



# Insights from Innovative Programs on Barriers and Opportunities for Heat Pump Adoption

## Final Report

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## Executive Summary

California has identified heat pumps as a keystone technology on its path to decarbonization. To achieve the state's goal of reaching six million heat pump installations by 2030, however, adoption rates must accelerate substantially. While various rebate programs have been introduced to alleviate the initial cost burden associated with heat pump installation, it is imperative to acknowledge and address critical non-cost barriers that may impede widespread adoption.

This research draws on information gathered from multiple sources, including academic and industry literature, public databases, media and websites, technology assessments, and in-depth interviews with utility program managers. Through its investigation, the research team aims to document and analyze innovative programs and strategies both domestically and globally that specifically target non-cost barriers to heat pump adoption throughout. The goal of this project is to create robust resources – a report and searchable database – that can inform utility program implementers in California about the activities used to promote heat pump adoption outside of the state.

The project team employed two theoretical frameworks to structure their analysis of heat pump programs. The first framework facilitates the systematic identification of the non-energy impacts of residential heat pumps, which can be important drivers (or hindrances) to adoption. It is used to identify the ways in which non-energy impacts are leveraged to promote adoption of residential heat pumps around the world. A second theoretical framework – the Technology Characteristics framework (Outcault, Sanguinetti, & Nelson, 2022) – was used to develop a survey to identify key characteristics that hinder heat pump adoption. Survey participants were recruited at a large heating, ventilation, and air conditioning (HVAC) conference and through the researchers' professional network. Data gathered from the survey identified heat pumps' technology characteristics that pose barriers to adoption. The technology characteristics were used as a framework through which to analyze the heat pump programs summarized in case studies.

The project team used a multi-method approach to identify programs and promotion efforts aimed at encouraging residential heat pump adoption. First, the team mined databases on heat pump programs, namely the Database of State Incentives for Renewables & Efficiency (DSIRE) and those maintained by the American Council for an Energy-Efficient Economy (ACEEE) and the International Energy Agency (IEA). Next, the team used a web scraping tool and machine learning algorithms to extract recent local and national news articles regarding. These articles explore efforts to promote heat pumps from two U.S. and the international NewsBank databases. Finally, the team searched websites run by government agencies (e.g., California Energy Commission, California Public Utilities Commission), utility companies, and non-governmental organizations (NGOs) to identify programs and outreach efforts aimed at disadvantaged, low-income, and hard-to-reach communities (DAC; LIC; HTR).

Brief case studies were drafted on 39 relevant programs, highlighting their efforts to address the technology characteristics that hinder heat pump adoption. Researchers also used program details to construct a searchable database that allows consumers to search by specific attributes (e.g., geography, technology characteristic, technology type). For each technology characteristic, the team synthesized and compiled strategies used by the identified programs into succinct lists to provide high-level takeaways. These lists provide an overview of various ways the programs review and

address each technology characteristic, presenting a range of options for mitigating challenges associated with heat pump adoption.

**Observability:** The case studies highlight efforts to increase observability of heat pumps, targeting key topics, including how heat pumps work, how they perform, the benefits they provide, the costs associated with installing and operating them, the availability of services/installers, and others' decision to install a heat pump. The programs profiled in the case studies use a wide range of methods to convey information about the key topics, including educational resources, media communications, software, events, and individuals. Home visits, video tours, testimonials, case studies, and social gatherings provided a platform for local heat pump owners to share their experiences. Heat pump installations themselves are made visible through neighborhood campaigns, lawn signs, a live dashboard counting heat pump installations, and locating them within communal spaces.

**Trialability:** Four broad methods of addressing the low trialability of heat pumps were observed among the case studies. The most common approach is active exposure, in which opportunities are created to enable prospective customers to gain direct (though limited) experience with heat pumps through showrooms, model homes or home visits hosted by heat pump owners. Another method involves visitors gaining direct experience with heat pumps through passive exposure in public or communal spaces, such as dance clubs and Airbnb rental properties. One program offered visitors the opportunity to virtually with a heat pump. Finally, rental programs and portable heat pumps programs offer prolonged, direct experience with heat pumps without the requirement to purchase them. While not the express intent, these programs have the indirect benefit of addressing heat pumps' low trialability.

**Non-energy impacts:** Collectively, the case studies help encourage heat pump adoption by highlighting a long list of non-energy benefits that customers would derive. These included economic factors, such as cost savings and increased property value. Benefits are also derived related to physical well-being, such as increased thermal comfort, reduced noise, improved indoor air quality, healthier or enhanced living conditions, improved safety (from removing gas-burning equipment), and enhanced ability to mitigate extreme heat (by adding cooling). Practical benefits include convenience (i.e., avoiding the need to install window units each summer), flexibility in space conditioning, reliability, and longevity of equipment. Finally, the psychological benefits related to air-source heat pumps include improved quality of life, sense of well-being and environmental responsibility, peace of mind, and satisfaction from installing a "cool new technology." The non-energy benefits of heat pumps are promoted through educational materials (e.g., descriptions on program websites, comparison tables, cost calculators). Individual customer accounts are conveyed through various means (e.g., in person at public events or organized home visits, customer testimonials or home tour videos, case studies).

**Complexity of installation:** Many of the efforts to promote heat pump adoption featured in the case studies aim to reduce the complexity of the installation process for prospective customers. They provide general information and tips on the installation process and prepare customers for what to expect through homeowners' experiences, frequently asked questions (FAQs), events, and guides outlining the steps to install a heat pump. Customers are also provided support in the decision-making and installation processes via interactive tools. More customized advice and support is offered through in-person resources, including heat pump coaches, home visit hosts, and dedicated

program support personnel. Assistance selecting a contractor is available in the form of lists or “networks” of approved contractors, a list of questions to ask contractors and their references, and tips or expert guidance on quote comparisons. Resources to support customers with equipment selection and purchase include product selection guides, a heat load estimator tool, and an online marketplace to simplify procurement. Some programs streamline the installation process by offering online platforms through which customers compile and submit information. Finally, businesses have emerged that attempt to eliminate virtually all the complexity involved in heat pump installation by providing a one-stop-shop service model.

The information collected for each technology characteristic can be used by utility Energy Savings Assistance (ESA) programs and other stakeholders (e.g., CEC, CARB, municipal utilities) to inform their strategies and messaging used to promote residential heat pump adoption. The database accompanying this report will allow stakeholders to create a tailored approach to addressing specific circumstances and concerns around heat pump adoption related to geographic, economic, and demographic characteristics of a given area within California.

## Abbreviations and Acronyms

Acronym	Meaning
DAC	Disadvantaged Communities
GHG	Greenhouse Gas
HTR	Hard-to-Reach
HVAC	Heating, Ventilation, and Air Conditioning
LIC	Low-income Communities

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## Introduction

The goal of this project is to create a resource on innovative programs and strategies that target non-cost barriers to adoption of heat pumps in new and existing homes throughout the United States and around the world. The information collected can be used by utility Energy Savings Assistance (ESA) programs and other stakeholders (e.g., CEC, CARB, municipal utilities) to tailor their strategies and messaging efforts to promote residential heat pump adoption.

## Background

California has identified heat pumps as a keystone technology on its path to decarbonization. While progress has been made on heat pump installations, with 1.4 million units installed from 2013 to 2022,<sup>1</sup> the state's adoption rate must catch up with targets established by policymakers to achieve established goals. California's growth rate in residential heat pump installations is slower than the nationwide average and currently follows a linear path with an annual increase of approximately 151,000 units.<sup>2</sup> This trajectory contrasts with the state's strategic goal of deploying six million heat pumps by 2030,<sup>3</sup> a target that requires a rate of more than 472,000 new installations annually. Without a drastic uptick in adoption, California is unlikely to meet its heat pump deployment objectives.

Most programs aimed at encouraging heat pump adoption in California (and elsewhere) focus overwhelmingly on providing financial incentives to defray high initial costs. While these programs are indeed vital, the focus on upfront costs may inadvertently overshadow other crucial factors inhibiting technology adoption. The importance of non-cost barriers to heat pump adoption was emphasized in Opinion Dynamics' 2022 heat pump market characterization study (pp. 70 - 71). The report highlighted the following customer concerns: upfront costs, noise, indoor unit aesthetics, climate performance, cost-benefits, complexity, zonal heating, and utility bills. costs.

These findings suggest that a holistic approach to promoting heat pump adoption is needed to address issues related to ease of installation and maintenance, concerns about performance, and consumers' overall lack of familiarity with heat pumps. In countries where heat pumps are being actively promoted, efforts by utilities, media outlets, and environmental organizations are emerging to address the non-cost barriers to heat pump adoption. Systematic analysis of those efforts reveals a range of strategies that California utility programs could adopt to accelerate heat pump adoption and put the state on course to meet its target.

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<sup>1</sup> Ayers, "Presentation - Changing Heat Pump Demand in California."

<sup>2</sup> Ibid

<sup>3</sup> Newsom, "Governors Letter to CARB," July 22, 2022.

## Objectives

The objective of this research is to develop a public-facing resource that identifies and describes innovative approaches to promoting residential heat pumps by targeting non-cost barriers to adoption (e.g., lack of awareness, concerns about performance). The research draws on information gathered through literature reviews, public databases, media and website searches, technology assessments, and in-depth interviews with utility program managers. Extrapolating from the approaches used by a variety of actors (including non-utilities), this research aims to articulate design strategies for the creation and implementation of innovative utility programs that. These programs are intended to further promote residential heat pumps in California by targeting the technology characteristics currently hindering adoption.

## Methodology & Approach

### Theoretical framework

This research employs two theoretical frameworks to structure analysis of heat pump programs. The first – the Occupant Non-Energy Impact Identification framework (Outcault et al., 2022) – provides a means to identify non-energy impacts (e.g., cost savings, environmental benefits, health benefits) of distributed energy resources such as heat pumps. Non-energy impacts can be important drivers of market adoption, sometimes to a greater degree than the energy benefits a technology may offer (Azizi et al., 2019). The Occupant Non-Energy Impact Identification Framework was used to identify ways programs are leveraging non-energy impacts of residential heat pumps to promote adoption.

The second – the Energy Technology Adoptability framework (Outcault et al., 2022) – offers a systematic way to assess market barriers to adoption of energy technologies by rating their economic, technical, informational, and externality (i.e., environmental and non-energy impact) characteristics. This framework builds upon the preeminent theory on technology adoption – Rogers’ diffusion of innovation theory (DOI, 1962) – which argued that technologies’ characteristics influence their rate of adoption. While this concept has been widely accepted with respect to energy technologies, Rogers’ list of characteristics and their definitions have been criticized as imprecise (Tornatzky and Klein, 1982), subjective (Outcault et al., 2022), and incomplete (Claudy et al., 2011; Franceschinis et al., 2017; Fleiter et al., 2012). The Energy Technology Adoptability framework was developed to address these shortcomings and provides an updated set of technology characteristics which can be used to evaluate current technologies.

A structured review of the academic and industry literature on technology characteristics that influence residential energy technology adoption yielded a list of 14 technology characteristics that are objective, relevant to adoption, mutually exclusive, and exhaustive (Outcault et al., 2022). Outcault et al. (2022) compiled the 14 technology characteristics into a morphological box, following Fleiter et al. (2012), to create the Energy Technology Adoptability tool shown in Figure 1. Simple ratings (e.g., high, medium, low) are assigned to each technology characteristic. Rating can be assigned based on empirical evidence or expert opinion. Adoptability is highest among characteristics rated on the right side of the table. The result is a snapshot of the characteristics that

hinder and help adoption of a given energy technology. The characteristics are organized into four broad categories and defined according to the authors' definitions.

	Technology characteristics	Assessment		
Economic	<b>Initial investment:</b> Total upfront cost (equipment, installation, permitting) to acquire and install the technology	High	Medium	Low
	<b>Operating costs:</b> Financial costs to operate and maintain the technology after the initial investment	High	Medium	Low
	<b>Return on investment:</b> The ratio of savings (or income) to initial costs	Low	Medium	High
	<b>Market availability:</b> The extent to which technology, support services, and information are readily accessible	Low	Medium	High
Technical	<b>Technical compatibility:</b> Extent to which technology is compatible with existing infrastructure, suitable for environmental conditions, and/or interoperable with relevant technologies/ equipment in the home	Low	Medium	High
	<b>Performance:</b> Demonstrated quality, reliability, and longevity of technology operation	Low	Medium	High
	<b>Complexity of installation:</b> Level of effort, skill, and time required to install (or oversee the installation of) technology	High	Medium	Low
	<b>Complexity of use:</b> Level of effort, skill, and time required to operate the technology	High	Medium	Low
	<b>Complexity of maintenance:</b> Level of effort, skill, and time required to maintain (or oversee the maintenance of) technology	High	Medium	Low
	<b>Energy savings:</b> Amount of energy saved, or consumption avoided	Low	Medium	High
Informational	<b>Observability:</b> Ability to readily witness the technology and/or its results	Low	Medium	High
	<b>Trialability:</b> Ability to use the technology on a limited basis	Low	Medium	High
Externalities	<b>Environmental impacts:</b> Negative effects of technology on the natural environment (e.g., GHG emissions, fuel consumption, peak load)	High	Medium	Low
	<b>Non-energy impacts:</b> Positive effects of technology on the home environment (e.g., health, noise, convenience), beyond core function (e.g., conditioned air), and energy use	Low	Medium	High



  
**Adoptability**

Figure 1. Technology Characteristics Adoptability Assessment tool

## Data collection and analysis

### Assessing heat pumps

The team conducted several preliminary activities to help guide its search for programs that promote heat pump adoption. These activities aimed to identify non-energy impacts of heat pumps, as well as their technology characteristics that hinder adoption in the residential sector. Methods used to collect and analyze such data, and how it was used to inform the program search, are described below.

Input from several HVAC experts was collected to identify the non-energy impacts of air-source heat pumps using the Occupant Non-Energy Impact Identification framework. This assessment was subsequently refined to reflect results of the media search of recent publications on heat pumps. Keywords associated with heat pump non-energy impacts were then used to identify programs that promote adoption by leveraging those attributes of the technology, as described further below.

To identify relevant heat pump programs to analyze for this research, the team utilized the Energy Technology Adoptability assessment to identify technology characteristics that hinder heat pump adoption. To complete the Energy Technology Adoptability assessment, a survey was developed to gather information from HVAC experts. Survey recruitment was conducted at a large HVAC conference and through the research team's professional network. For this research, results are compiled from the 10 experts from the Western United States (a subset of the 29 respondents from throughout the country). Respondents were asked to rate air-source heat pumps -- compared to gas furnaces in their region -- on the technology characteristics listed in the Energy Technology Adoptability framework, using a simple "low," "medium," and "high" scale, as in Figure 1 (see above). Data from the respondents were analyzed to identify the median response to each technology characteristic.

The Energy Technology Adoptability assessment was validated by comparing it to the list of customer concerns reported in Opinion Dynamics' 2022 market characterization study and analysis of media articles on heat pumps, as described below. This comparison resulted in a list of technology characteristics that pose the greatest barriers to heat pump adoption. This list was the basis for the search strategy for identifying relevant heat pump programs and a lens through which to analyze them.

### **Identifying heat pump promotion efforts**

The research team employed a multifaceted approach, combining data mining and textual analysis, to identify programs and promotional efforts aimed at encouraging residential heat pump adoption. First, the team mined three heat pump program databases. Data on 516 residential heat pump programs in the United States were extracted from the Database of State Incentives for Renewables & Efficiency (DSIRE), a resource of energy-related policies and incentives maintained by North Carolina State University. Information on a further 31 US-based programs was collected from the American Council for an Energy-Efficient Economy (ACEEE) database. Information on an additional 78 international heat pump programs was extracted from the International Energy Agency (IEA) database.

To identify efforts that promote heat pumps, and which fall outside the realm of the utility or government programs listed in the above databases, researchers employed data mining techniques to search news media. Using Octoparse, a web scraping tool, the team extracted articles published between January 2019 and August 2023 that explicitly mention heat pumps. The project team also extracted local and national news articles from two databases ("World" and "US") using the NewsBank database collection. More than 3,000 articles in total were identified and then processed using machine learning algorithms developed by the researchers.

A separate set of searches was also conducted to identify programs and outreach efforts aimed specifically at disadvantaged, low-income, and hard-to-reach communities (DAC; LIC; HTR). These targeted Google searches focused on websites run by government agencies (e.g., California Energy

Commission, California Public Utilities Commission), utility companies, and non-governmental organizations (NGOs). Keywords used in these searches included “residential heat pump programs,” “disadvantaged communities,” “hard-to-reach,” “low-income,” “adoption campaign,” “education and awareness,” “events,” and “programs.”

The resulting set of programs (N=800) identified through the methods outlined above were then processed using specific keywords from the TCA framework (e.g., “visibility,” “performance,” “energy bills,” “installation”) and the non-energy impacts of heat pumps (e.g., “comfort,” “noise,” “environmental benefit”). Programs found to include or feature TCA keywords were selected for consideration. These 70 programs were then reviewed by the team to verify whether they included efforts to address non-cost barriers to heat pump adoption and if so, whether detailed information was publicly available. For programs with similar offerings, the more comprehensive or novel were selected to ensure that the final set of programs would constitute a rich set of case studies with ample materials to address the challenges associated with heat pump adoption.

