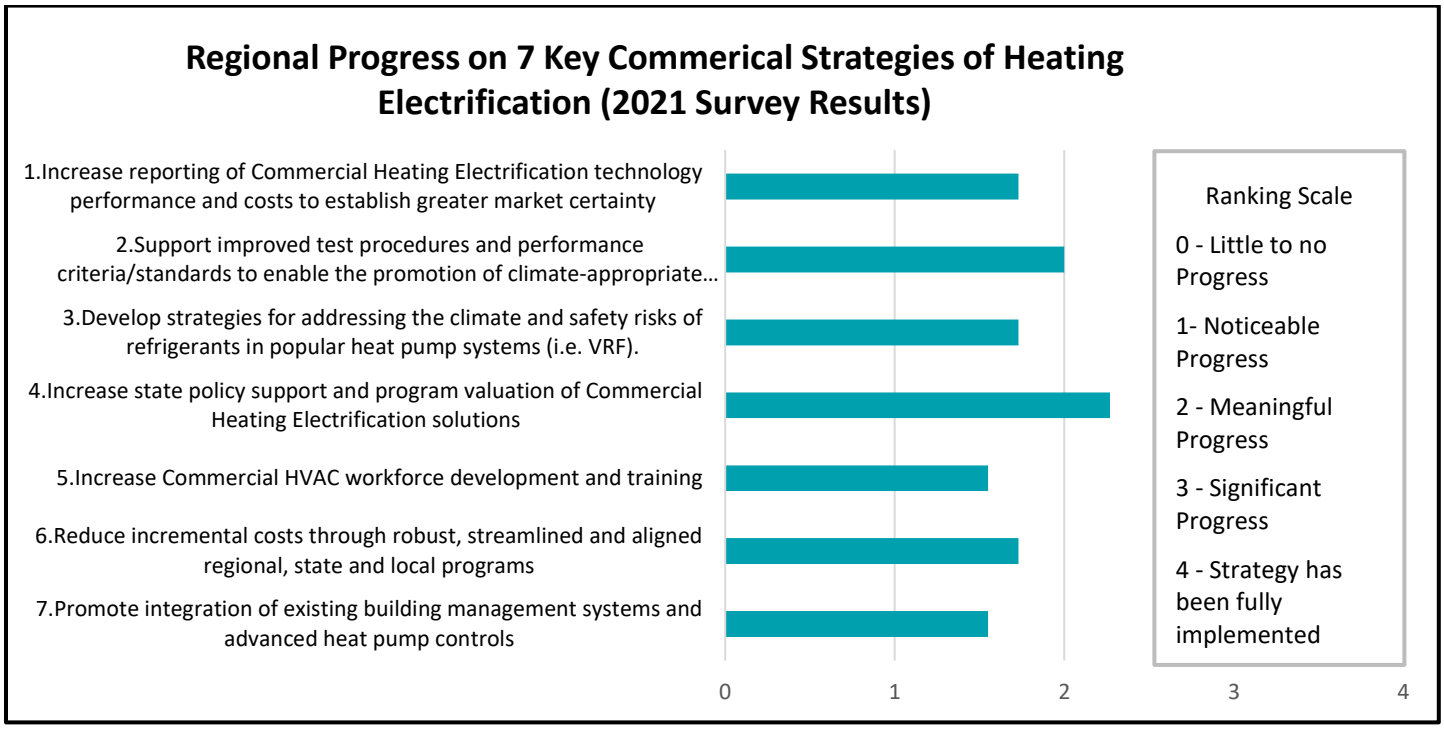


Graph 5: *Survey responses of recognized geographies and customer groups that are experiencing low to no market adoption in the residential sector*

As seen in **Graph 5**, stakeholders in the residential working group have noted that almost all the categories above are experiencing low-to-no market adoption. Renters in single family or multifamily homes were ranked as the highest group that was experiencing low-to-no market adoption. Following renters, income eligible groups, rural areas, and other groups were noted as experiencing low-to-no market adoption. Respondents who marked “Other” expressed that they were specifically highlighting customers who are currently using gas for their heating.

Commercial Survey Results

Using 2021 as a baseline, section 1 of the survey asked respondents of the Commercial Heating Electrification Working Group to rate implementation progress in each of the seven market strategy areas made through the first half of 2022.