A final set of 39 programs was then subjected to an in-depth analysis by the team. Through the development of detailed case studies, the team highlighted nuanced efforts made by each program to address technology characteristics that hinder heat pump adoption. The researchers also constructed their own database of case studies, with relevant data related to each program including program name, description, heat pump type, organization type, URL, and program details according to the selected technology characteristics. This specialized database has been designed to facilitate user-friendly searches, enabling users to pinpoint relevant programs based on specific attributes (e.g., geographical or technological characteristics). This design is intended to enhance accessibility and usability for customers, program managers, and stakeholders alike.

Data collected from the 39 case studies was synthesized, and emergent themes and sub-themes were identified. The range of information and activity being undertaken to address each technology characteristic was systematically identified. This information has been compiled in the report and, as well as in the database, with exemplary. Exemplary examples of each type selected to provide a convenient means of accessing the resources offered by other programs.

## Findings

### Technology assessments

This section presents two assessments of residential air-source heat pumps – one on their non-energy impacts and another on their adoptability by technical characteristics. It discusses several of the challenges and opportunities associated with each.

#### *Non-Energy Impacts*

Table 1 presents a holistic view of the potential non-energy impacts of air-source heat pumps (for new and existing homes). Air-source heat pumps have the potential for non-energy impacts related to the spatial, thermal, air, acoustic, and visual quality of the homes in which they are installed, and associated occupant experience. These impacts include the occupant experiencing thermal comfort and avoiding outdoor air pollutants (physiological impacts), the heat pump generating minimal noise (psychological impact), and the raising or lowering of utility bills (economic impact). Practical impacts

include the disruption that the restrictions on location produce such as replacing the need for adaptive thermal comfort strategies and avoiding the need to clean outdoor air pollutants. Air-source heat pumps that can deliver different levels of heating or cooling to individual rooms may impact how occupants interact with each other. These non-energy impacts will affect user experience of – and satisfaction with – the air-source heat pumps, which may ultimately determine customer acceptance and market uptake. Programs intended to increase adoption must understand the potential non-energy impacts of heat pumps and how to leverage these impacts to encourage adoption.

**Table 1: Non-energy Impacts Assessment of Residential Air-source Heat Pumps**

<i>Functional Outcomes</i>	<b>IMPACTS</b>				
	<b>Physiological+ (+/-)</b>	<b>Psychological (+/-)</b>	<b>Economic (+/-)</b>	<b>Practical (+/-)</b>	<b>Sociological (+/-)</b>
<b>Spatial Quality</b> (e.g., usable space, access, ergonomics)				Some restrictions on installation location	
<b>Thermal Quality</b> (e.g., temperature, humidity, air speed)	Thermal comfort from space heating and cooling		Equipment use impacts utility bills	Replaces need for adaptive strategies	Some configurations enable room-level settings
<b>Air Quality</b> (e.g., pollutant levels)	Does not introduce outdoor air pollutants			No cleaning of outdoor air pollutants required	
<b>Acoustic Quality</b> (e.g., sound levels, absorption)		Minimal noise from equipment operation			
<b>Visual Quality</b> (e.g., lighting levels, view)		Some equipment (e.g., indoor units) may be highly visible in occupied spaces			
<b>Building Integrity</b> (e.g., airtightness, fire safety, absorption of heat)					

***Adoptability Assessment***

Table 2 shows the assessment for residential air-source heat pump adoption. Four of the technology’s attributes, with ratings in the far-right column, favor adoptability: low complexity of both use and maintenance, high potential for energy savings, and benefit to the environment. By contrast, adoptability is hampered by characteristics highlighted in the left-most column: high initial and operating cost, low return on investment, and low observability and trialability. The latter characteristics, observability and trialability, refer to the extent to which a potential adopter can



easily observe heat pumps or witness evidence of their performance, and whether experience with them can be gained without making a significant commitment. To a lesser extent, heat pump adoption is also hindered by limited market availability and technical compatibility, lack of awareness about performance and non-energy impacts, and complexity of installation.

**Table 2: Adoptability Assessment by Technology Characteristics of Residential Air-source Heat Pumps**

Technology Characteristics		Rating		
Economic	Initial investment	High	Medium	Low
	Operating costs	High	Medium	Low
	Return on investment	Low	Medium	High
	Market availability	Low	Medium	High
Technical	Technical compatibility	Low	Medium	High
	Performance	Low	Medium	High
	Complexity of installation	High	Medium	Low
	Complexity of use	High	Medium	Low
	Complexity of maintenance	High	Medium	Low
	Energy savings	Low	Medium	High
Informational	Observability	Low	Medium	High
	Trialability	Low	Medium	High
Externalities	Environmental impacts	Low	Medium	High
	Non-energy impacts	Low	Medium	High

While most heat pump promotion programs focus on the initial costs, which are indeed a barrier to adoption, this assessment illustrates the technology characteristics that may pose more subtle challenges (e.g., low observability and trialability, complexity of installation, non-energy impacts). These characteristics are crucial to understanding non-financial barriers to – and enablers of – technology adoption, providing a more holistic view of what drives or hinders uptake of residential heat pumps.

## Case studies

This section presents brief overviews of selected efforts (e.g., programs, activities, approaches) to promote residential heat pumps. These efforts are organized by the entity leading the program or project: utility, government, non-governmental organization, or private sector. A separate section is dedicated to programs targeting DAC and HTR communities.

A searchable database containing key details of the case studies was developed to enable searches by field (e.g., technology characteristic, DAC/HTR, region). This is provided as an Excel file accompanying this Final Report.

## Utility

Eight efforts by utility programs to promote heat pump adoption are summarized below, highlighting activities that target the most challenging technology characteristics.

### **COMFORT ADVANTAGE** Mississippi



[Singing River Electric Cooperative](#), located in southeastern Mississippi, manages Comfort Advantage, an energy efficiency program that provides its members rebates on heat pump installations in new and existing homes. The goal of this program is to reduce peak demand for electricity and reduce energy costs among cooperative members.

As part of the Comfort Advantage program, Singing River Electric provides several resources to its members. They distribute a brochure with details on the variety of heat pumps that meet rebate requirements, as well as highlighting the heat pumps' features. The brochure includes advice on equipment sizing and efficiency ratings, along with several definitions of common terminology related to heat pumps (e.g., R-Value, thermal break, etc.).<sup>4</sup> Singing River provides guides on important factors (e.g., insulation) to consider when replacing an HVAC system and for members building a new, energy efficient home. Their Energy Efficient Home Construction guide provides information on heat pumps, including a list of online resources related to building an energy efficient home.<sup>5</sup> Members who decide to install a heat pump in their new or existing home can request a review of their homes' building plans to ensure they meet the heat pump rebate requirements.

The Singing River website also provides members with access to an online energy audit tool and an energy calculator. Homeowners can use these to enter information about their home and what energy technologies they currently use such as heat pumps, to help them understand how they may improve their home's efficiency and reduce energy costs.<sup>6</sup> In addition to these resources, Singing River provides a smartphone app called SmartHub that allows members to track daily and monthly energy use, view outage maps, and report power outages.<sup>7</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - Singing River Electric Cooperative provides its members with a smartphone app to track their energy use and bill, allowing them to monitor the potential impacts of installing a heat pump.
- **Complexity of installation** - Singing River will review members' building plans to ensure that their heat pump installation meets the rebate eligibility requirements. They also provide resources on choosing a heat pump and contractor.

### **EDUCATIONAL, INTERACTIVE TINY HOUSE (EDITH)** Lincoln, Nebraska



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<sup>4</sup> [https://singingriver.com/wp-content/uploads/2018/01/smepa\\_ca\\_broch\\_11\\_24\\_2015\\_nocrops-web-1.pdf](https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_broch_11_24_2015_nocrops-web-1.pdf)

<sup>5</sup> [https://singingriver.com/wp-content/uploads/2018/01/smepa\\_ca\\_bklt\\_12-2-2015-web-1.pdf](https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_bklt_12-2-2015-web-1.pdf)

<sup>6</sup> <https://c03.apogee.net/mvc/home/hes/profile?utilityname=singingriver>

<sup>7</sup> <https://singingriver.com/smarthub/>



[Lincoln Electric System](#) (LES) is a public power provider serving the capital city of Nebraska. The company has established sustainability goals, including net-zero carbon emissions from electricity generation by 2040. For the past several years, LES has hosted a Sustainability Series, community events, and activities to raise awareness about the company’s goals and opportunities it offers customers to reduce their carbon footprint and manage energy costs. A key feature of the large community events hosted by LES is its Educational, Interactive Tiny House, known as EdITH (**Error! Reference source not found.**). The tiny house was designed to inform customers about solar power, insulation, LEDs, and heat pumps for space conditioning and water heating. Interactive displays inside the home allow customers to “get hands-on experience and education” about the sustainable features that may be suitable for their homes and available through LES programs. It is unclear from the LES website whether the home’s heat pumps are operational<sup>8</sup>.

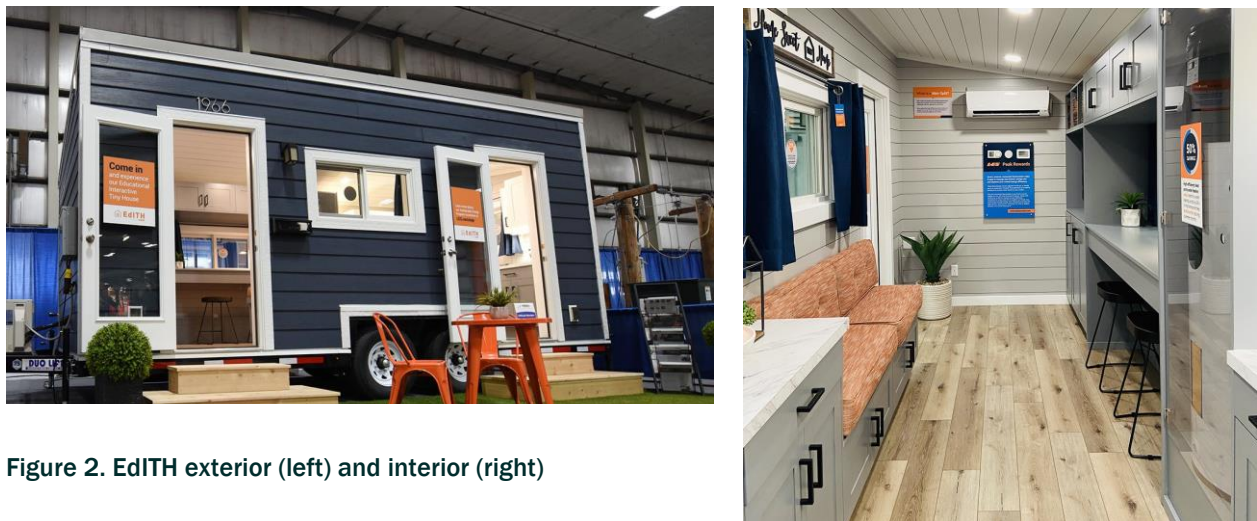


Figure 2. EdITH exterior (left) and interior (right)

Since it was built in 2020, in partnership with a local community college and high school program, EdITH has been featured at several community events.<sup>9</sup> It was displayed at the Home Builders’ Association of Lincoln Home & Garden show in 2020,<sup>10</sup> LES’s 2021 EV Ride + Drive event as part of its Sustainability Week,<sup>11</sup> and at a free, community drive-in movie event in 2022 that also featured more than 20 electric vehicles.<sup>12</sup> EdITH was also featured at LES’s booth at the Nebraska Builders Home & Garden Show in February 2024, where they showcased it as a platform to share information about the utility’s sustainability programs, including those incentivizing heat pumps.<sup>13</sup> EdITH has been taken to local schools to provide student learning opportunities and visits can be requested by community organizations hosting large events.

<sup>8</sup> <https://www.les.com/sustainability/educational-interactive-tiny-house>

<sup>9</sup> <https://www.les.com/sustainability/educational-interactive-tiny-house>

<sup>10</sup> <https://m.facebook.com/LincolnElectricSystem/posts/2860367717390642/>

<sup>11</sup> <https://www.les.com/sites/default/files/bd-012122-reflections.pdf>

<sup>12</sup> <https://www.les.com/2022-annual-report>

<sup>13</sup> <https://www.les.com/sustainability/les-sustainability-series>

### Summary of activities related to technology characteristics:

- **Observability** - EdITH prominently displays heat pumps at public events with the express purpose of raising awareness and educating customers.
- **Trialability** - EdITH allows visitors to see a heat pump water heater and space conditioning heat pump in a residential (albeit small format) environment.

**FLATHEAD ELECTRIC COOPERATIVE**  
Montana



[Flathead Electric](#) is a nonprofit member-owned electric cooperative in Montana that provides services to the municipalities of Kalispell, Whitefish, Cooke City, and Libby. It is the state's largest electric cooperative and second-largest energy utility.<sup>14</sup> On its website, Flathead Electric provides information and resources about air-source and ductless heat pumps (as well as ground-source heat pumps). This includes detailed information about accessing rebate programs (both for residential and commercial customers), finding an installer, learning more about related technologies like smart thermostats and window upgrades, and financing options that are available for eligible home upgrades like heat pumps. The website's pages on air-source and ductless heat pumps provide information on how these technologies work and the benefits they provide. Flathead Electric offers rebates for air-source and ductless heat pumps worth up to \$1,200 and \$800, respectively.<sup>15</sup> The website explains how to qualify for available rebates and provides a link to the application.<sup>16</sup> Energy Advisors are available to answer questions about rates, equipment recommendations, safety considerations, and available rebates.<sup>17</sup> As a community-based organization embedded in this region for several decades, Flathead Electric provides an endorsement of heat pump technology on its website, saying, "As your trusted cooperative, we have evaluated this new technology and found it to be the most efficient water heater upgrade available. Plus, after the rebate and tax credit a heat pump water heater could pay for itself in under a year."<sup>18</sup>

Contact information is provided for heat pump contractors who have been approved by Flathead Electric as having knowledge of its programs and the ability to install eligible equipment.<sup>19</sup> For those who wish to become an approved installer, Flathead requires information about participation in its programs, licenses, certificates, insurance, and experience installing equipment that meets Flathead specifications. Approved installers are listed on the website and receive technical assistance, training, access to rebates, incentives, loans, and assistance with marketing and sales from Flathead to promote efficiency work.<sup>20</sup>

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<sup>14</sup> <https://www.flatheadelectric.com/about-my-co-op/who-we-are/>

<sup>15</sup> <https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/residential-rebate-programs/heat-pumps/air-source-heat-pumps/>, <https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/residential-rebate-programs/heat-pumps/ductless-heat-pumps/>

<sup>16</sup> [https://www.flatheadelectric.com/wp-content/uploads/HomeownerHeatPump\\_Pre-Approval\\_Form.pdf](https://www.flatheadelectric.com/wp-content/uploads/HomeownerHeatPump_Pre-Approval_Form.pdf)

<sup>17</sup> <https://www.flatheadelectric.com/meet-your-energy-advisors/>

<sup>18</sup> <https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/residential-rebate-programs/heat-pump-water-heaters/>

<sup>19</sup> <https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/find-an-approved-installer/>

<sup>20</sup> <https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/find-an-approved-installer/become-an-approved-installer/>

### Summary of activities related to technology characteristics:

- **Observability** - Flathead Electric has been embedded in this community for several decades and leverages its position within the region to endorse heat pump adoption.
- **Non-energy impacts** - The website lists the non-energy related perks customers can expect, including convenience, quiet operation, and thermal comfort.
- **Complexity of installation** - Flathead Electric provides “Energy Advisors” who can be contacted by phone, email, or in person to discuss questions, equipment recommendations, and available rebates with customers. The website also provides a list of available rebates organized by replacement technology, and a pre-approval form to estimate likely rebate amount. Flathead also provides a list of approved installers who have been pre-vetted by the company for quality and experience.

## **HEAT PUMP RENTAL PROGRAMS**

### Canada



Heat pump rental programs install, maintain, and repair heat pumps for residential customers for a monthly fee. Utilities and private sector companies throughout Canada provide several such programs, including Solidcare Home Improvements,<sup>21</sup> HVAC Service Solutions,<sup>22</sup> and DeMark Home Ontario in Ontario<sup>23</sup>, and Saint John Energy in New Brunswick.<sup>24</sup> Customers interested in renting a heat pump begin by having an assessment performed on their home and receiving a quote for their rental. Rates for the heat pump rentals vary by size and model of the equipment and the length of the rental period. For example, Saint John Energy charges \$53 - 82 per month.<sup>25</sup> The other utilities mentioned above do not publish rental costs on their websites. When entering into a rental agreement, customers agree to pay their monthly fee and to take reasonable care of the heat pump (following user guidelines, keeping air filters clean, and keeping the heat pump clear of debris, etc.). The HVAC Service Solutions provides a side-by-side comparison of the renting versus owning heat pump systems, including factors such as maintenance and repair costs (Figure 3).