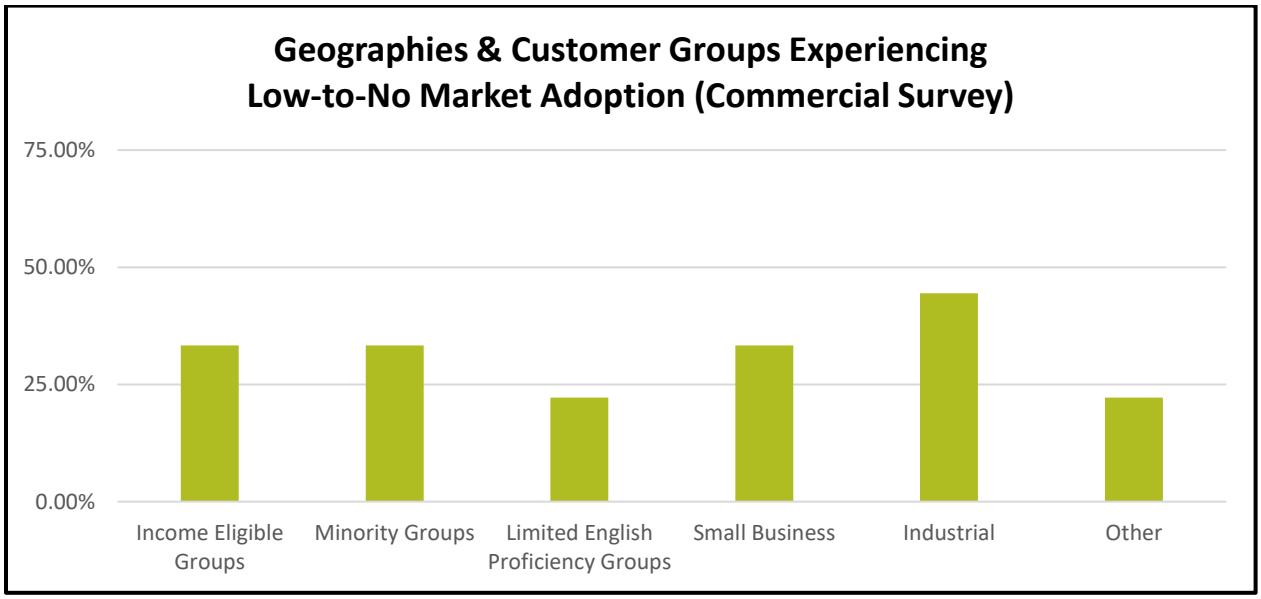


Graph 6: *Rated Progress by Market Transformation Strategy Area for the commercial sector, 2021 Weighted Averages*

This was the first year that a separate survey was conducted for the Commercial Heating Electrification Working Group, and therefore will be used as the base for comparison of future reports. The weighted averages of the survey results in **Graph 6** indicate that "Noticeable Progress" was achieved across most of the seven strategies, with "Meaningful Progress" seen in "Increased state policy support and program valuation of Commercial Heating Electrification solutions".

Respondents noted that this was a short period of time to gauge if any change has been made, so it should be noted that many felt "Little to No Progress" has been made across the seven strategies. In particular, the data shows stakeholders feel the least progress was made in regards to the development of the HVAC workforce.

Stakeholders were also asked to weigh in on what customer groups and geographies they were noting as experiencing low-to-no market adoption.



Graph 7: *Survey responses of recognized geographies and customer groups that are experiencing low to no market adoption in the residential sector*

The commercial survey saw slightly different results than the residential group, with **Graph 7** illustrating that the industrial sector is experiencing little-to-no market adoption. Trailing the industrial sector are income-eligible and minority groups, as well as small businesses. For respondents who marked "Other," they have expressed that they are referring to large commercial businesses and red states.

For a more detailed breakdown of states centering equity within their policies and programs please visit NEEP's Regional Roundup page.

Beyond the survey responses for rating implementation of the strategies, stakeholders were also asked to speak more broadly on activities that have happened in the past year that will help in the market adoption of heat pumps. Below are their responses, along with additional activities cited by NEEP, broken up into policy, program, and market activity sections:

Policy Drivers

Throughout 2021 some policies have been implemented that will be influential in the increase of market adoption of heat pumps. Below you will find a selection of policies enacted both federally and regionally, that have an effect of the progress on our seven key market strategies for both the residential and commercial sectors.

Infrastructure Investment and Jobs Act

Congress passed the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act) in November 2021, which focuses on 10 infrastructure-related activities supported and funding by the federal government. Two of these activities will affect the market adoption of heat pumps in a beneficial manner for the Northeast. The Act plans to invest $42 billion in the nation's airports, ports, and waterways, which will prevent disruptions and strengthen our supply chains. Additionally, the federal government plans to invest over $65 billion in upgrading the nation's power infrastructure to deliver clean, reliable energy and in the deployment of innovative energy technology to help achieve a zero-emissions future. A portion of this allotment will help fund new programs supporting the development, demonstration, and deployment of energy-efficient technologies.

Defense Production Act

President Biden invoked the Defense Production Act in June 2022 signaling that clean energy is a national security issue. With this action, the administration is scaling up clean energy technologies to help decarbonize the building sector, with heat pumps being highlighted as one of the technologies. This can help influence manufacturers in increasing production and also builds awareness around the technology. It should be noted that while this action is encouraging, the DPA budget is smaller and that the authorization can be revoked.

An Act Creating a Next-Generation Roadmap for MA Climate Policy

Massachusetts Governor Baker signed the Act Creating a Next-Generation Roadmap for MA Climate Policy in May of 2021. The legislation touches upon many subjects including energy efficiency programs, climate targets and regulatory authority, building codes and appliances, clean energy workforce, and equity and environmental justice, to name a few. For a breakdown of the policy, please view NEEP's Policy Fact Sheet on the S.9, An Act Creating A Next-Generation Roadmap for Massachusetts Climate Policy.

Particular items to highlight are the additional $12 million dollars invested annually into a Clean Energy Equity Workforce and Market Development Program. These funds are aimed to create more job training opportunities for the advancement of environmental justice communities, minority-owned and women-owned businesses, and fossil fuel employees in the clean energy industry. Beyond this, the Act seeks to create a heat pump market development program that will fund and offer training for the expansion of heat pump technology used for space and water heating. Additionally, the first ever sector-by-sector greenhouse gas limits were created and adopted in July 2022, including limits for commercial, industrial, and residential heating and cooling. Benchmarks were also adopted for clean energy technology, including heat pumps.