While Saint John requires a three-year minimum rental, the other programs indicate flexible rental periods but do not specify a minimum number of months. Saint John also makes a sample heat pump rental agreement available on its website, . This sample agreement explains that, at the end of the required rental period, customers can either pay a fee to have the heat pump removed or can continue paying the monthly fee to maintain their rental.<sup>26</sup> Sale of the home terminates the rental contract unless the new owners want to take over the rental agreement. As part of their rental

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<sup>21</sup> <https://solidcarehomeimprovements.ca/en/heat-pump/heat-pump-rental>

<sup>22</sup> <https://thehvacsolution.ca/rent-heat-pumps/>

<sup>23</sup> <https://www.dhontario.com/catalog/heat-pumps/heat-pump-rent-to-own/>

<sup>24</sup> <https://sjenergy.com/pages/heat-pump-rentals>

<sup>25</sup> [https://sje-corp-site.cdn.prismic.io/sje-corp-site/bb2a61ca-ae7a-4586-8b5e-82eacc6d1a65\\_Mini-Split+Customer+Rental+Agreement+12-5-2023.pdf](https://sje-corp-site.cdn.prismic.io/sje-corp-site/bb2a61ca-ae7a-4586-8b5e-82eacc6d1a65_Mini-Split+Customer+Rental+Agreement+12-5-2023.pdf)

<sup>26</sup> [https://sje-corp-site.cdn.prismic.io/sje-corp-site/bb2a61ca-ae7a-4586-8b5e-82eacc6d1a65\\_Mini-Split+Customer+Rental+Agreement+12-5-2023.pdf](https://sje-corp-site.cdn.prismic.io/sje-corp-site/bb2a61ca-ae7a-4586-8b5e-82eacc6d1a65_Mini-Split+Customer+Rental+Agreement+12-5-2023.pdf)

agreements, Solidcare, HVAC Service Solutions, and DeMark offer rent-to-own options for customers who wish eventually own the heat pump.

## Rent vs. Buy Heat Pump Near Me: Compare Your Options

Category	RENTAL	FINANCE
Installation Charges	Included	Not included
Maintenance Costs	\$0	Not included
Repair Costs	\$0	Not included
Who Owns the Ductless	The HVAC Service	You
Extended Warranty	\$0	Paid
Agreement Term	Rent to Own	None

Figure 3. Heat pump rental vs. purchase comparison from The HVAC Service Solution<sup>27</sup>

Customers of these rental programs are eligible for financial incentives in some cases. Through Saint John Energy, customers may be eligible for up to \$400 of rebates through the New Brunswick Power Total Home Energy Savings Program. Rebates may be available for customers who are renting to own through DeMark via the Enbridge Gas Canada Greener Homes Grant or Home Efficiency Rebate, although this process to access these rebates is not clear from the rental program’s website. Both HVAC Service Solutions and DeMark offer perks for signing a heat pump rental agreement, such as free smart thermostat (both) and a \$500 gift card (DeMark only).

Solidcare provides information on its website in six languages (English, Spanish, Dutch, Italian, French, and Mandarin) to ensure their program is accessible to its diverse customer base. It is unclear whether the other programs provide information in any language other than English.

### Summary of activities related to technology characteristics:

- **Trialability** - By renting a heat pump, customers can try the technology without a long-term commitment or high upfront financial investment.
- **Complexity of installation** - Each program supports customers in choosing which heat pump to rent. The programs include all installation, maintenance, and repairs for the heat pumps. Where rebates are available, assistance is offered to customers in applying for these offers.

<sup>27</sup> <https://thehvacsolution.ca/rent-heat-pumps/>

## LANE ELECTRIC

Eugene, Oregon

[Lane Electric cooperative](#) provides rebates and loans for installing heat pumps and a grant program for income-qualified homes. Qualifying ducted heat pumps must be inverter-driven and meet specific efficiency ratings (HSPF2 and SEER2). The cooperative's Heat Pump Program offers a \$800 rebate or a zero-percent-interest loan of up to \$9,000 for its members who install a new heat pump or replace older space conditioning technologies.<sup>28</sup> The Income-Qualified Ductless Heat Pump Grant Program offers a cash grant of \$4,400 toward the installation of a qualified ductless heat pump. Rental properties are also eligible for the Income-Qualified program, and property owners of rentals are required to provide 50 percent of project funding.<sup>29</sup>



A significant feature of the program is the requirement for pre-approval and installation by approved HVAC contractors, as a way of guaranteeing quality and efficiency. To ease the bureaucratic burden on households, both the pre-authorization and completed installation forms<sup>30</sup> can be filled out and submitted by approved HVAC contractors on behalf of the household. The household is required to fill out only the loan application if a loan is requested. Lane Electric also provides a heat pump installation checklist to guide customers through the process.<sup>31</sup>

Installation forms are accompanied by promotional and educational materials detailing the multiple benefits of heat pump technologies. These materials emphasize how upgrading to a heat pump provides an efficient heating and cooling system that helps maintain a comfortable temperature throughout the year, increases flexibility in conditioning a home's air, and substantially reduces operating costs.<sup>32</sup> For heat pump water heater installations, Lane Electric links to *Hot Water Solutions' "Compare"*<sup>33</sup> webpage. This resource provides detailed insights into the benefits of these energy-efficient options, guiding consumers toward making informed energy choices. The site facilitates a comparative understanding by highlighting heat pump water heaters' efficiency, cost-effectiveness, and environmental advantages compared to traditional systems.

### Summary of activities related to technology characteristics:

- **Observability** - Lane Electric demonstrates the observable benefits of heat pumps through educational and promotional materials. These resources emphasize heat pumps' efficiency, comfort, and cost savings, allowing potential adopters to clearly see the advantages before installation.
- **Trialability** - Lane Electric does not explicitly offer trialability for heat pumps. Instead, it focuses on providing detailed information and financial incentives to encourage adoption.

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<sup>28</sup> <https://laneelectric.com/programs-services/heat-pump-program/>

<sup>29</sup> <https://laneelectric.com/wp-content/uploads/0-LI-DHP-Packet-10.pdf>

<sup>30</sup> <https://laneelectric.com/wp-content/uploads/0-Regular-DHP-Packet-9.pdf>

<sup>31</sup> <https://laneelectric.com/programs-services/heat-pump-program/>

<sup>32</sup> <https://laneelectric.com/wp-content/uploads/00-Ducted-Heat-Pump-Packet-8.pdf>; <https://laneelectric.com/wp-content/uploads/0-Regular-DHP-Packet-9.pdf>; <https://laneelectric.com/wp-content/uploads/0-LI-DHP-Packet-10.pdf>

<sup>33</sup> <https://hotwatersolutionsnw.org/compare>



- **Non-energy impacts** - Highlights multiple benefits beyond energy savings, such as improved comfort, flexibility in home air conditioning, and enhanced reliability and longevity of the technology.  
**Complexity of installation** – Addresses the complexity of installing heat pumps by requiring pre-approval and installation by approved HVAC contractors. Additionally, the "How to Install a Heat Pump Water Heater: Consumer Version" video lowers the barrier to self-installation, making the process more accessible.

**NATIONAL GRID HEAT PUMP CAMPAIGN**  
 Northeastern United States



[National Grid](#), an electric and gas utility provider in Massachusetts, Rhode Island, and New York, partnered with Oracle Utilities’ Opower to produce a personalized education campaign in winter 2023 that aimed to encourage customers to purchase heat pumps. A key part of this campaign included sending customers a personalized video about how much they were spending on cooling and heating, an explanation of how heat pumps work, and links to learn more about heat pump installation. A senior marketing analyst at National Grid stated, “I told the Opower team we need to do a lot in 90 seconds or less: explain how heat pumps work, show in personal terms how they help your wallet, wellbeing, and carbon footprint, and offer a big heat pump rebate. The heat pump videos Opower created somehow got it all done.” Customers opened the personalized emails at twice the industry average and 80 percent of those who opened the email clicked through to watch the personalized video.<sup>34</sup> In addition to the personalized videos and emails, National Grid used personalized printed materials and other forms of video outreach to educate customers about heat pumps.<sup>35</sup>

As part of the personalized videos, National Grid directed customers to learn more about next steps for heat pump installation, including finding available rebates. National Grid directed Massachusetts customers to learn more about the MassSave rebate programs, which can include up to \$10,000 in rebates, in addition to the up to \$2,000 in federal tax credits for air-source and air-to-water heat pumps.<sup>36</sup> National Grid reported that, over in the course of one month, about 44 percent of traffic on their rebate page came from viewers of these personalized videos. In the following months, National Grid converted around 1,900 customers to heat pumps.

National Grid emphasizes that its strategy is to get customers thinking and learning about heat pumps before they are faced with an HVAC-related emergency. In the future, Opower plans to implement a system to alert customers to possible HVAC failures and send them heat pump education materials prior to the failure of their current system. This would be made possible by their patented technology that can detect HVAC degradation.

Summary of activities related to technology characteristics:

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<sup>34</sup> <https://blogs.oracle.com/utilities/post/national-grid-removes-a-big-barrier-to-heat-pump-adoption>

<sup>35</sup> <https://www.youtube.com/watch?v=yey1i7pM00g>

<sup>36</sup> <https://www.masssave.com/en/residential/rebates-and-incentives/heating-and-cooling/heat-pumps/air-to-water-heat-pumps>; <https://www.masssave.com/en/residential/rebates-and-incentives/heating-and-cooling/heat-pumps/air-source-heat-pumps>

- **Observability** - National Grid provides customers with personalized communications about their monthly energy use, allowing them to see how installing heat pumps may impact their energy use and costs over time.

## **ROCKY MOUNTAIN POWER**

Idaho, Wyoming, and Utah

[Rocky Mountain Power](#) provides rebates, informational resources, and guidance to encourage the adoption of space conditioning heat pumps and heat pump water heaters. In addition to product rebates, Rocky Mountain Power offers the "Wattsmart Homes" program, which provides a comprehensive suite of resources to educate consumers about heat pump technology and encourage adoption. These resources describe how heat pumps work, the ideal type of heat pump to replace various space conditioning systems, and their installation requirements. The materials highlight the energy cost savings from heat pumps, as well as other benefits such as improved comfort, efficiency, reliability, and contributions to enhanced living conditions and sustainability. The webpage addresses common queries, like options for heating and cooling single rooms, benefits for new homeowners or landlords, and how to be prepared to replace an HVAC system before failure.



Rocky Mountain Power's webpage on "Heat Pump Comfort"<sup>37</sup> also allows visitors to "take a modern heat pump for a spin" with an interactive animation that guides homeowners on heat pump use. The animation walks them through the points at which they would interact with the system, i.e., the thermostat and phone applications. It then details the technical aspects of the system's functionality and the environmental and community benefits of adopting a lower-emission space conditioning alternative.

For customers who decide to install a heat pump, the Wattsmart Homes program website guides users through the process of selecting appropriate heat pump options based on their existing home heating systems. It provides a list of program-qualified contractors to ensure quality installation and tips for completing rebate applications, including locating the necessary information on utility bills (Figure 4).

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<sup>37</sup> <https://wattsmarthomes.com/heat-pump-comfort/>

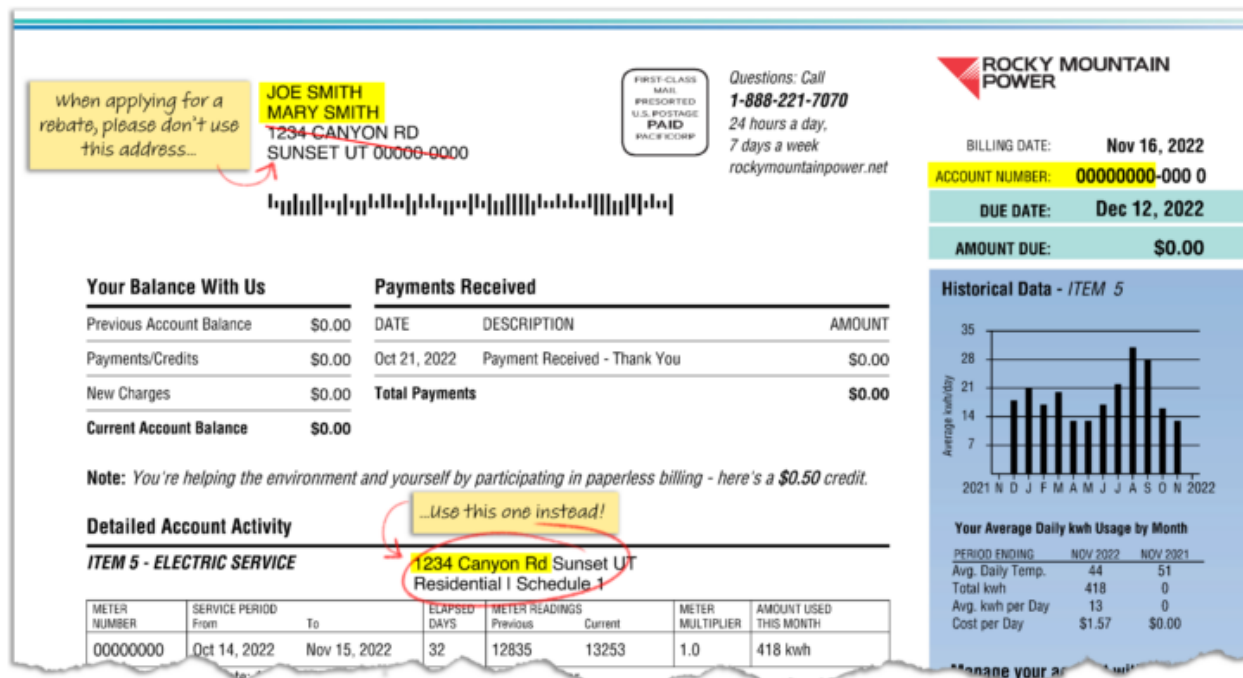


Figure 4. Rocky Mountain Power's guide to finding rebate applications information on customer bill<sup>38</sup>

Summary of activities related to technology characteristics:

- **Observability** - Rocky Mountain Power's "Wattsmart Homes" program addresses observability by offering extensive resources that explain how heat pumps operate, their installation requirements, and their benefits. With its interactive animation, the "Heat Pump Comfort" webpage allows homeowners to experience a heat pump system virtually, making the technology's benefits and functionality more tangible and observable before installation.
- **Trialability** - Rocky Mountain Power's initiative does not allow consumers to physically try out heat pumps before committing to the technology, focusing instead on virtual demonstrations and educational resources.
- **Non-energy impacts** - The program explicitly discusses non-energy benefits such as improved comfort, efficiency, and contributions to enhanced living conditions. This highlights the broader positive impacts of heat pumps on homeowners' comfort and overall quality of life.
- **Complexity of installation** - Wattsmart Homes program website guides users through the process of selecting appropriate heat pump options based on their existing home heating systems. It also lists approved contractors and provides tips for completing rebate applications.

<sup>38</sup> <https://wattsmarthomes.com/rebates/ductless-heat-pumps-ut/>



## WHITE RIVER VALLEY ELECTRIC COOPERATIVE – ENERGY EFFICIENCY REBATE PROGRAM

Missouri



[The White River Valley Electric Cooperative \(WRVEC\)](#) implemented a program to promote energy efficiency and sustainable energy use among its members. This initiative includes rebate programs designed to facilitate the adoption of air-source (and ground-source) heat pumps for space conditioning and water heating, all of which require ENERGY STAR certification. Residential and commercial members can receive rebates for air-source heat pumps and mini split systems at \$150-per-ton capacity, up to 10 tons. Rebates for heat pump water heaters cover 50 percent of the cost of up-to-\$500 per unit for a 40-gallon or larger appliance.

Beyond access to rebates and other financial incentives, WRVEC's energy efficiency program website offers quick access to a suite of tools to aid customers in understanding how the adoption of a heat pump in their homes could benefit them. Touchstone Energy, of which WRVEC is a cooperative, provides a "Home Energy Adventure Quiz". This is an interactive tool, designed to assist members in evaluating their homes' energy consumption patterns.<sup>39</sup> By answering detailed questions about their living habits and specific home characteristics, members are guided toward identifying potential areas for energy efficiency improvements. The quiz covers various topics, including insulation and window types, heating and cooling systems, and daily usage patterns. Upon completion, users receive a personalized report highlighting areas where energy usage can be optimized and practical suggestions for improvements. This tool is intended to be used to help members make informed decisions about potential home upgrades, such as installing heat pumps.

WRVEC also offers the "SEER Savings Calculator" for its members.<sup>40</sup> This tool is specifically designed to provide detailed insights into the energy efficiency of air conditioning systems. Members can compare their system's energy usage against newer, more efficient models (including heat pumps) by inputting information about their current air conditioning units. The calculator presents short-term and long-term energy savings metrics, offering a clear and quantitative understanding of potential benefits. This feature is particularly beneficial for members considering upgrading their air conditioning systems, as it provides a data-driven basis for evaluating the return on investment. The SEER Savings Calculator is a crucial aid in encouraging members to adopt more energy-efficient technologies, by demonstrating savings in energy costs and greenhouse gas emissions over time.

The WRVEC website also provides critical information and access to financial support programs. For instance, the site includes details about Federal Tax Credits for Consumer Energy Efficiency. It informs members about potential tax benefits when purchasing heat pumps and other sustainable technologies. The website also provides a link to the Database of State Incentives for Renewables & Efficiency (DSIRE), a resource that outlines state and local incentives available to Missouri residents.<sup>41</sup>

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<sup>39</sup> <http://adventure.touchstoneenergy.com>

<sup>40</sup> <https://www.pickhvac.com/central-air-conditioner/seer/savings-calculator/>

<sup>41</sup> <https://www.whiteriver.org/member-center/rebates-audits/>

### Summary of activities related to technology characteristics:

- **Observability** - The SEER Savings Calculator enables users to create personalized comparisons between their existing air conditioning system and newer, more efficient models (including heat pumps). The calculator estimates potential energy and cost savings from installing new equipment, highlighting the performance of newer equipment.
- **Complexity of installation** - The Home Energy Adventure Quiz creates a personalized report to help members make informed decisions about potential home upgrades such as installing heat pumps.