New York City New Construction Regulation

New York City saw updates to what is permissible in new construction. In December of 2021, New York City Council passed Int. 2317-2021, which bans new fossil fuel hookups in buildings for kitchen stoves, space and water heating. This ban will take effect in 2024.

Program Activity

NEEP tracks heat pump programs across the Northeast and Canada to discover the types of systems being incentivized, rebate offers, and requirements. Below is a brief breakdown of our findings for the Northeastern programs only. The data shown is not a full representation of all program offerings, but is instead a representation of the larger programs found in CT, MA, ME, RI, VT, NY, PA, NH, NJ, and Washington D.C.

Residential

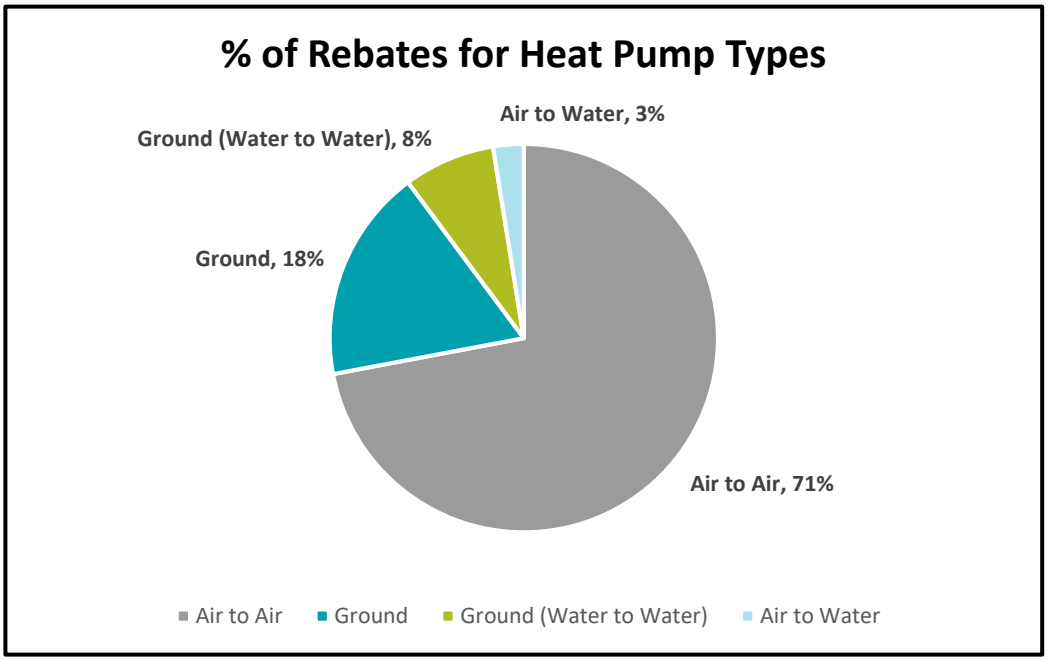
For purposes of this question, NEEP considered rebates provided for residential housing of four units or less.

20
Northeast Programs

119
Rebates

$150 - $10,000
Rebate Range for ASHP

$500 - $15,000
Rebate Range for GSHP



Graph 8: *Heat Pump technology making up the incentive offerings in residential, northeast programs*

Out of the 20 residential programs NEEP tracks in the Northeast, 119 rebates are offered for ASHP and GSHP combined with a majority of the rebates focused on air source, at approximately 71 percent. Out of the 20 programs, eight require cold climate heat pumps to be listed on the NEEP ccASHP List. These eight programs comprise three states (NY, RI, and VT).

The rebates range from $150/ton up to $10,000/home for ASHP. Even larger incentives are provided for GSHP, ranging from $500 to $15,000/home. Efficiency Maine had unprecedented demand, including a 123 percent increase in heat pump sales in 2021, causing it to reduce incentives in order to manage the budget. New Jersey also reduced incentives in 2021 and the ConEd utility program in New York ran out of funding in 2022.

Program News

- The Canada Greener Homes Grant was launched in 2021, offering grant amounts up to $5,000 for heat pumps. This large market has caught the attention of manufacturers, resulting in a sharp increase of cold climate heat pumps on the NEEP ccASHP list.
- The NYS Clean Heat program announced a $10 million Consumer Education & Awareness Campaign for Clean Heating and Cooling Solutions, as well an $38 million investment through 2025 on the heating electrification workforce.
- Ithaca, NY announced its Efficiency Retrofitting and Thermal Load Electrification Program in 2021, where it aims to retrofit its existing residential and commercial building stock by 2030. It is a voluntary program where each building is assessed for energy efficiency improvements with a specific emphasis on the building envelope and heat pump technologies for space and water heating. The program is open to everyone, but there is a special emphasis on serving low-to-moderate income communities.

Commercial

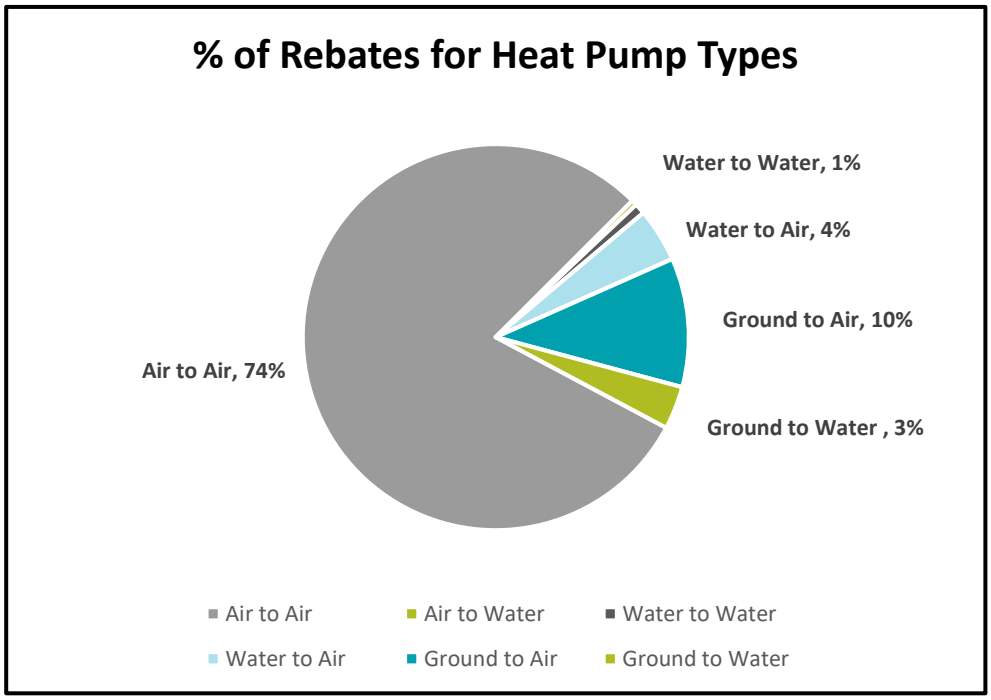
For purposes of this question, NEEP considered commercial rebates provided for residential housing of five+ units and for businesses.

18
Northeast Programs

240
Rebates

$20 - $3,500
Rebate Range for ASHP

$75 - $4,500
Rebate Range for GSHP



Graph 9: *Heat Pump technology making up the incentive offerings in northeast, commercial programs*

Out of the 18 commercial programs NEEP tracks in the Northeast, 240 rebates are offered for ASHP and GSHP combined, with a majority of the rebates focused on air-source, at approximately 74 percent. Out of the 18 programs, three require cold climate heat pumps to be listed on the NEEP ccASHP List. These eight programs comprise two states (NY and VT).

This was the first year NEEP began tracking commercial heat pump programs, but overall rebates ranged from $20 to $3,500 per ton for ASHP and $75 to $4,500 per ton for GSHP. Rebates were offered for mini-splits, split- and single-package systems, vertical packaged systems, and VRF units.

Market Activity

Beyond program and policy changes in the past year, additional market activities have occurred that demonstrate heating electrification progress. Below are some activities that have occurred in 2021 and the first half of 2022, along with some additional anecdotal evidence provided by stakeholders from the survey.

U.S. DOE Cold-Climate Heat Pump Technology Challenge

As a part of the U.S. DOE's Initiative for Better Energy, Emissions, and Equity (E3) Initiative, the Residential Cold-Climate Heat Pump Technology Challenge was launched in 2021. Creating an opportunity for technological advancement in cold-climate centrally-ducted heat pumps by having manufacturers compete to attain optimal operation at 5°F and/or -15°F. Nine manufacturers, including Carrier, Lennox, Daikin, Johnson Controls, LG, Midea, Mitsubishi Electric, Rheem, and Trane, are participating in the challenge by having their next-generation prototypes submitted and lab-tested by the end of 2022.

U.S. DOE Smart Tools for Efficient HVAC Performance Campaign

In 2021, U.S. DOE launched a new campaign, Smart Tools for Efficient HVAC Performance Campaign (STEP), to help accelerate the adoption of smart diagnostic tools for HVAC contractors to commission and identify malfunctions in new HVAC systems. These smart diagnostic tools can address performance at a lower cost than with the tools that were previously on the market. This campaign is aimed at a full range of products and not only for high-end equipment. This national campaign will aid in our market strategies by helping to build knowledge and tools that can be utilized by contractors to help in the proper installation of heat pumps.

V6.1 Energy Star Cold Climate Specs & NEEP ccASHP Specs

Both in last year's and this year's survey, respondents highlighted Energy Star Specification V6.0 and V6.1, which helps dictate minimum performance of heat pump systems and encourages HVAC manufacturers to design their systems beyond the specification, ensuring performance and satisfaction. NEEP finalized an updated Version 4.0 of the ccASHP Specification which now includes categories for central heat pumps, packaged terminal heat pumps and single package vertical heat pumps, and Variable Refrigerant Flow (VRF)