### **Government**

The work of six efforts led by governmental organizations to promote heat pumps are summarized below, highlighting the activities that target the most challenging technology characteristics.

#### **EFFICIENCY MAINE HEAT PUMP PROGRAM**

Maine



State legislation in 2019 established a goal of installing 100,000 heat pumps in Maine homes and businesses by 2025. Since then, significant progress has been made. A 2021 study found that 37 percent of new homes surveyed use a heat pump for space conditioning, up from virtually zero in 2008. Heat pump water heaters were found in 17 percent of homes surveyed.<sup>42</sup> In 2023, it was announced that the 100,000-heat pump goal had been reached two years ahead of schedule. This prompted Maine’s governor to establish a new target of 175,000 additional heat pumps by 2027.<sup>43</sup>

The primary driver for heat pump installations throughout the state has been [Efficiency Maine’s rebate program](#) (MaineHousing runs a complementary direct-install heat pump program for low-income residents). Incentives of up to \$8,000 are offered for heat pump systems used as the sole home heating source, along with federal tax credits of up to \$2,600.<sup>44</sup> In addition to information about the rebate programs, Efficiency Maine’s website provides a wealth of information on heat pumps, an overview of which is presented in **Error! Reference source not found.** (left). The site describes how heat pumps work, with particular emphasis on their performance at very low temperatures. It also provides a detailed list of considerations related to cold-temperature performance, air movement, and heat distribution to inform customers about how space conditioning might feel with a heat pump. The site contains a brochure on myths facts and misconceptions about heat pumps,<sup>45</sup> and a list of FAQs.<sup>46</sup> Cost-related resources include estimates of installation and operating costs for typical homes and a savings calculator to compare the heating costs by fuel and equipment type.<sup>47</sup> Resources related to heat pump installation include a registered vendor search tool,<sup>48</sup> a list of questions to ask contractors and their references to help determine

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<sup>42</sup> <https://www.energymaine.com/docs/Maine-New-Construction-Baseline-Assessment-08262021.pdf>

<sup>43</sup> <https://www.maine.gov/governor/mills/news/after-maine-surpasses-100000-heat-pump-goal-two-years-ahead-schedule-governor-mills-sets-new>

<sup>44</sup> <https://www.energymaine.com/at-home/whole-home-heat-pump-incentives/>

<sup>45</sup> <https://www.energymaine.com/docs/Heat-Pump-Myths-and-Facts.pdf>

<sup>46</sup> <https://www.energymaine.com/heat-pumps-faq/>

<sup>47</sup> <https://www.energymaine.com/at-home/heating-cost-comparison/>

<sup>48</sup> <https://www.energymaine.com/at-home/vendor-locator/>

which bid to select,<sup>49</sup> and a heat load estimator tool to inform correct equipment sizing.<sup>50</sup> The site also offers a resource on installation considerations, including topics such as indoor unit types, indoor and outdoor unit locations, ducted systems, and line sets.<sup>51</sup> Photos of the four types of indoor units allow customers to see what they look like and consider the visual impact of installing them in their homes. Efficiency Maine also provides an online brochure with tips on heat pump use related to thermostat and fan settings, optimizing airflow, and maintenance requirements for optimal performance.<sup>52</sup>

Efficiency Maine's website also features information on customer experiences with heat pumps. Case studies present fact sheets with information on project costs, projected fuel costs and savings, and payback period. The website lets visitors hear directly from heat pump users through videos (**Error! Reference source not found.**, right) and quotes.<sup>53</sup> All three platforms highlight the benefits heat pump customers have experienced from their equipment, benefits including thermal comfort and lower heating costs. The platforms also explore less-obvious benefits, such as reduced uncertainty related to heating oil costs, reduced inconvenience by eliminating the need for fuel deliveries, stoking the wood stove, or installing window AC units. The platforms point out how heat pumps provide greater control over comfort and operating costs, quiet operation, low environmental impact, and reduced humidity during hot summer days.

Efficiency Maine offers a similar program and resources to promote heat pump water heaters as well. The website explains how they work, the benefits they provide, and various considerations. It offers brochures on user tips, myths and facts, and compares purchase and water heating costs.<sup>54</sup> It also explains their incentive and no-cost low-income programs, and lists participating retailers, distributors, and installers.<sup>55</sup> Instead of customer testimonials, the water-heating program offers plumber testimonials, with quotes such as: "I was a little hesitant to recommend them at first, but when customers started requesting them, I did some research. The short payback and ten-year warranty are what my customers want to see. Now I recommend them all the time."<sup>56</sup>

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<sup>49</sup> <https://www.energymaine.com/docs/Questions-to-ask-a-rv.pdf>

<sup>50</sup> <https://www.energymaine.com/estimate-your-homes-heating-needs/>

<sup>51</sup> <https://www.energymaine.com/at-home/ductless-heat-pump-installation-considerations/>

<sup>52</sup> <https://www.energymaine.com/docs/Heat-Pump-User-Tips.pdf>

<sup>53</sup> <https://www.energymaine.com/heat-pump-testimonials/>

<sup>54</sup> <https://www.energymaine.com/at-home/water-heating-cost-comparison/>

<sup>55</sup> <https://www.energymaine.com/at-home/heat-pump-water-heater-program/>

<sup>56</sup> <https://www.energymaine.com/docs/EM-HPWH-Plumber-Testimonials.pdf>



Figure 5. Overview of informational resources (left); Heat pump customer videos (right)

Sources: <https://www.energymaine.com/energyinformation/case-studies/>; <https://vimeo.com/736154606>; <https://vimeo.com/736147643>

The incentive programs run by Efficiency Maine have yielded rapid uptake of heat pumps throughout the state. They have been “issuing a rebate for a heat pump every six minutes.”<sup>57</sup> Efficiency Maine’s efforts have not been isolated, as supportive ecosystem has bolstered its work. Shortly after the heat pump goal was established, Maine adopted its climate plan: *Maine Won’t Wait*.<sup>58</sup> The plan’s website actions homeowners can take to “save money while making your home climate friendly.” The site provides information about federal tax credits and state rebate programs that incentivize the installation of heat pump water heaters and space conditioning units.<sup>59</sup> In response to the goal of installing 100,000 heat pumps, the Maine Community College System also ramped up heat pump workforce programs and opened a heat pump workforce training lab in 2021.<sup>60</sup> This has helped to ensure there are ample qualified installers to meet demand.

<sup>57</sup> <https://coloradosun.com/2023/01/26/heat-pumps-work-colorado/>

<sup>58</sup> <https://www.maine.gov/climateplan/>

<sup>59</sup> <https://www.maine.gov/climateplan/taking-action/actions-for-home>

<sup>60</sup> <https://www.maine.gov/governor/mills/news/after-maine-surpasses-100000-heat-pump-goal-two-years-ahead-schedule-governor-mills-sets-new>

### Summary of activities related to technology characteristics:

- **Observability** - Efficiency Maine has made heat pumps (and their performance) highly visible online by sharing technical and anecdotal information about heat pump performance in very low temperatures and impacts on customers' heating costs.
- **Non-energy impacts** - Case studies and testimonials highlight the comfort, convenience, cost, noise, and environmental benefits of heat pumps.
- **Complexity of installation** - Efficiency Maine provides resources on installation considerations, a search tool for identifying approved installing contractors, a list of questions to ask contractor and their references, and a heat load estimator tool to inform correct equipment sizing.

### **GREEN HOMES NETWORK**

United Kingdom



[The Green Homes Network](#), an initiative by the Energy Saving Trust in Scotland, promotes heat pump adoption and sustainable living. This network comprises more than 300 homeowners who have integrated renewable technologies like heat pumps and solar panels into their homes. Collectively, the homes reflect the diversity of construction in the region, from modern eco-builds to traditional stone cottages, conveying the broad applicability of heat pumps.<sup>61</sup>

The network offers several interactive ways for the public to engage and learn about heat pumps (among other technologies). An interactive search tool enables users to find detailed case studies on participating homes that highlight the practical benefits of heat pumps, such as improved energy efficiency, lower energy bills, and a reduced carbon footprint. They also detail homeowners' adoption journeys, including their motivations, the installation process, and the outcomes of adopting these technologies. Some members of the network host home visits to allow individuals to see firsthand how heat pumps are integrated into various home settings. During these visits, homeowners share their experiences, offering practical advice and answering questions.<sup>62</sup>

Local events organized by the network provide another platform for engagement. These events often feature talks by homeowners, demonstrations of the technologies in use, and discussions on the latest trends in renewable energy. The aim of the program is to foster a broader understanding of the role of clean technologies in sustainable living and to encourage membership in the community to build the network's collective knowledge and resource base.

### Summary of activities related to technology characteristics:

- **Observability** - The Green Homes Network excels in observability, with tangible examples of heat pump installations in homes throughout Scotland. The visibility of these technologies in a real-world setting aims to enhance public understanding and acceptance.

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<sup>61</sup> [www.energysavingtrust.org.uk/tool/green-homes-network/](http://www.energysavingtrust.org.uk/tool/green-homes-network/)

<sup>62</sup> <https://greenhomesnetwork.energysavingtrust.org.uk/>



- **Trialability** - By allowing visits to network members' homes and facilitating discussions, the network provides an opportunity for visitors to interact with heat pumps prior to installing them. Prospective adopters can witness the technologies in action and gain firsthand experience, which can reduce apprehension and encourage adoption.
- **Non-energy impacts** - The network emphasizes non-energy impacts such as enhanced property values, improved lifestyle, and community engagement. These benefits extend beyond mere cost savings, contributing to participants' greater sense of well-being and environmental responsibility.
- **Complexity of installation** - By sharing their experiences and providing advice to prospective heat pump customers, members of the network help to demystify the installation process for new adopters.

## HEAT PUMP READY PROGRAMME

United Kingdom

The UK's [Heat Pump Ready Programme](#), an integral part of the £1 billion Net Zero Innovation Portfolio (NZIP), spearheaded by the Department for Business, Energy & Industrial Strategy (BEIS), represents a strategic endeavor to expedite the commercialization of innovative clean energy technologies, with a focus on heat pumps for decarbonizing homes. The program is designed to stimulate solutions across the heat pump sector, addressing several crucial aspects of technological adoption among three streams, each targeting specific challenges and opportunities in the heat pump sector.



Stream 1, entitled “Solutions for High-Density Heat Pump Deployment Competition,” represents up to £30 million to develop and demonstrate optimized solutions for cost-effective deployment of domestic heat pumps in high-density areas. It supports projects with “innovative methodologies” to make heat pump adoption “hassle-free,” reduce the cost for consumers (mainly through bulk provisioning), and leverage network impacts through distribution network operators (DNOs).<sup>63</sup> For example, Clean Heat Streets in Oxford is a collaboration between Samsung Electronics (UK) Limited and local councils and finance providers. The project targets a wide demographic, including those facing financial and logistical challenges, to demonstrate the accessibility and benefits of heat pump technology. The project's second phase will establish community “show homes”, offering live demonstrations for neighbors and other community members to directly experience the advantages of heat pumps. The intent is to create a domino effect of adoption throughout the community, partly by streamlining the installation process in a street-by-street approach. Organizers hope this will make heat pumps more accessible and dispel the notion that their installation is complex and costly.

Stream 2, titled “Developing Tools and Technology,” is offering £25 million in grants to reduce the lifetime costs of heat pumps, enhance their performance, and ease the “consumer journey.”<sup>64</sup> For example, in the Catalyst project, led by EDF with a grant value of £395,000, Daikin Airconditioning UK Ltd, ScottishPower Energy Networks (SPEN), and the University of Sheffield, are collaborating to develop a remote survey to reduce complexity and information overload. Prospective adopters use three main digital modules, each addressing a different phase of the heat pump installation process:

<sup>63</sup> <https://www.gov.uk/government/publications/heat-pump-ready-programme-apply-for-stream-1-opportunities>

<sup>64</sup> <https://www.gov.uk/government/publications/heat-pump-ready-programme-apply-for-stream-2-opportunities>

- a. Home Assessment: Utilizing basic data provided by the customer, together with housing stock data, this module aims to determine eligibility of a property for heat pump installation. It also advises other necessary steps, such as insulation improvements, to make a property suitable for heat pump technology.
- b. Remote Survey and Analysis: This module involves a detailed design, quotation, and installation plan. The remote survey element is particularly innovative, as it allows for a thorough analysis and planning phase without needing on-site visits, saving time and resources for both the customer and the installation team.
- c. Post-Installation Monitoring and Customer After-Care Package: This module, in recognition of the importance of ongoing support, focuses on building long-term customer relationships. It includes monitoring the performance of the installed heat pump system and providing continuous aftercare services. This approach ensures that customers receive the necessary support and guidance after the installation, thus enhancing overall customer satisfaction and trust in the technology.

This self-service approach significantly reduces the initial information required from customers, making the process more user-friendly and less daunting. The ultimate goal of this digital platform is to provide customers with end-to-end support, guiding them in identifying and selecting innovative heat pump solutions best suited to their individual needs and profiles in a seamless and customer-friendly journey from initial assessment to post-installation support.

Lastly, Stream 3, titled “Trial Support and Learning,” devotes up to £5 million to enhance the program’s overall impact by sharing information generated in the other two streams. It focuses on facilitating learning, collaboration, and knowledge sharing within the program and with external stakeholders to overcome barriers and “demonstrate the feasibility of heat pump installations,” as well as develop an understanding of stakeholder needs and knowledge.<sup>65</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - Clean Heat Streets is targeting adoption at the neighborhood level to leverage the visibility of neighbors’ participation to help encourage others.
- **Trialability** - Clean Heat Streets offers “show homes” where the local community can experience the thermal comfort, aesthetics, and noise of heat pump units at a community member’s house.
- **Complexity of installation** - The Catalyst project is streamlining the installation process for homeowners by developing online survey platforms to facilitate home assessments, project design, and post installation monitoring.

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<sup>65</sup> <https://www.gov.uk/government/publications/heat-pump-ready-programme-apply-for-stream-3-opportunities>

## HOME ENERGY NAVIGATOR PROGRAM

British Columbia, Canada



[The Home Energy Navigator](#) is a free program introduced in November 2022 by local governments in British Columbia to support homeowners who are interested in retrofitting their homes with energy-efficient equipment such as heat pumps. The program’s goal is to reduce carbon emissions from homes and buildings in British Columbia, which currently contribute up to 40 percent of the carbon pollution in the region. The program is funded by 19 different municipalities and has the support of City Green Solutions, a nonprofit organization in British Columbia that promotes energy efficient solutions for homes and buildings.<sup>66</sup> To use the program’s services, participants must own a home (single family, duplex, townhouse, or mobile home) within the Capital Regional District, Regional District of Nanaimo, or the City of Vancouver.

The program is framed as a “one-stop shop” for homeowners interested in energy efficient retrofitting.<sup>67</sup> Participants go through a five-step process to support them through their home energy retrofit journey. They first complete an intake form and are connected virtually with an energy concierge for a free consultation. During the meeting, applicants are provided with information such as how to have a home evaluation done (a requirement for certain rebates) and the list of rebate-eligible contractors. After homeowners receive quotes from eligible contractors, the energy concierge provides a Contractor Selection Report and Quote Comparison Report to help homeowners understand differences in proposed system configurations and decide on their retrofit plan.<sup>68</sup> While retrofitting their homes, homeowners can contact their energy concierge with questions such as how to apply for rebates. Lastly, upon completion of their renovations, the energy concierge sends a commemorative package to celebrate the completion of the upgrades. Although the program is designed to assist homeowners from beginning to end, participants can request the support of an energy concierge at any stage in their retrofit journey. For each step of this process, the Home Energy Navigator provides a webpage with specific steps, tips, and short online forms to fill out if homeowners would like to request more information (such as a rebate guide).<sup>69</sup>

The Home Energy Navigator also provides a library with resources on heat pumps (and other technologies). Resources include consumer guides,<sup>70</sup> videos, case studies, and other materials aimed at helping customers make an informed decision on retrofitting.<sup>71</sup> One such resource includes testimonials featuring homeowners who have completed home retrofits through the program. These are listed by location and type of retrofit (heat pump, solar, insulation, etc.). Each testimonial includes a photo, quotes from homeowners, and information about the features of their home. Homeowners describe the cost-savings, comfort, efficiency, and environmental benefits of their heat pump (or other retrofit), providing real life examples of the technology’s impact on local households.<sup>72</sup>

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<sup>66</sup> <https://homeenergynav.ca/about-us/>

<sup>67</sup> <https://www.timescolonist.com/sponsored/this-free-program-can-save-you-tens-of-thousands-in-home-efficiency-retrofit-costs-7865463>

<sup>68</sup> <https://homeenergynav.ca/retrofit-roadmap/>

<sup>69</sup> <https://homeenergynav.ca/retrofit-roadmap/step-4/>

<sup>70</sup> [https://homeenergynav.ca/wp-content/uploads/2022/11/HEN\\_HeatPump\\_Central\\_ConsumerGuide\\_2022\\_v2.pdf](https://homeenergynav.ca/wp-content/uploads/2022/11/HEN_HeatPump_Central_ConsumerGuide_2022_v2.pdf)

<sup>71</sup> <https://homeenergynav.ca/resource-library/>

<sup>72</sup> <https://homeenergynav.ca/testimonials/>



Each of the three service regions also maintain its own individual webpage to provide region-specific information on program variations (e.g., rebate programs). For example, the City of Vancouver outlines an eight-step process (similar to the five-step process, but with more details). They also provide information on requirements for energy renovations in Vancouver, on how to apply for the CleanBC Heat Pump Group Purchase Rebate for Vancouver, and about the Canada Greener Homes Grant, which provides funding for upgrades including heat pumps. It also provides a more general “getting started” YouTube video,<sup>73</sup> along with several links to additional information on eligible retrofits such as ductless heat pumps, central-ducted heat pumps, and available financial incentives.<sup>74</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - Through testimonials, homeowners interested in retrofitting can read about how others have directly benefited from installing energy-efficient technologies such as heat pumps.
- **Non-energy impacts** - The testimonials include information about the non-energy impacts of retrofitting. Homeowners share that, after installing heat pumps, their homes are comfortable, they are saving money, and that the heat pump is quiet.
- **Complexity of installation** - By providing holistic support and continual access to an energy concierge at every step of the retrofitting process, homeowners can receive beginning-to-end assistance in their retrofit journey. This reduces the time homeowners must spend to locate contractors, compare quotes, and apply for rebates.