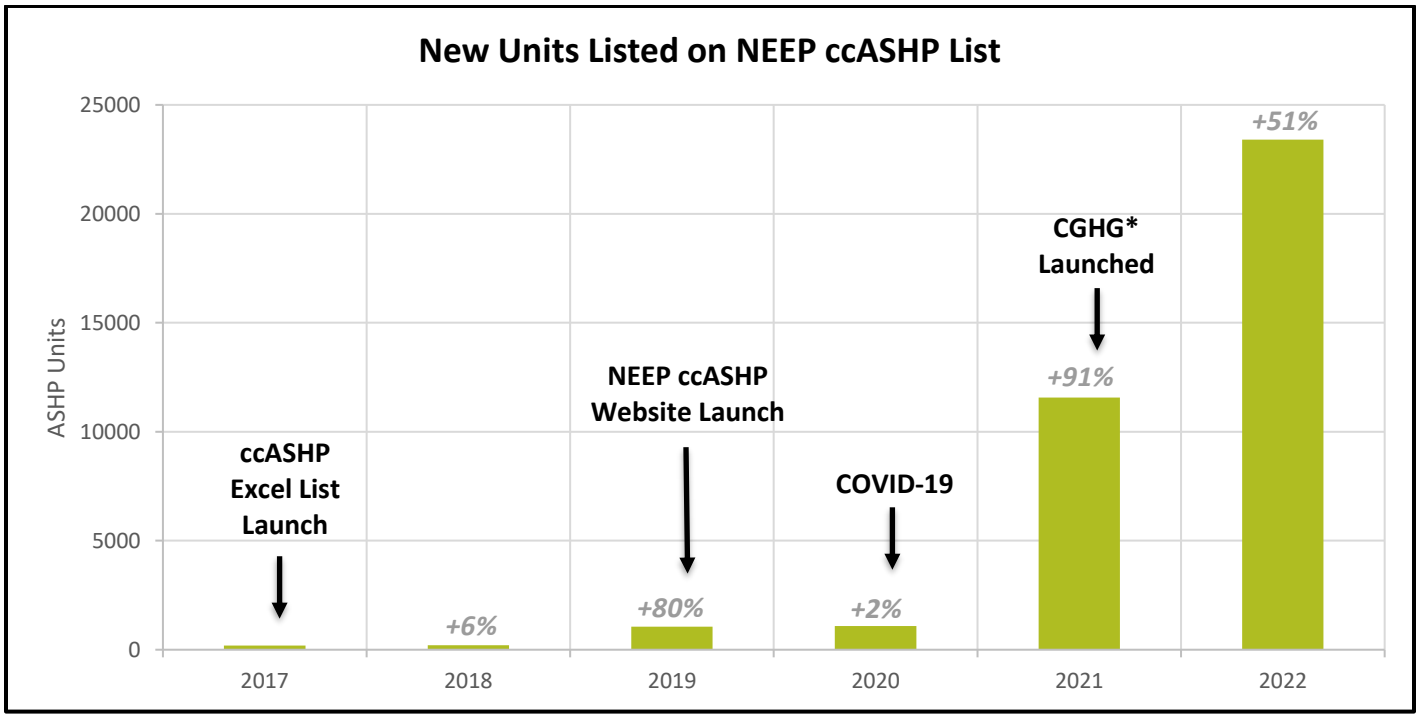
Anecdotal Evidence (Survey Responses)

Beyond the market activities noted above, survey respondents expressed what they have noticed within the market this last year:

- We're having more conversations with manufacturers about the need for commercial cold climate heat pumps.
- There is year-after-year growth that is much higher than forecasted. Customers are asking for heat pumps.
- More heat pumps are being utilized in projects than cheap AC units.
- Contractors are starting to buy ASHPs in bulk & storing them, demonstrating confidence in being able to sell through that inventory.
- The robust incentives for whole-home conversion in MA has contractors previously hesitant to "get on board" as they see the writing on the wall with fossil fuel equipment.
- Cal TECH program cut rebates and ran out of funding. Con Edison in New York and the New Jersey Clean Energy Program exhausted rebate budgets by mid-year 2021.

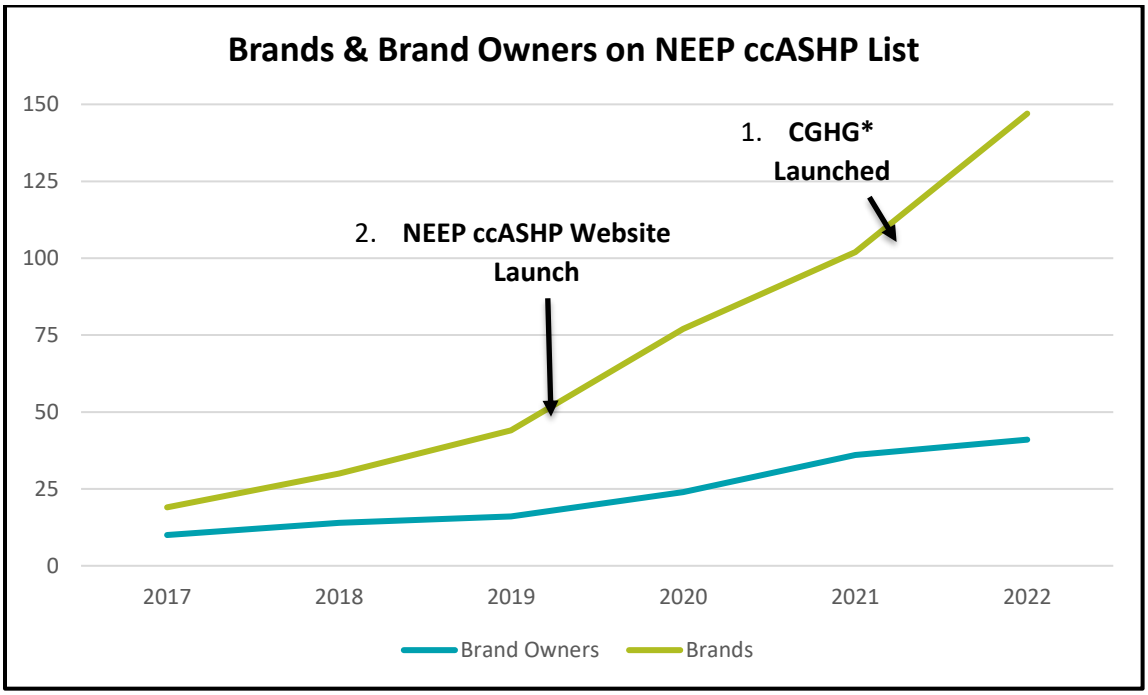
Manufacturer Engagement with NEEP ccASHP List

The NEEP Cold-Climate Air Source Heat Pump (ccASHP) List launched in 2015 as a tool for program administrators, contractors, and customers to have a consolidated library of heat pumps that meet the specifications needed to work efficiently in the cold climate of the Northeast. Multiple programs throughout the region utilize the NEEP ccASHP list as a qualified products list for customers to receive rebates, which has been a driver for manufacturers to create innovative technologies that meet the standards of the list. Below you will find how manufacturer engagement has changed over time.



Graph 10: *New cold-climate ASHP's listed on the NEEP ccASHP directory (2017-2022)*
**Canada Greener Homes Grant*

In 2021 the ccASHP list saw huge growth in the number of eligible units submitted by manufacturers, as seen in **Graph 10**. The 91 percent increase, compared to 2020, is likely due to Northeastern programs increasing both their rebates and their program offerings. Additionally, a new program, the Canada Greener Homes Grant (CGHG), was launched by Natural Resources Canada in 2021. The CGHG extends its offerings across Canada and uses the NEEP ccASHP database as a source list to help build its own qualified products list. Having programs in both the Northeast and Canada that use the ccASHP list as a first measure of qualification for rebates has greatly bolstered the NEEP list with new, innovative technologies that meet its stringent criteria



Graph 12*: Number of brands and brand owners comprising the NEEP ccASHP list since its inception in 2017*

Graph 12 notes that the ccASHP list has steadily increased in both brands and brand owners (manufacturers) since 2017. In 2019 NEEP launched the ccASHP website for contractors, customers, and program administrators to better search for cold climate specific heat pumps, resulting in a wider variety of heat pumps being submitted to the site. The variety of brands is continuing to expand, as seen in the 2021 inflection point. Again the increased amount of brands could be potentially caused by the launch of the CGHG.

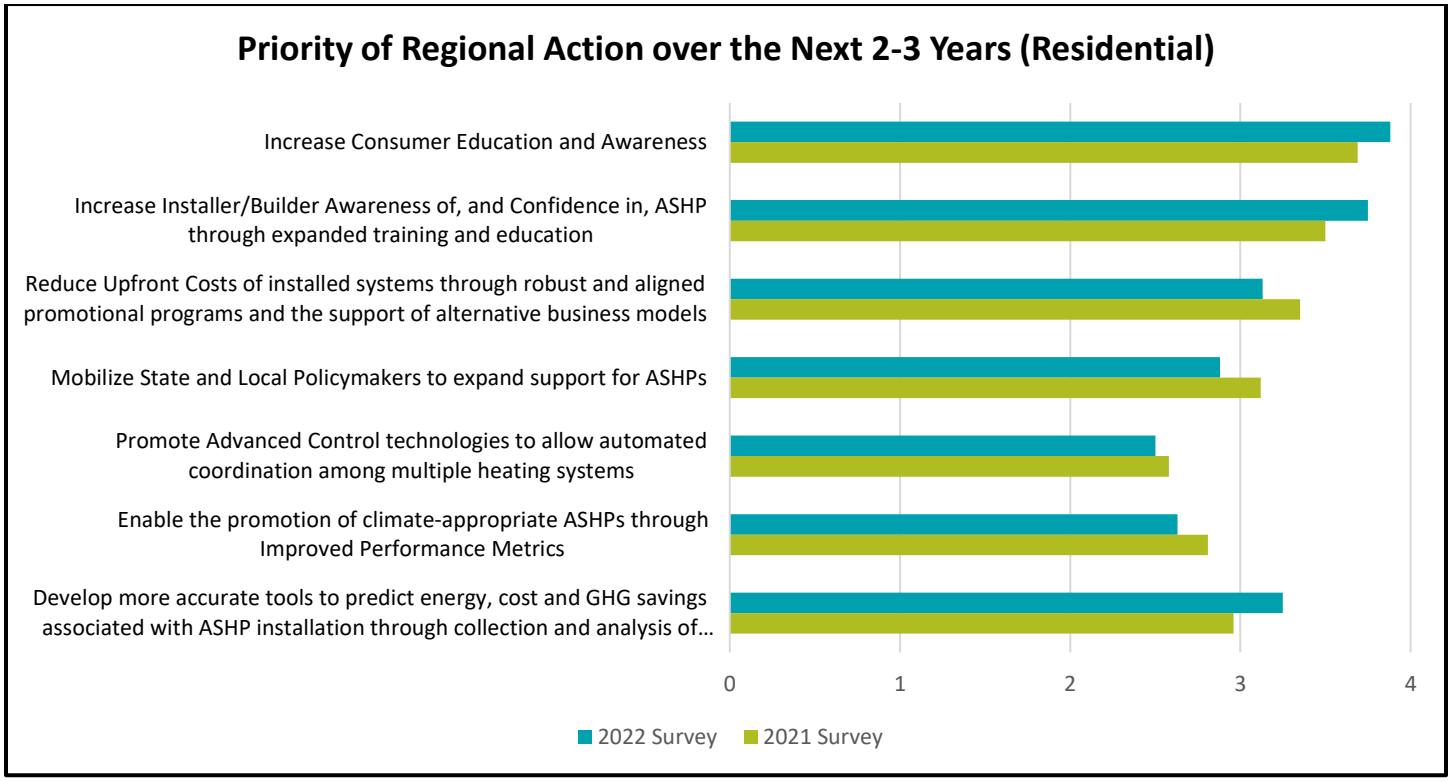
At the time of this report there are a total of 41 brand owners (manufacturers), 147 brands, and 37,635 cold climate heat pumps on the NEEP list.