## **MAKING THE SWITCH**

Saanich, British Columbia, Canada



[Make the Switch Study](#) was a collaborative project between Canadian electric utility British Columbia Hydro, nonprofit organization City Green Solutions, building science and engineering consulting company RDH Building Science Inc., the Community Energy Association charity, and the District of Saanich, a municipality on Vancouver Island in British Columbia. The purpose of the study was to better understand the costs and benefits of heat pump installations in British Columbia and to share the experience of heat pump owners with the wider community.<sup>75</sup>

Using data from 24 participating households in British Columbia, the study compared energy bills for one year before prior to with those after homeowners had from natural gas furnaces or boilers to

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<sup>73</sup> <https://homeenergynav.ca/vancouver/>

<sup>74</sup> <https://homeenergynav.ca/vancouver/>

<sup>75</sup> [https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch\\_SummaryReportFinal\\_MAY9.pdf](https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch_SummaryReportFinal_MAY9.pdf)

electric air-source heat pumps. Homeowners provided both quantitative information on their energy bills, home size and age, and number of occupants, and reported on the thermal comfort in their homes before and after their heat pumps were installed. Ninety-seven percent of participants said that their heat pump was “better” or “much better” than their previous natural gas furnace or boiler. In written testimonials, several participants reported their view that heat pumps are the way of the future and they encouraged other members of the community to try them.<sup>76</sup>

Based on the survey data provided, the study found that two-thirds of participating homes experienced a reduction in energy costs (by 10 percent, on average). Homes where energy costs rose tended to be older, poorly insulated, or leaky. The report emphasized the importance of a home energy evaluation prior to installation and hiring a qualified contractor to maximize the energy saving potential of heat pumps. In addition, households in this study reduced their monthly carbon emissions by 73 percent on average after installing a heat pump. Canada’s national carbon price is scheduled to increase from \$50 per ton of pollution in 2023 to \$170 per ton by 2030.

When applying this future carbon price to the energy bills of homeowners in this study, results suggest that a heat pump will be cost effective for 88 percent of households in the nation.<sup>77</sup>

Saanich used several modes of communication to broadcast the information generated by the study. In addition to producing a written report of the results, three videos were produced that document homeowners’ “heat pump stories.” In these one- to two-minute videos, participants share their reasons for installing a heat pump and their experiences since installation, including the comfort heat pumps provide in hot weather, reduced energy costs, and positive feelings about reducing their households’ carbon emissions. Saanich shared these videos on YouTube with a caption that reads, “Hear from British Columbian homeowners as they share their real-world experiences about heat

### In Their Own Words

At the conclusion of the survey, researchers asked participants for any parting thoughts. Here are a few excerpts.



“Natural gas furnaces seem like an extremely outdated technology in comparison to heat pumps, like still having a landline instead of a cell phone!”  
– Rebecca, Victoria

“I have talked with my neighbours about the benefits of heat pumps, and three are in the process of installing new systems. They were primarily interested in cooling due to the recent heat waves.”  
– Conor, Vancouver

“Go for it. Operating costs are the same or lower, it’s great having the air conditioning in summer and we have to get away from gas to slow climate change.”  
– Harvey, Vancouver

**Figure 6. Quotes from heat pump owners featured in *Making the Switch* case study report**

Source:

[https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch\\_SummaryReportFinal\\_MAY9.pdf](https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch_SummaryReportFinal_MAY9.pdf)

<sup>76</sup> [https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch\\_SummaryReportFinal\\_MAY9.pdf](https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch_SummaryReportFinal_MAY9.pdf)

<sup>77</sup> [https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch\\_SummaryReportFinal\\_MAY9.pdf](https://www.saanich.ca/assets/Community/Documents/MakeTheSwitch_SummaryReportFinal_MAY9.pdf)

pump ownership.”<sup>78</sup>

Two of the three videos showcased families with young children, and all the families featured in the videos discuss both the environmental and cost benefits to installing a heat pump. In the written report, testimonials from participants are used to share what local heat pump users have to say about the technology (**Error! Reference source not found.**). These testimonials are a way to communicate peer endorsement of this technology to those in Saanich and show examples of current heat pump users in their community.

#### Summary of activities related to technology characteristics:

- **Observability** - The report and videos raise the visibility of heat pumps by sharing information about local families who installed a heat pump and their experiences with them.
- **Non-energy impacts** - Study participants describe in their testimonial videos the convenience and cost savings they have experienced since switching to a heat pump.
- **Performance** - This study documents heat pump performance in terms of comfort and energy costs among members of the local community within which heat pumps were being promoted.

### **NYSERDA HEAT PUMP PROGRAMS**

New York

The New York State Energy [Research and Development Authority \(NYSERDA\)](#) has launched the Green Jobs-Green New York (GJGNY) initiative, which reflects New York State’s approach to the transition to sustainable energy solutions. This program aims to assist New York State’s residents in accessing and financing renewable energy systems and efficiency improvements through a suite of loan offerings.<sup>79</sup>



At the forefront of the GJGNY Program are several specialized sub-programs, each catering to New York residents’ diverse needs and demographics. The EmPower+ program targets income-qualified homeowners, offering a thorough approach to enhancing energy efficiency and home comfort, including substantial discounts on improvement costs.<sup>80</sup> The NYS Heating and Cooling Program highlights efficient heating and cooling options that eliminate fossil fuels, particularly emphasizing the installation of air-source and ground-source heat pumps.<sup>81</sup> For utility customers of Public Service Electric and Gas Company (PSE&G), the Home Performance and Home Comfort Programs offer a comprehensive approach, promoting air-source heat pumps and providing holistic home energy solutions.<sup>82</sup> PSE&G Long Island offers a heat pump explainer video,<sup>83</sup> customer case studies, contractor lists, and rebate applications.<sup>84</sup> The utility also offers a HVAC Comparison Calculator

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<sup>78</sup> <https://www.youtube.com/watch?v=EymI6KTPWlg>; <https://www.youtube.com/watch?v=psjilJRF6c&t=88s>

<sup>79</sup> <https://www.nyserda.ny.gov/All-Programs/Green-Jobs-Green-New-York>

<sup>80</sup> <https://www.nyserda.ny.gov/All-Programs/EmPower-New-York-Program>

<sup>81</sup> <https://cleanheat.ny.gov/>

<sup>82</sup> <https://homeenergy.pseg.com/homeperformance>

<sup>83</sup> <https://youtu.be/2UI3yqUcp9Q>

<sup>84</sup> <https://www.psegliny.com/saveenergyandmoney/homeefficiency/HomeComfort/AirSource>

where users can enter characteristics of their home and receive a customized estimate of the total cost of ownership of an air-source heat pump compared with alternatives.<sup>85</sup>

Finally, NYSERDA's "Heat Pump Planner" is an interactive tool that guides residents through the process of selecting the most suitable heat pump technology for their homes. The planner solicits details about a homeowner's current heating system, home type, and conditioning needs, and tailors the heat pump options it presents to align with individual circumstances. The planner also provides a comprehensive overview of potential benefits of switching to a heat pump system, including financial considerations, comfort and convenience, health and safety, and environmental impacts.<sup>86</sup>

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<sup>85</sup> <https://c03.apogee.net/mvc/home/hes/land/el?utilityname=psegliny&spc=hcc>

<sup>86</sup> <https://cleanheat.ny.gov/assets/planner/pdf/central-air-source-heat-pump-for-a-one-story-home.pdf>

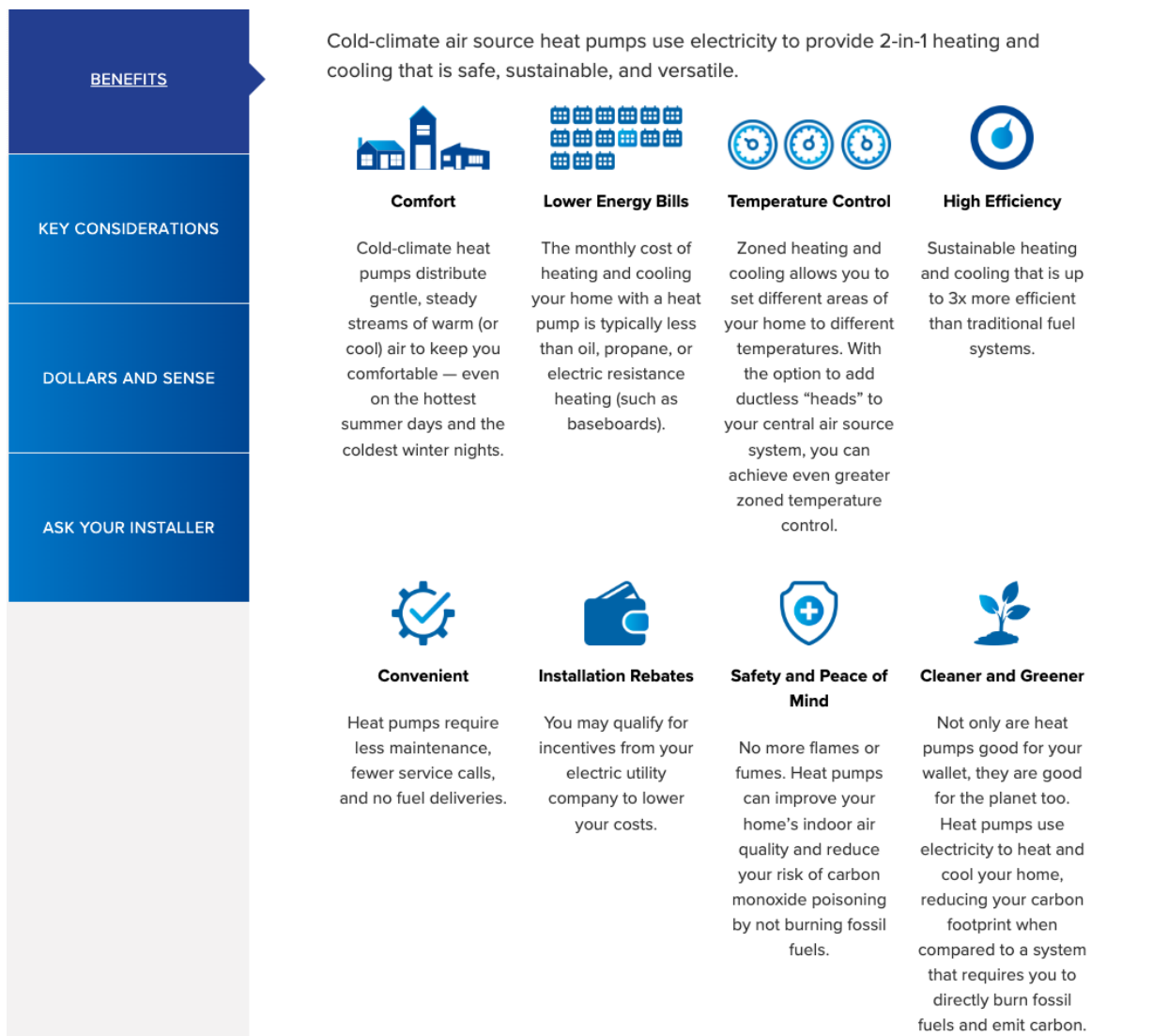


Figure 7. PSE&G’s description of non-energy benefits from air-source heat pumps<sup>87</sup>

Each program explicitly mentions comfort alongside environmental sustainability and cost considerations, addressing a primary concern for many looking to upgrade their home heating and cooling systems. For example, the PSE&G website outlines the range of non-energy benefits from residential air-source heat pumps to encourage adoption (Figure 7).

NYSERDA’s Community Thermal Energy Networks initiative takes a unique approach to encouraging (albeit geothermal) by doing so at the community – rather than individual – level. The program guides stakeholders through a structured three-step process, emphasizing the benefits to a community of promoting heat pumps. The program first educates key community figures, like city planners and real estate developers, about efficiency and environmental advantages. It then transitions into offering comprehensive support for project planning and implementation, including

<sup>87</sup> <https://cleanheat.ny.gov/central-air-source-heat-pump-for-a-one-story-home/>

technical assistance, financial planning, and regulatory guidance. The program's final step provides essential resources for accessing services and funding, which is crucial for navigating the complexities of urban project execution.<sup>88</sup> This streamlined approach shifts the focus from individual to community-led efforts, demonstrating a strategic method for adopting sustainable heating solutions in densely populated areas.

#### Summary of activities related to technology characteristics:

- **Observability** - The Community Thermal Energy Networks initiative educates community figures about the benefits and workings of heat pump systems.
- **Non-energy impacts** - Customer education resources emphasize the financial considerations, comfort and convenience, health and safety, and environmental impacts of switching to heat pumps.
- **Complexity of installation** - NYSERDA's "Heat Pump Planner" is an interactive tool that guides residents through the process of selecting the most suitable heat pump technology for their homes.

### **Non-governmental organizations (NGOs)**

Thirteen NGO efforts to promote heat pumps are summarized, highlighting the activities that target the most challenging technology characteristics.

#### **AIR SOURCE HEAT PUMP (ASHP) COLLABORATIVE** Minnesota



[The Air Source Heat Pump \(ASHP\) Collaborative](#) nonprofit Center for Energy and Environment,<sup>89</sup> in partnership with Minnesota Utilities, established the Minnesota Air-Source Heat Pump (MNASHP) Collaborative in 2019. The collaborative's mission is to encourage widespread adoption of heat pumps throughout Minnesota. It aims to position heat pumps as the preferred choice for both customers and contractors by educating and assisting them in making informed choices regarding their heating and cooling needs.

The MNASHP Collaborative's website offers a comprehensive platform for both homeowners and contractors. The homeowner site includes information on the benefits and advantages of heat pumps; resources and guidance on how to select, purchase, and install them; and a homeowner FAQ<sup>90</sup> where key terms are<sup>91</sup> and common questions are answered. The site also features interactive tools, like a rebate search tool<sup>92</sup> with a map and "Contact us" form where homeowners can send in their questions directly to be addressed by MNASHP.

To assist customers in identifying qualified HVAC contractors, MNASHP's website offers an interactive map and search tool<sup>93</sup> that provides contact information for contractors in their preferred

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<sup>88</sup> <https://www.nyserdera.ny.gov/All-Programs/Clean-Energy-Communities/High-Impact-Actions/Toolkits/Thermal-Energy-Networks>

<sup>89</sup> <https://www.mncee.org/>

<sup>90</sup> <https://www.mnashp.org/homeownerfaq>

<sup>92</sup> <https://www.mnashp.org/incentives-financing>

<sup>93</sup> <https://www.mnashp.org/preferred-contractor-network-homeowners>

contractor network. The website also includes a blog<sup>94</sup> that instructs homeowners on how to “ask the right questions”, “be clear about [their] motivations for installing a heat pump”, “[review and] compare bids carefully”, and “make sure the contractor has expertise with [their] home type and heating system”.

The site maintains a repository of case studies, where homeowners can hear from others who have made the switch to heat pumps. The case studies are sorted by technology, offering at least three different case studies for both ductless and ducted heat pumps. The case studies emphasize cold-climate performance, reasonable operating costs, and reduced carbon emissions.<sup>95</sup>

The contractor site offers best-practice guides, online training, and utility rebate tools to support increased sales and installations of air-source heat pump technologies. MNASHP’s free online training<sup>96</sup> and learning resources allows contractors to access courses, modules, and educational content on various topics, such as the installation and optimization, and the technologies, to enhance understanding of the technology.

#### Summary of activities related to technology characteristics:

- **Observability** - The MNASHP website maintains a repository of case studies, where homeowners can hear from others who have made the switch to heat pumps.
- **Non-energy impacts** -- The site offers also offers an interactive rebate search tool that includes a rebate map.
- **Complexity of installation** -- The site includes tips for homeowners on how to “ask the right questions”, “be clear about [their] motivations for installing a heat pump”, “[review and] compare bids carefully”, and “make sure the contractor has expertise with [their] home type and heating system.” It also offers”. In addition, they offer a search with tool that provides contact information for contractors in the homeowner’s preferred contractor network.