3. Evolution of the ASHP Market Strategy Areas

Within the survey, stakeholders were asked to rate each of the seven key market strategies on a scale from 0-4 with 4 representing "highest priority" for regional action over the next 2-3 years. Respondents also included

their thoughts on how the strategies could evolve and indicated which strategies they most seek collaboration on.

Residential Survey Results



Graph 13: *Seven key residential market strategies ranked for prioritization over the next 2-3 years by survey respondents*

All market strategy areas were ranked as relatively high priority for action over the next 2-3 years, as seen in **Graph 13**. A particular emphasis is seen for strategy areas involving consumer education, installer education & training, and the development of tools for energy, cost, and GHG savings. As respondents ranked the strategies for prioritization they also expressed ideas on specific areas of focus to help evolve the strategies. Below are their responses:

- Utilizing social media to build awareness of the technology and available incentives.
- Educating contractors on proper sizing and selection of systems.
- Creating policies that limit the installs of new fossil fuel systems.
- More economic comparisons with propane and natural gas heating. States like Colorado and Minnesota create cost comparisons that customers and contractors can understand.
- Designing programs for equity purposes.
- Selling less gas furnaces and no oil furnaces.
- Finding more creative ways to justify the replacement of natural gas furnaces with heat pumps.

Strategy Collaboration

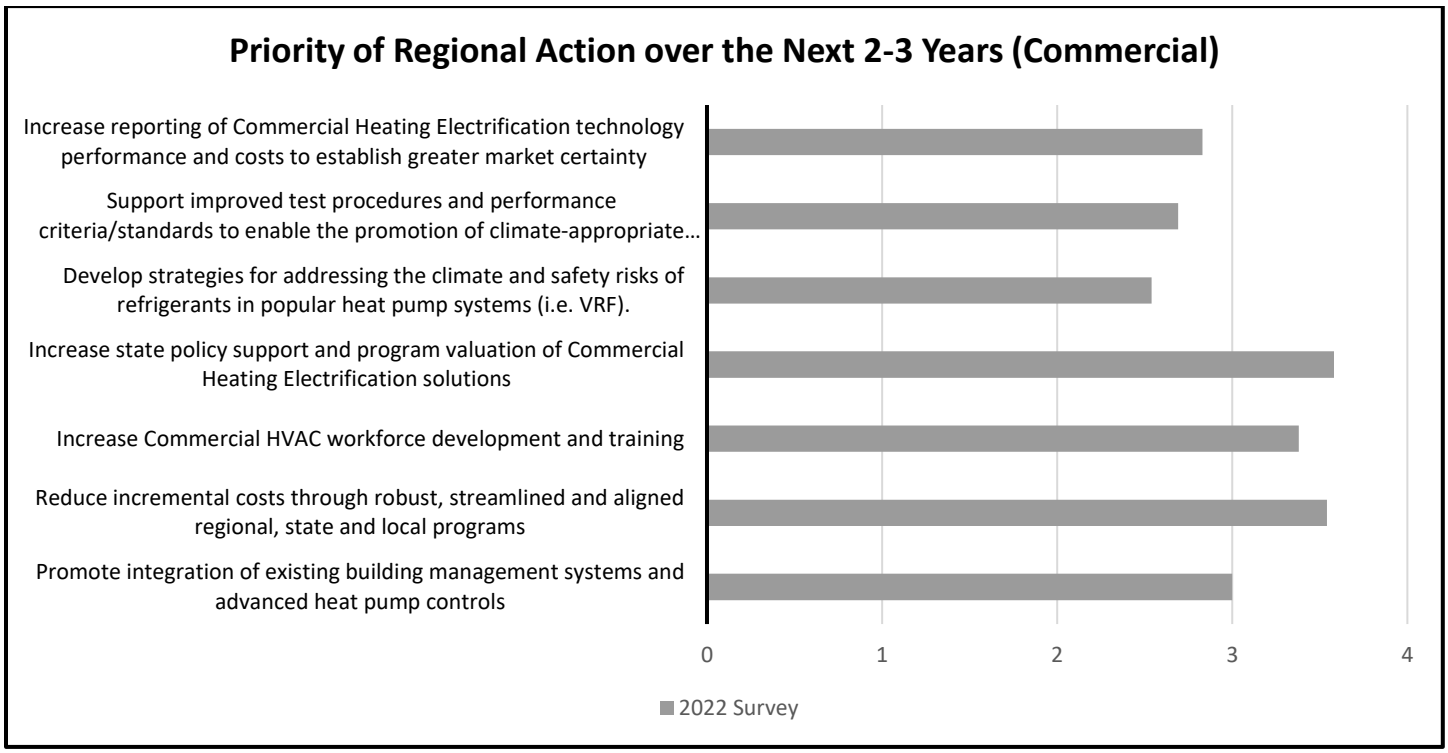
Beyond ranking which strategies should be prioritized in the future, stakeholders were asked which of these seven strategies they would most like to collaborate on, and to provide any specific activities they would be interested in.