## **CLEAN ENERGY SOURCE TEAMS**

Minnesota



[Clean Energy Resource Teams \(CERTs\)](#) is an organization whose mission is to “connect individuals and communities” to resources to “implement community-based clean energy projects.” To support these projects, CERTs provides technical assistance and resources, such as seed grants, throughout Minnesota.

CERTs’ general website<sup>97, 98</sup> and CERTs’ air-source heat pumps page<sup>99</sup> offer an overview of the technology, including a specific focus on cold-climate operation. The website offers estimates of bill

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<sup>94</sup> <https://www.mnashp.org/blog/blog-post-how-to-choose-a-heat-pump-contractor-b8f5f>

<sup>95</sup> <https://www.mnashp.org/casestudy-pelican-rapids>

<sup>96</sup> <https://mnashp.talentlms.com/>

<sup>97</sup> <https://www.cleanenergyresourceteams.org/>

<sup>99</sup> <https://www.cleanenergyresourceteams.org/ashp>



and energy savings, with a detailed table comparing energy savings from air-source heat pumps relative to propane furnaces and electric resistance heaters.

The site also provides an overview on the steps to consumer adoption of a heat pump. It promotes following four steps in order: (1) contacting your electric utility provider, (2) getting two to three<sup>2</sup> – 3 bids from contractors, and (3) asking contractors the right questions. With regard to asking contractors the right questions, they offer the following starter list:

- Are they state licensed for HVAC?
- Are they insured?
- How long have they been in business?
- If heating through winter, ask for a cold-climate air-source heat pump and a technician experienced with these heat pumps.
- Ask them to calculate the home's heating and cooling load and evaluate the home's ductwork.

The site also details various tax credits and homeowner rebates that are available. It also offers a high-level overview on how to install a heat pump and links to a “best practices installation guide.”<sup>100</sup> Case studies, described as “success stories,” from people throughout Minnesota who have been involved in the transition to clean energy are also featured on the website.<sup>101</sup> CERTs previously maintained an online advice column called “Ask Alexis” in which Alexis, a CERTs staff member, tackled common heating and cooling questions for homeowners wondering if a heat pump is right for them.<sup>102</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - CERTs offers case studies that it describes as “success stories” from people throughout Minnesota who have installed heat pumps.
- **Complexity of installation** – The CERTs website offers a high-level overview on how to install a heat pump and link to a “best practices installation guide.” Provides an overview on the steps to consumer adoption of a heat pump: (1) contacting electric utility provider, (2) getting two to threethree bids from contractors, and (3) asking contractors the right questions.

## **ELECTRIFY EVERYTHING MINNESOTA** Minnesota



[Electrify Everything Minnesota](#) is a program administered by the Center for Energy & Environment located in the Twin Cities. The Electrify Everything site promotes heat pumps in the context of building electrification. Heat pumps are billed as a means of achieving various outcomes (e.g., heating, water heating, healthier home) and as being critical to electrification efforts.

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<sup>100</sup> [https://www.mnashp.org/s/ASHp-Install-Guide-FINAL\\_V3-gfjj.pdf](https://www.mnashp.org/s/ASHp-Install-Guide-FINAL_V3-gfjj.pdf)

<sup>101</sup> <https://www.cleanenergyresourceteams.org/story/things-i-learned-about-heat-pumps-homeowners-perspective>

<sup>102</sup> <https://www.cleanenergyresourceteams.org/ask-alexis>



The site highlights three different “pathways” to electrification, each with different “aims” (e.g., reducing climate impact, lower energy costs, improving home health). While all pathways eventually lead to the recommendation to install heat pumps, the customized pathways are designed to offer diverse messaging that resonates with a wide audience. For example, in the third pathway, meant to attract homeowners primarily concerned with improving the health and safety of their home, those particular benefits of heat pumps are highlighted. The site pointedly states, “many homes have natural gas water heaters, which have a risk of spilling combustion exhaust back into your home when not properly installed or maintained. Heat pump water heaters do not produce any combustion exhaust.”<sup>103</sup>

Electrify Everything provides an interactive tool that allows users to get specific recommendations for electrifying their heating, depending on their current heating source. It also provides a detailed table that outlines upfront costs, annual operation costs, lifetime carbon emissions, and equipment lifespan of various electric heating systems, including various types of heat pumps (i.e., ducted and non-ducted air-source heat pumps, ground-source heat pumps, air-to-water heat pumps). The website also offers links to information on rebates, cold-climate specifications, and contractor resources.<sup>104</sup>

The water-heating page provides similar information, including upfront costs and annual operation costs of heat pump water heaters compared to gas-fired water heaters.<sup>105</sup> It also offers resources for rebates and contractor information from its Heat Pump Installer Network.

Electrify Everything provides a page dedicated to “getting ready”<sup>106</sup> to electrify, that details necessary preparations including energy audits, service panel or wiring upgrades, renewable sourcing, and incentive and financing options. It offers detailed information about each of these topics, including links to resources where consumers can learn more, and links to relevant organizations.

The site features “real life inspiration,” for consumers by offering case studies from other Minnesota consumers who have switched to using heat pump water heaters.<sup>107</sup> It provides links to the organization’s social media pages including Facebook, Instagram, and TikTok.<sup>108</sup> On social media Electrify Everything posts short, informational videos about heat pumps, including clips from webinars, interviews with users, and videos demonstrating heat pumps in operation.

#### Summary of activities related to technology characteristics:

- **Observability** - The site offers “real life inspiration,” for consumers by offering case studies from other Minnesota consumers who have switched to using heat pump water heaters. On social media, Electrify Everything posts short, informational videos about heat pumps, including clips from webinars, interviews with users, and videos demonstrating heat pumps in operation.

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<sup>103</sup> <https://www.mncee.org/>

<sup>104</sup> <https://www.mncee.org/electrify-everything-mn?heating>

<sup>105</sup> <https://www.mncee.org/electrify-everything-mn?water-heating>

<sup>106</sup> <https://www.mncee.org/electrify-everything-mn?get-ready>

<sup>107</sup> <https://www.mncee.org/sites/default/files/2023-08/Staying%20Cool%20with%20a%20Heat%20Pump%20-%20Electrify%20Everything%20Case%20Study.pdf>

<sup>108</sup> <https://www.tiktok.com/@electrifyeverythingmn>

- **Non-energy impacts** - Lower operating costs, reduced climate impact and improved indoor air quality from heat pumps are also emphasized.
- **Complexity of installation** - A resource details necessary preparations for heat pumps, including energy audits, service panel or wiring upgrades, and incentive and financing options, as well as links to additional resources and organizations.

## **ENERGIZE DELAWARE AFFORDABLE MULTIFAMILY HOUSING PROGRAM**

Delaware



[The Energize Delaware Affordable Multifamily Housing program \(AMHP\)](#) provides support, financial incentives, and financing assistance for energy-efficiency renovations – such as heat pumps – to building owners of multifamily housing in Delaware.

To be eligible for AMHP, a property must have at least five units and either receive assistance from a government housing program or charge affordable rents defined as no higher than the Delaware State Housing Authority standard. AMHP offers a customized “whole-building” approach to energy efficient upgrades that covers all utilities and offers building owners “one-stop shop technical and financial assistance” to navigate the upgrade process. The program covers 90 percent of the cost for a whole-building assessment and creates a prioritized list of upgrades, which can include heat pump installation.<sup>109</sup> AMHP also provides a Request for Proposal to prospective contractors, helps locate contractors, and evaluates their bids. AMHP provides on-site inspection, troubleshooting, verification of the upgrade work, and assists building owners with securing financing and applying for rebates.<sup>110</sup>

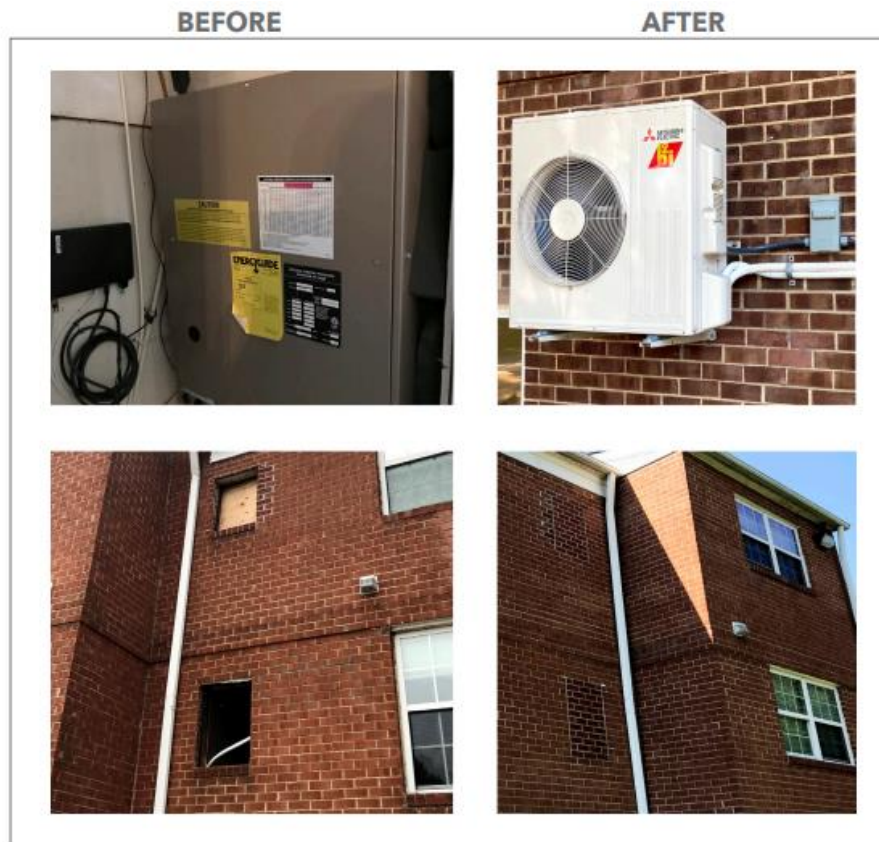
To illustrate how the process works and the benefits of participation, AMHP’s website includes a case study, explaining how the owner of an existing 165-unit building installed a heat pump and other upgrades through the program.<sup>111</sup> Before and after photos of the building are included in the case study to illustrate how the retrofit impacted the building (Figure 8). Through the program, the owner was able to lower operating costs and help extend the building’s Housing Assistance Payment contract with the U.S. Department of Housing and Urban Development. In a separate video testimonial, a building owner describes the process of working with AMHP to upgrade an existing 100-year-old building. He recommends the program to other affordable multifamily building owners, describing how, in addition to the cost savings, AMHP’s assistance with the upgrade engineering plans and rebate applications was helpful.

<sup>109</sup> <https://www.energizedelaware.org/wp-content/uploads/2020/01/multifamily.pdf>

<sup>110</sup> <https://www.newecology.org/energizede/>

<sup>111</sup> <https://www.energizedelaware.org/wp-content/uploads/2023/03/Case-Study-Carrington-Way-FINAL-3.20.23.pdf>

BEFORE AND AFTER: Aging condensing units were replaced with exterior, wall-mounted heat pumps. The abandoned wall penetrations were fully insulated and finished with brick.



**Figure 8. Equipment and exterior facade of multifamily building before and after heat pumps installation<sup>112</sup>**

AMHP was created in partnership with nonprofit organizations New Ecology Inc. and Elevate Energy, along with the Delaware Sustainable Energy Utility. The goal of this program is for building owners to reduce energy use, operating costs, and improve occupants’ living conditions. AMHP is one of several programs offered through Energize Delaware to specific groups of Delaware energy consumers making energy-efficient improvements to their buildings, such as residential properties with less than four units,<sup>113</sup> residential properties with more than four units,<sup>114</sup> business owners,<sup>115</sup> and public and nonprofit organizations<sup>116</sup>. Energize Delaware is also working to ensure there are ample qualified heat pump installers. In 2023, it hosted a “Green Workforce Development Training” for HVAC professionals from throughout the state to learn about heat pump technology and the cost savings and environmental benefits they offer.<sup>117</sup>

<sup>112</sup> <https://www.energizedelaware.org/wp-content/uploads/2023/03/Case-Study-Carrington-Way-FINAL-3.20.23.pdf>

<sup>113</sup> <https://www.energizedelaware.org/residential/home-performance-with-energy-star/homeowners/>

<sup>114</sup> <https://www.energizedelaware.org/residential/home-performance-with-energy-star/ahpes/>

<sup>115</sup> <https://www.energizedelaware.org/nonresidential/business/>

<sup>116</sup> <https://www.energizedelaware.org/nonresidential/public-nonprofit/>

<sup>117</sup> <https://www.energizedelaware.org/hvac-green-workforce-development/>

### Summary of activities related to technology characteristics:

- **Observability** - Through the case study and video testimonial, the Energize Delaware Affordable Multifamily Housing program showcases the benefits heat pumps offer to affordable multifamily buildings.
- **Complexity of installation** - AMHP provides “one-stop shop” services that support affordable multifamily building owners throughout the process of identifying upgrades, choosing a contractor, and providing on-site advice throughout the renovations. This program reduces the knowledge and time needed to install energy-efficient technologies such as heat pumps.

### **FINNISH HEAT PUMP ASSOCIATION (SULPU)** Finland



Suomen Lämpöpumppuyhdistys (SULPU), SULPU - or Suomen [Lämpöpumppuyhdistys](#) which translates in English to “the Finnish Heat Pump Association,” was created in 1999 by a heat pump entrepreneur and a heat pump researcher with support from the government efficiency agency, Motiva. SULPU’s goals are to promote cooperation among professionals working in the heat pump industry, support the industry’s growth, improve the quality of heat pump operation in the country, and work in cooperation with legislators and authorities. One of the specific goals of the founders was to have one million heat pumps installed in Finland by 2020. As SULPU became more prominent, it improved training and standards for heat pump installations throughout the 2000s, contributing to improvements in the reputation of the technology and increased sales. By 2018, SULPU was reporting that 70 percent of new homes were installing heat pumps and that sales of heat pumps had increased that year by 22 percent.<sup>118</sup>

The association currently has around 160 members, including contractors, manufacturers, importers, wholesalers, and companies and associations in Finland and abroad related to the industry. Members receive access to training, information bulletins, certificates, and access to research projects and surveys related to heat pumps. The association conducts sector-wide research and provides information about legal changes and regulations in the industry, both at the national and European Union level. Potential customers can find contact information for heat pump installers and contractors who are SULPU members through its website. Member benefits also include media exposure and political influence through the association’s activities.<sup>119</sup>

While SULPU is primarily a resource for the heat pump industry, it also provides resources for prospective heat pump customers. The website publishes information on the national prevalence, cost savings, and environmental benefits of heat pumps in Finland, and makes a case for why heat pumps are the future of meeting the country’s heating and cooling needs. SULPU also provides information on consumer considerations for deciding whether to purchase a heat pump and which

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<sup>118</sup>[https://rapidtransition.org/stories/peer-to-peer-support-and-rapid-transitions-how-finland-found-an-answer-to-heating-homes/#:~:text=supported%20the%20market,-,A%20Finnish%20national%20heat%20pump%20association%20\(SULPU\)%20was%20established%20in.10%E2%80%9315%20heat%20pump%20resellers](https://rapidtransition.org/stories/peer-to-peer-support-and-rapid-transitions-how-finland-found-an-answer-to-heating-homes/#:~:text=supported%20the%20market,-,A%20Finnish%20national%20heat%20pump%20association%20(SULPU)%20was%20established%20in.10%E2%80%9315%20heat%20pump%20resellers)

<sup>119</sup> <https://www.sulpu.fi/jasenet/>

type (geothermal, air, or air-water).<sup>120</sup> This information includes housing and climate characteristics to consider, the importance of hiring experienced suppliers and contractors, and the need to properly maintain heat pumps once installed. Each type of heat pump has its own web page that further details how it operates and how it may be a good investment for homeowners.<sup>121</sup> The site also includes in-depth guides for each category of heat pump. They offer additional statistics and information on how the technology works, choosing a heat pump based on home characteristics, and what to expect once it is installed.<sup>122</sup>

Lastly, SULPU maintains a bulletin section of the website where information about heat pumps, like news articles, reports, and blogs, are shared.<sup>123</sup> These items include both Finnish and international sources, such as stories on the prevalence of heat pumps around the world.<sup>124</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - As a prominent national organization, SULPU uses its platform to raise awareness about the performance, benefits, and availability of heat pumps.
- **Market availability** - As a national association with members across sectors, SULPU has made a significant impact on market availability through its lobbying and informational campaigns.

### **HEAT PUMP PARTIES/COMMUNITY EVENTS**

Community events to promote heat pumps, hosted by local organizations, governments, and businesses, are cropping up throughout the U.S. and Canada. In 2023, in-person heat pump promotion events took place in regions as diverse as Massachusetts, Colorado, California, and Toronto. Online events, such as webinar and social media contests, also occurred.

Some events were community-oriented, inviting members of the public to learn more about heat pumps through formal workshops. These included the “So You Want to Install a Heat Pump” webinar put on through West Marin Climate Action, a California-based community climate network.<sup>125</sup> More informal gatherings were also organized, such as the Heat Pump Party hosted in Gloucester, Massachusetts by the Cape Ann Climate Coalition, in collaboration with HeatSmart Alliance (**Error! Reference source not found.**).<sup>126</sup> The latter is a Massachusetts nonprofit that coordinated more than 30 local events in 2023 related to promoting heat pump adoption and sustainable heating and cooling. The events typically feature local guests who speak about climate change and climate education and take place in public spaces such as libraries and senior centers.<sup>127</sup> Recordings of these in-person events are posted on the organization’s website to increase accessibility.

Community events have also occurred in private homes, such as the Heat Pump Party hosted by journalist Sarah Lazarovic in her Toronto home. Lazarovic indicated she hoped people would leave

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<sup>120</sup> <https://www.sulpu.fi/lampopumput/lampopumpun-hankinta/>

<sup>121</sup> <https://www.sulpu.fi/lampopumput/>

<sup>122</sup> [https://www.sulpu.fi/wp-content/uploads/2021/05/Motiva-Lampoa\\_omasta\\_maasta-1.pdf](https://www.sulpu.fi/wp-content/uploads/2021/05/Motiva-Lampoa_omasta_maasta-1.pdf)

<sup>123</sup> <https://www.sulpu.fi/tiedotteet/>

<sup>124</sup> <https://www.sulpu.fi/tiedotteet/>

<sup>125</sup> <https://www.westmarinclimateaction.org/events/so-you-want-to-install-a-heat-pump-webinar>

<sup>126</sup> <https://capeannclimatecoalition.org/heat-pump-party-on-october-1-at-1130-am/>

<sup>127</sup> <https://stage.heatsmartalliance.org/local-heat-pump-events/>



the party with an idea of what the next step in their electrification journey could be. At the party, she and other guests discussed the benefits of heat pumps, home characteristics that affect the cost of a heat pump, and how to find a contractor. Lazarovic emphasized that people need someone they can get answers from when investigating a new technology. She believes referrals from friends and family are important to people who are considering installing technology such as a heat pump.<sup>128</sup>

Other events have happened entirely online such as the Heat Pump Halloween costume contest giveaway, hosted by Rewiring America (Lazarovic’s employer).<sup>129</sup> Multiple stakeholders are involved in organizing these events, often a combination of nonprofits, government entities, utility companies, and other businesses. While there are often contractors and businesses involved in these events, anecdotally that the events tend to be oriented around spreading awareness and increasing knowledge of heat pumps and avoid ‘hard sell’ pitches aimed at attracting immediate sales. Heat pump parties have even been the subject of climate humor aimed at encouraging heat pump adoption (Figure 9).



Figure 9. Cartoon referencing heat pump parties<sup>130</sup>

Community heat pump events have also been organized to target local businesses and contractors who are current or potential heat pump installers. These events tend to be workshops and seminars, such as the County of Ventura’s Sustainability Division webinar series called “Retaining Profit-Minimize Call Backs on Heat Pump Installs” and “Getting Past Heat Pump Objections” events, both of which aimed to address specific problems that contractors might encounter related to educating customers and addressing their concerns on heat pumps.<sup>131</sup> Other business events are more social, such as business happy hours in Denver, Colorado, where contractors and building professionals could take a look at heat pumps, learn about how they work, and discuss how heat pumps may be

<sup>128</sup> <https://www.cbc.ca/player/play/2195349571829>

<sup>129</sup> <https://us17.campaign-archive.com/?u=5cd020364fd51939c4a8db050&id=81b63349d3> , <https://www.linkedin.com/pulse/heat-pump-halloween-rewiring-america-1uwyc/>

<sup>130</sup> <https://www.canarymedia.com/articles/fun-stuff/cartoon-heat-pump-party>

<sup>131</sup> <https://sustain.ventura.org/event/getting-past-heat-pump-objections/> , <https://sustain.ventura.org/event/retaining-profit-minimize-call-backs-on-heat-pump-installs/>



profitable for them.<sup>132</sup> The purpose of many industry-related events is often to educate those within or related to the heat pump industry on heat pumps and why this technology is beneficial both financially and environmentally.

#### Summary of activities related to technology characteristics:

- **Observability** - Many community heat pump-related events seek to educate people on how heat pumps work and why the technology may be beneficial to install in their homes.
- **Non-energy impacts** - While not the direct purpose of these events, informal conversations with individuals who currently use a heat pump may help those interested in this technology learn more about the convenience, noise, and other non-energy impacts.
- **Complexity of installation** - Many of these events provide an opportunity for the public to learn more about heat pump technology, get answers to their questions, and learn about the first steps to getting it installed in their home.

### **HEATSMART ALLIANCE**

Massachusetts



The [HeatSmart Alliance](#) in Massachusetts is an innovative, community-driven effort to promote heat pumps in homes and buildings. Stemming from the HeatSmart Massachusetts program, this volunteer-run group is dedicated to reducing greenhouse gas emissions by advancing heating and cooling technologies with a particular focus on heat pumps. This initiative aligns closely with the Massachusetts Decarbonization Roadmap, which is targeting net-zero carbon emissions by 2050, and the Clean Energy and Climate Plan, which has a goal of install heat pumps in more than one million Massachusetts homes by 2030.<sup>133</sup>

Its energy coaching program is a core element of the HeatSmart Alliance's strategy. This program relies on volunteer coaches who provide personalized assistance guiding individuals through selecting and installing heat pumps suitable to their needs.<sup>134</sup> This typically includes:

- Educating clients on heat pumps, available rebates, and energy audit requirements;
- Gathering information on household needs, priorities, and equipment;
- Conducting a heat-load analysis using HeatSmart Alliance's tool<sup>135</sup> and suggesting system configurations;
- Suggesting questions to ask installers; and,
- Comparing installer quotes.

The coaches are not HVAC professionals, but they receive tools and training,<sup>136</sup> follow a coaching model,<sup>137</sup> and are asked to follow the organization's coaching principles of professionalism,

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<sup>132</sup> <https://www.eventbrite.com/e/heat-pump-happy-hour-good-for-business-tickets-739749459547>

<sup>133</sup> <https://www.mass.gov/info-details/ma-decarbonization-roadmap>

<sup>134</sup> <https://heatsmartalliance.org/coaching/>

<sup>135</sup> <https://heatsmartalliance.org/heat-load-analysis/>

<sup>136</sup> <https://heatsmartalliance.org/coaching-tools/>

<sup>137</sup> <https://heatsmartalliance.org/coaching-model/>

objectivity, and service.<sup>138</sup> Coaching services are advertised on the HeatSmart Alliance website, at its events, and through lawn signs.<sup>139</sup>

The <sup>140</sup> Alliance also actively engages in public education and outreach efforts.<sup>141</sup> It arranges for knowledgeable speakers to participate in virtual and in-person events centered around eco-friendly heating and cooling solutions. These events serve as platforms for sharing information and raising awareness about the practical benefits of heat pump technology. By interacting with homeowners and businesses, the Alliance is vital in equipping them with the knowledge to make informed decisions about incorporating heat pumps into their homes or commercial spaces. At the events, Alliance representatives explain the technical aspects of heat pump systems, provide insights into potential cost savings and environmental advantages, and clarify installation and maintenance processes. This effort helps demystify heat pump technology, particularly in Massachusetts, where cold climates and architectural variations present unique challenges and opportunities for installing heat pumps.

The Alliance also focuses on establishing partnerships with governments, businesses, and community organizations to expand its impact. By collaborating with these partners, the HeatSmart Alliance can utilize resources, including funding, incentives, expertise, and marketing support. Through these collaborations and other efforts, the HeatSmart Alliance aims to drive momentum toward sustainable heating and cooling solutions like heat pumps.<sup>142</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - The HeatSmart Alliance is making heat pumps and their practical benefits more visible through community engagement, educational events, and home installations of heat pumps.
- **Complexity of installation** - The Alliance's volunteer coaches assist homeowners in navigating the installation process and reducing the technical and logistical barriers associated with heat pump adoption.

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<sup>138</sup> <https://heatsmartalliance.org/coaching-principles/>

<sup>139</sup> <https://www.canarymedia.com/articles/heat-pumps/heat-pump-coaches-help-neighbors-ditch-fossil-heat-in-massachusetts>

<sup>141</sup> <https://heatsmartalliance.org/local-heat-pump-events/>

<sup>142</sup> <https://heatsmartalliance.org/about/>

[Hot Water Solutions](#) is an initiative by the Northwest Energy Efficiency Alliance (NEEA) that is committed to accelerating the adoption of heat pump water heaters in the Northwest region of the United States. The initiative provides a range of resources, tools, and support to bolster both sales and installations of heat pump water heaters. Hot Water Solutions' website<sup>143</sup> offers a comprehensive platform for both consumers and partners. The consumer-facing website provides resources such as interactive tools and an explainer video.<sup>144</sup> One such tool is a Water Heater Age Decoder<sup>145</sup> to help users determine the age of their existing water heaters. Another tool assists users in deciding whether a heat pump water heater is “right for them” based on their fuel source and geographic location (Figure 10).

**Is a Heat Pump Water Heater Right for You?**

Because they use **up to 70% less energy** than standard electric water heaters, heat pump water heaters are the best choice for many homes. But is it the right choice for you? Use the interactive tool below to see if your home fits the bill.

**Tell us about your home!**  
What is the power source for your water heater?

Electricity     Gas     Solar

**Figure 10. Hot Water Solutions' interactive tool to determine suitability for heat pump water heater<sup>146</sup>**

The detailed buyer's guide<sup>147</sup> offers information for those considering a heat pump water heater purchase. Planning resources include a sizing guide to help users determine the appropriate capacity for their heat pump water heaters, based on specific needs and space requirements. Installation resources provide guidance, including do-it-yourself (DIY) instructions in both English<sup>148</sup> and Spanish.<sup>149</sup> The website also features a “Find a Contractor”<sup>150</sup> tool, connecting users with professionals for efficient installations. With a focus on education and practical tools, Hot Water

<sup>143</sup><https://hotwatersolutionsnw.org/>

<sup>144</sup> <https://youtu.be/f7KeX8bse-0>

<sup>145</sup> <http://hotwatersolutionsnw.org/news/how-old-is-my-water-heater>

<sup>146</sup> <http://hotwatersolutionsnw.org/is-it-right-for-you>

<sup>147</sup> <http://hotwatersolutionsnw.org/buyers-guide>

<sup>148</sup> <http://hotwatersolutionsnw.org/installation/do-it-yourself>

<sup>149</sup> <https://hotwatersolutionsnw.org/installation/guia-de-instalacion-del-calentador-de-agua-con-bomba-de-calor>

<sup>150</sup> <https://hotwatersolutionsnw.org/installation/find-an-installer>

Solutions aims to empower users to make informed decisions about heat pump water heater purchases.

Complementing these resources, Hot Water Solutions' "Is It Right for You?"<sup>151</sup> webpage offers a personalized approach to help consumers assess the suitability of heat pump water heaters, given their household's needs. This tool guides homeowners through a series of questions to ensure that a heat pump system is viable and, if so, what type of installation would best fit their home. The tool also provides quick links to installers and retailers if homeowners prefer to perform a self-installation. If they choose the latter, the site links to the video "How to Install a Heat Pump Water Heater: Consumer Version," which provides a practical, step-by-step installation guide. This visual aid helps demystify the installation process, allowing homeowners to save on installation costs and, for many, lower the barrier to installation by easing the self-install process.

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<sup>151</sup> <https://hotwatersolutionsnw.org/is-it-right-for-you>

## HEAT PUMP WATER HEATER VS. STANDARD ELECTRIC

Lower bills. Big rebates. Plenty of hot water. A heat pump water heater is just a smarter choice – see how it stacks up in the NW.\*

WATER HEATER COMPARISON	50-Gallon standard electric water heater	50-Gallon electric heat pump water heater
ESTIMATED ELECTRIC WATER HEATING COSTS PER MONTH	\$30	<b>\$12</b>
ESTIMATED ANNUAL ELECTRIC WATER HEATING COSTS	\$359	<b>\$142</b>
SAVINGS PER YEAR	\$0	<b>\$217</b>
LIFETIME SAVINGS <i>Based on 10-year warranty</i>	\$0	<b>\$2,168</b>
UTILITY REBATES & TAX CREDITS	No	<b>Yes</b>
PAYBACK OF INCREMENTAL COSTS	N/A	<b>3 Years</b>
WARRANTY <i>Tank and parts</i>	6 Years	<b>10 Years</b>
ENERGY STAR® <i>Meets or exceeds ENERGY STAR specifications for energy efficiency.</i>	No	<b>Yes</b>
UNIFORM ENERGY FACTOR <i>Percentage of energy that is turned into hot water. The higher the number, the more efficient the unit and the less it will cost to operate.</i>	0.93-0.95	<b>3.24-3.70</b>
FIRST HOUR RATING <i>Number of gallons of water a fully heated water heater can deliver in the first hour of use.</i>	60-67	<b>66-70</b>
RECOVERY RATE <i>Amount of hot water, measured in gallons, a water heater is capable of providing in 1 hour, assuming 90 degree F increase.</i>	20-22	<b>29</b>

\*Northwest savings provided by the Regional Technical Forum based on an average cost of electricity of \$0.101/ kWh and a usage pattern of 2.5 people.

Figure 11. Cost and performance comparison of heat pump and standard electric water heaters<sup>152</sup>

The Hot Water Solutions’ website contains a “Hot Water Emergency” button<sup>153</sup> which when clicked, takes users to a page where they are met with a persuasive plea to “upgrade” and “not replace” their old water heater. The page provides quick, high-level descriptions of the advantages of heat

<sup>152</sup> <https://hotwatersolutionsnw.org/buyers-guide>

<sup>153</sup> <https://hotwatersolutionsnw.org/emergency-replacement>

pumps (e.g., “a new heat pump water heater not only delivers the same reliable source of hot water, it will also save you up to 70 percent on water heating costs”) and a quick comparison chart for customers to see the savings between standard electric water heaters and heat pump water heaters (Figure 11). The page also offers a search tool that allows users to input their zip code to find out which utilities in their area can help them with the upgrade, including both service and rebates. It also offers a search tool to locate retailers and installers.

A second part of Hot Water Solution’s website is devoted to providing resources for installing contractors, referred to as “partners.” The site features a product overview<sup>154</sup> of 120-volt heat pump water heaters and their ideal applications, to help partners determine which heat pump water heater is right for a given customer’s home. It also offers installer talking points, highlighting heat pump benefits (e.g., efficiency in delivering reliable hot water while saving up to 60 percent on water usage). In addition, technical specs and product support<sup>155</sup> can be found on the partner site through an integrated search tool that allows users to browse products by manufacturer.

The partner site also provides information on training sessions and orientations,<sup>156</sup> available both in person and via webinar for convenience. The On-Demand Training<sup>157</sup> includes two free online courses, equipping participants with the knowledge and resources to enhance their technical understanding of heat pump water heaters, and to educate installers on installation best practices and customer messaging. The Training Resources also provide a “Best Practices Installation Guide” best practices installation guide for optimizing performance and ensuring quality installations. Several training presentations are available for download, such as retail sales and contractor sales training, aimed at assisting businesses in guiding customers toward informed water heating decisions. There are also detailed tutorials on heat pump water heater installations for industry professionals.

Additionally, the partners section provides resources to help contractors understand heat pump water heater market conditions.<sup>158</sup> Materials include a comprehensive Market Characterization Report<sup>159</sup> that delves into both the supply and demand aspects of the region’s water heater market, a Market Progress Report<sup>160</sup> that evaluates barriers faced by installers in recommending heat pump water heaters, and a Consumer Messaging report. The latter summarizes findings from a study on messaging related to ductless heat pump and heat pump water heaters, conducted for NEEA by ILLUME Advising, LLC. These resources aim to equip partners with a better understanding of customer needs and sales opportunities in the Northwest market. NEEA, which established the Hot Water Solutions initiative, is an alliance of more than 140 utilities and energy efficiency

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<sup>154</sup> <https://hotwatersolutionsnw.org/partners/news/120-volt-heat-pump-water-heater-product-overview>

<sup>155</sup> <https://hotwatersolutionsnw.org/partners/tech-specs-manufacturer-product-support>

<sup>156</sup> <https://hotwatersolutionsnw.org/partners/training>

<sup>157</sup> <https://hotwatersolutionsnw.org/partners/on-demand-trainings>

<sup>158</sup> <https://hotwatersolutionsnw.org/partners/market-research>

<sup>159</sup> [https://neea.org/resources/water-heater-market-characterization-report?\\_hstc=223560068.d947ffb13a8beaff800211db3934abb7.1705604063213.1705961133144.1706029154095.4&\\_hssc=223560068.6.1706029154095&\\_hsfp=2161264190](https://neea.org/resources/water-heater-market-characterization-report?_hstc=223560068.d947ffb13a8beaff800211db3934abb7.1705604063213.1705961133144.1706029154095.4&_hssc=223560068.6.1706029154095&_hsfp=2161264190)

<sup>160</sup> [https://neea.org/resources/northwest-heat-pump-water-heater-initiative-market-progress-evaluation-report-5?\\_hstc=223560068.d947ffb13a8beaff800211db3934abb7.1705604063213.1705961133144.1706029154095.4&\\_hssc=223560068.6.1706029154095&\\_hsfp=2161264190](https://neea.org/resources/northwest-heat-pump-water-heater-initiative-market-progress-evaluation-report-5?_hstc=223560068.d947ffb13a8beaff800211db3934abb7.1705604063213.1705961133144.1706029154095.4&_hssc=223560068.6.1706029154095&_hsfp=2161264190)



organizations that supports the widespread adoption of energy-efficient products, services, and practices among their more than 13 million energy consumers.