Graph 14: *Top market strategies survey respondents would like to collaborate with other regional stakeholders (Residential)*

As seen in **Graph 14**, stakeholders expressed an interest in regional collaboration across all of the strategies but are most interested in collaborating on consumer education and contractor training. Below are the activities suggested by respondents as collaboration opportunities:

- Creation of cold climate case studies with multiple application types
- Creation of advanced control technology case studies
- Social media promotion
- Educational resources for proper/optimal usage of an ASHP
- Educational materials for the right sizing, selection, and proper installation to minimize refrigerant leaks
- Increasing uptake in integrated controls programs
- Alignment on metrics and guidance for program administrators

Commercial Survey Results



Graph 15: *7 key commercial market strategies ranked for prioritization over the next 2-3 years by survey respondents*

For the commercial sector, stakeholders ranked policy support and program valuation, HVAC education and training, and reduction of cost through programs as the three most important strategies in the next 2-3 years, as seen in **Graph 15**. These are less technical, more top-down strategy areas that will gain traction through more holistic attention and market penetration of heat pumps. Survey respondents also provided activities that could help evolve the seven market strategies:

- Increase customer awareness of heat pump technologies and provide favorable cost-benefits for implementation.
- Set performance standards for the industry to meet our region's (i.e. cold climate) operational needs.
- Increased awareness at all levels is needed for the next few years. Some of the technical objectives laid out around policy on refrigerants are only important in that they guard against overly onerous regulation that would hinder electrification.
- Advocate for a right to space cooling in all residential buildings including affordable rentals, coupled with heat pump incentives.
- Focus on the electrification of existing buildings.
- Gain policy support for the sunset of fossil fuels in commercial buildings.
- Demonstrate cold-climate performance of VRF equipment in the field.
- Find creative ways to help justify the economics of using heat pumps.

Strategy Collaboration

Beyond ranking which strategies should be prioritized in the future, stakeholders were asked which of these seven strategies they would most like to collaborate on, and to provide any specific activities they would be interested in.

Graph 16: *Top market strategies survey respondents would like to collaborate with other regional stakeholders (Residential)*

Graph 16 illustrates that stakeholders who took the survey have varying interests on which strategies they would like to collaborate. Each strategy received interest, but over 75 percent of survey respondents said they would like to work together on building up workforce development & training. Additionally, over 50 percent of respondents would like to work on increasing reporting of commercial HVAC technology performance and costs as well as improving state policy support and program valuation. Below are some activities that were cited by respondents as opportunities for collaboration:

- Focusing on cost reporting of VRF and other commercial HVAC technologies to help show positive results.
- How to design programs and incentives for heat pump technologies.
- Training code officials.
- Aligning energy efficiency program goals with long-term state GHG goals to enable better VRF and heat pump rebates.
- Increasing the ease of incentive programs by creating clear and accessible applications.
- Educating policy makers.

4. DEIJ

The last part of the 2021 Heat Pump Market Transformation survey asked stakeholders to provide their current status, if any, on work with diversity, equity, inclusion, and justice (DEIJ), and to suggest ideas for how to incorporate DEIJ principles into the Heating Electrification Initiative.

The vast majority of respondents expressed that their company/organization has taken steps to expand DEIJ within their work and they have provided the following suggestions for the Heating Electrification working group to better tie in principles of diversity, equity, inclusion, and justice:

- Focusing on low-to-moderate income rental housing.
- NEEP could show how states are tracing energy efficiency program impacts in DEIJ communities.
- Sponsoring trainings for DEIJ targeted, inner city individuals.
- Offering guidance or case studies of effective use of federal/state funds for ASHP & HP renovations for mobile homes and low income housing units.
- Encouraging workforce training and contractor development in income disadvantaged areas.

For a breakdown of states centering equity within their policies and programs please visit NEEP's Regional Roundup page.

Conclusion

Based on our scan of regional market progress, it is clear the region has made important progress in implementing key market strategies for heat pump adoption in the residential and commercial sectors. Stakeholders suggest that more progress towards strategy implementation has taken place in the residential sector versus the commercial sector. The region will have to raise its collective focus to drive implementation of market strategies in the commercial sector.

Stakeholders confirmed the existing core regional strategy areas as being relevant and important, and highlighted a variety of priority areas for collaboration.

NEEP is committed to working with regional market actors to coordinate implementation of these market strategies with a long-term objective of driving greater adoption of heat pump technology and achieving 40 percent reductions in carbon emissions in the region by 2030.