Summary of activities related to technology characteristics:

- **Observability** - Hot Water Solutions' comparison of heat pump water heaters and electric water heaters aims to raise awareness about the technical and cost performance of the two technologies. An explainer video demonstrates how the technology works.
- **Non-energy impacts** - A quick comparison sheet between standard electric and electric heat pump water heaters shows money savings potential by estimating the monthly, yearly and lifetime savings.
- **Complexity of installation** - The installation process is made easier with a Buyer's Guidebuyer's guide and a tool to identify qualified local installers to answer questions and schedule an in-home consultation. A DIY heat pump water heater installation guide is also provided in English and Spanish.

**LOVE ELECTRIC**  
Colorado



[Love Electric](#) is an initiative in Colorado that seeks to educate homeowners on the benefits of heat pumps and heat pump water heaters (as well as induction cooktops). Love Electric aims to accelerate the adoption of these and other efficient electric technologies for homes and businesses.<sup>161</sup>

Love Electric houses vast resources on its website to help consumers find rebates, locate installers, and secure financing for their electric equipment installation. It also provides educational resources, such as technical guides for purchasing heat pumps, YouTube videos on heat pumps and heat pump water heaters, and graphics explaining how heat pumps are installed (Figure 12).<sup>162</sup> The website offers “where to start” information for consumers and tips on deciding whether a heat pump is the right choice, choosing a heat pump based on home features, and planning an installation. The website also provides a map of the climate zones in Colorado, which may affect heat pump usage.<sup>163</sup> There is a “common questions” section of the website to address frequent concerns, especially those related to heat pump operation in cold climates.<sup>164</sup> Resources are available for new home construction, including heat pump customer testimonials.<sup>165</sup> Updates on the ever-changing landscape for heat pumps are shared on the “news and Updates” section of the website.<sup>166</sup>

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<sup>161</sup> Love Electric is part of a coalition of Colorado-based stakeholders called the Beneficial Electrification League, a nonprofit organization that is working toward universal acceptance of beneficial electrification. Beneficial electrification refers to installing energy-efficient electric equipment, such as heat pumps, in place of combustion-fueled equipment, in cases where doing so benefits the customer through reduced energy costs and/or improved indoor air quality.

<sup>162</sup> <https://loveelectric.org/additional-resources/> , <https://loveelectric.org/heating-cooling/>

<sup>163</sup> <https://loveelectric.org/heating-cooling/>

<sup>164</sup> <https://loveelectric.org/common-questions/>

<sup>165</sup> <https://loveelectric.org/new-homes/>

<sup>166</sup> <https://loveelectric.org/news/>

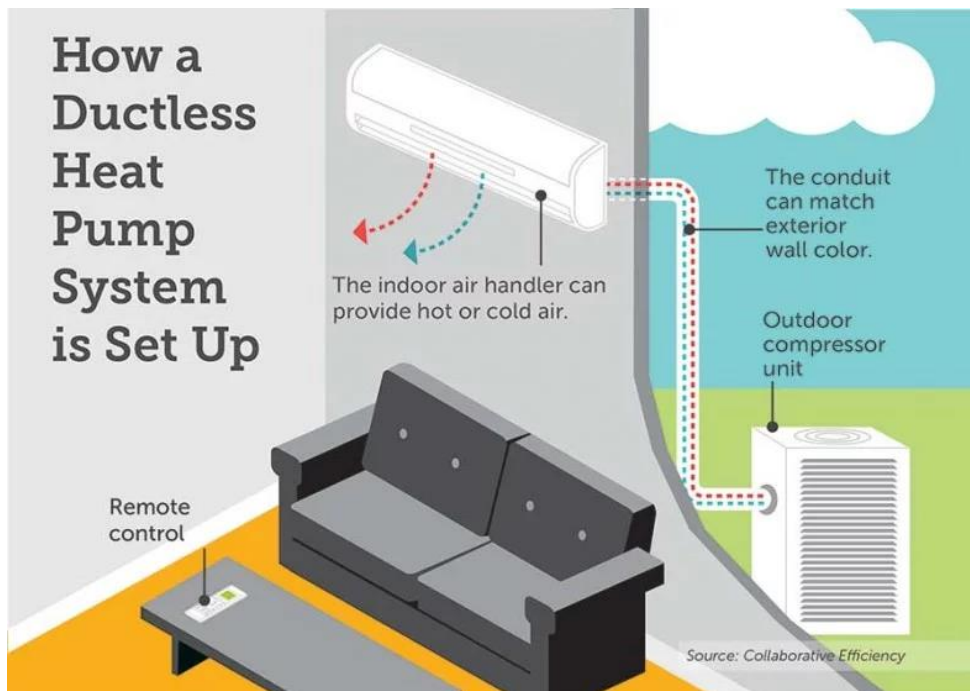


Figure 12. Love Electric's illustration of user experience with heat pump space conditioning<sup>167</sup>

The Love Electric website also hosts a chat box that provides interactive support to those who have questions about heat pumps. Some questions, such as “What rebates are available in Boulder County?” and “What is a heat pump?” are pre-loaded into the site. The chat box offers customers a way to get their questions answered with little time or money.

Love Electric’s website also features detailed information about heat pump installers.<sup>168</sup> To be listed on the website, installers must report which utilities authorize them to offer heat pump rebates, recent trainings they have attended, and the number of heat pump installations they have completed in recent years.<sup>169</sup> These requirements help to ensure that installers listed on the Love Electric site are experienced and informed about available rebates.

Summary of activities related to technology characteristics:

- **Observability** - Explainer videos, FAQs, customer testimonials, and other educational resources raise awareness about heat pumps and their performance in the local region.
- **Non-energy impacts** - Love Electric touts the non-energy benefits of heat pump technology on its website and through several in-depth testimonials of current heat pump users.
- **Complexity of installation** - Love Electric provides a list of contractors with relevant training and experience installing heat pumps, as well as securing utility rebates.

<sup>167</sup> <https://loveelectric.org/heating-cooling/>

<sup>168</sup> <https://loveelectric.org/installer-listing/>

<sup>169</sup> <https://loveelectric.org/become-an-installer/>

## MARIN GREEN HOME TOUR

Marin County, California



[The Marin Green Home Tour](#) initiative in Marin County focused on reducing greenhouse gas emissions, provides an opportunity for thousands of people to observe the electrification of homes, with a particular emphasis on heat pump technology. This tour, which is free and virtual, showcases six homes through video presentations, followed by live question-and-answer sessions with the homeowners each year.<sup>170</sup> Written summaries of the sustainable features of the toured homes are also available.<sup>171</sup> Sponsored by Sustainable Marin, the program emphasizes transitioning from fossil fuels and improving efficiency in new and existing buildings.

The homes that are showcased demonstrate a range of options possible with heat pumps. One home, which was retrofitted to “Passive House” standards, includes among its key features a multi-function heat pump that provides space heating, cooling, and water heating. This heat pump uses CO<sub>2</sub> as a refrigerant, heats water in a tank, and transfers the heat to the existing forced-air unit through a water-to-air heat exchanger. In doing so, it provides heated air using preexisting ducts. This system represents an innovative approach to using heat pumps, showcasing their versatility and efficiency in residential settings.<sup>172</sup>

Another home featured on the tour employs a minimalist approach to green upgrades, using heat pump space conditioning systems. The homeowner’s emphasis on a modest- yet-effective approach to sustainability showcases the adaptability of heat pump technology to different home sizes and types. The homeowner is also in the process of adding a heat pump water heater, further demonstrating the comprehensive electrification possible with heat pumps. This home’s story, especially the significant cost savings in acquiring the heat pump water heater, provides a compelling narrative for the tour’s participants, illustrating the economic benefits of transitioning to heat pump technology.<sup>173</sup>

The Marin Green Home Tour is supported by a network of regional partners, including Marin Clean Energy, the County of Marin, Drawdown Marin, Sustainable Novato, and the Environmental Forum of Marin. The partnerships aim to enhance the initiative’s reach and impact, ensuring a broad spectrum of community benefits from the insights and resources provided.<sup>174</sup>

### Summary of activities related to technology characteristics:

- **Observability** - The Marin Green Home Tour provides video tours of homes using heat pump technology. These visual presentations allow viewers to directly observe how heat pumps are integrated into different homes, showcasing their functionality and aesthetic appeal in various settings. The program itself also raises the visibility of heat pump usage within the local community.

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<sup>170</sup> <https://www.youtube.com/watch?v=A0oQna34M4M&t=34s>

<sup>171</sup> <https://www.marinegreenhometour.org/homes>

<sup>172</sup> <https://www.marinegreenhometour.org/home-mary/james>

<sup>173</sup> <https://www.marinegreenhometour.org/home-kevin>

<sup>174</sup> <https://www.marinegreenhometour.org/about>

- **Non-energy impacts** - Video tours emphasize the non-energy impacts homeowners have experienced (e.g., enhanced indoor air quality, improved comfort, and healthier living conditions).
- **Complexity of installation** - Homeowners' experiences and the expert question-and-answer sessions provide insights into the installation process, making it more approachable and understandable for viewers considering similar upgrades.

## MR. HEAT PUMP

United States

[Mr. Heat Pump](#) is a persona created in 2022 by Rewiring America, a nonprofit organization focused on electrification (**Error! Reference source not found.**).<sup>175</sup> The character represents an effort to help start conversations about energy-efficient technologies, like heat pumps. Mr. Heat Pump's outfit consists of a cardboard box with a spinning fan and exhaust duct headpiece. The character is played by Sam Calisch, an engineer and advisor at Rewiring America who has founded several electrification-related companies.

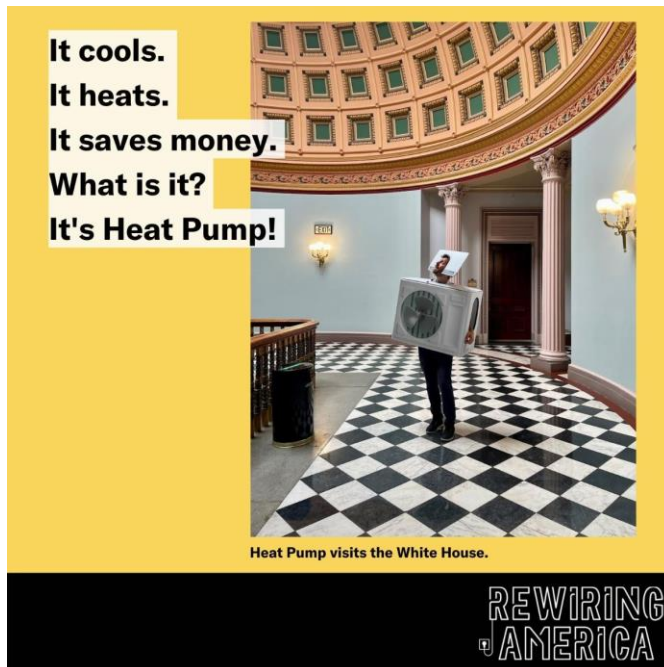


Figure 13. Mr. Heat Pump visits Washington D.C. (left); Mr. Heat Pump (right)

Source: <https://www.rewiringamerica.org/newsletter/mr-heat-pump-goes-to-washington>

Mr. Heat Pump has engaged with the public and with lawmakers by talking to them about heat pumps. The conversations emphasize that heat pumps can be bipartisan.<sup>176</sup> His visit to the U.S. capital included conversations with four senators and the creation of a seven-part YouTube playlist, showcasing these conversations along with additional videos discussing heat pump technology and

<sup>175</sup> <https://www.rewiringamerica.org/about>

<sup>176</sup> <https://www.politico.com/newsletters/power-switch/2022/08/02/heat-pumps-are-so-hot-right-now-00049206> , <https://wpln.org/post/what-is-a-heat-pump-why-are-they-planet-friendly-and-why-dont-more-americans-have-them/>

production.<sup>177</sup> Senator Ed Markey of Massachusetts created his own video featuring Mr. Heat Pump.<sup>178</sup> During street interviews in Washington D.C., Calisch (dressed as Mr. Heat Pump) found that few people he spoke to knew what a heat pump was.<sup>179</sup> Dressing in costume and engaging the public has created opportunities to inform a broad audience about how heat pumps work and the potential in their home.<sup>180</sup>

Mr. Heat Pump's publicity has included encouraging others to wear clothing expressing enthusiasm for heat pumps.<sup>181</sup> In a January 2023 Citizens' Climate Lobby legislative strategy session, a heat pump outfit was discussed as something that volunteers could wear while talking with communities about electrification technologies.<sup>182</sup> Similar to Mr. Heat Pump, Joe Wachunas, a writer for CleanTechnica and senior project manager at the New Buildings Institute, has dressed up as a heat pump water heater.<sup>183</sup> In a 2023 video, an in-costume Wachunas encourages viewers to hug their heat pump water heater and take a picture with it, as a way to promote this technology to others.<sup>184</sup> In October 2023, the nonprofit Generation180 encouraged people to dress up as clean energy-related technologies for Halloween, citing Calisch as an example of a heat pump costume.<sup>185</sup>

#### Summary of activities related to technology characteristics:

- **Observability** – By dressing in a heat pump costume, Mr. Heat Pump helps familiarize people with what this technology looks like and how it works. The publicity around Mr. Heat Pump may also generate conversations among people about this technology.
- **Complexity of installation** – Mr. Heat Pump educates the public about heat pump technology and encourages people to locate a contractor who can help them determine the best heat pump for them. This education may reduce the time and knowledge needed for those interested in installing a heat pump.

## **NEXTZERO HEAT PUMP ASSESSMENT**

Massachusetts



In Massachusetts, customers of several regional municipal electric companies can receive a free NextZero [Heat Pump Assessment](#) with recommendations on replacing their current heating system with a heat pump. This assessment is provided by the Center for EcoTechnology (CET).<sup>186</sup> CET arranges for heat pump experts to talk to customers about their home, conduct an energy audit of the home, create a roadmap for switching to a heat pump, and review contractor recommendations and eligibility for rebates. After the heat pump is installed, CET provides a heat pump specialist to conduct a virtual quality-control check, after which customers can apply for

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<sup>177</sup> <https://www.youtube.com/watch?v=i3sGqMZdfwo&list=PLPiYvnxdDko5wjZ4bX0DKhb-Bps8XZ-J>

<sup>178</sup> <https://www.facebook.com/EdJMarkey/videos/when-we-deliver-heat-pumps-for-all-everyone-will-save-money-on-their-bills-our-a/372723271507786/>

<sup>179</sup> <https://wpln.org/post/what-is-a-heat-pump-why-are-they-planet-friendly-and-why-dont-more-americans-have-them/>

<sup>180</sup> <https://www.youtube.com/watch?v=px24dAKSFKA>

<sup>181</sup> <https://www.rewiringamerica.org/newsletter/homegrown-heat-pumps>

<sup>182</sup> <https://citizensclimatelobby.org/blog/policy/building-electrification-efficiency-breakout-session-december-2022-conference/>

<sup>183</sup> <https://cleantechnica.com/2022/10/24/hug-your-super-efficient-water-heater-on-heat-pump-water-heater-day/>

<sup>184</sup> <https://www.linkedin.com/video/live/urn:li:ugcPost:6986074323459465216/>

<sup>185</sup> <https://generation180.org/blog/five-costumes-that-make-halloween-and-our-clean-energy-future-less-spooky/>

<sup>186</sup> <https://www.centerforecotechnology.org/heatpump/>



rebates. Some local utility companies require a heat pump assessment for customers to be eligible for a rebate.<sup>187</sup>

The free assessment offered by CET and NextZero eliminates the potential cost of seeking a heat pump assessment, while providing additional support to customers through continued access to CET heat pump experts throughout the installation process.<sup>188</sup> These assessments also help customers become more comfortable with the technology. On CET’s website, customers can access consumer guides on heat pumps and preferred contractor contact information.<sup>189</sup> NextZero makes its website available in 14 different languages to ensure accessibility to a diverse customer base. NextZero also seeks to decrease risks of improper installation and operation of a heat pump system by reviewing the contractor’s plans prior to installation.<sup>190</sup>

These heat pump assessments are made available to residents in 20 more than ten municipalities in Massachusetts through the Massachusetts Municipal Wholesale Electric Company (MMWEC). MMWEC provides its residential efficiency program, NextZero, to its customers and the customers of partner organizations. These partner organizations include both local government and utility companies, such as South Hadley Electric Light Department and the West Boylston Lighting Plant.<sup>191</sup> CET is MMWEC’s energy audit provider and “decarbonization partner” in developing incentive programs for customers to raise awareness and confidence in energy-efficient technology.<sup>192</sup> CET is an environmental nonprofit organization that has been providing services, including home energy audits, to Massachusetts communities since the 1970s.<sup>193</sup>

#### Summary of activities related to technology characteristics:

- **Complexity of installation** - The Heat Pump Assessment program supports customers throughout the installation process by connecting them with experts who conduct an energy audit of the home, create a roadmap for switching to a heat pump, address customer questions and concerns, and review contractor recommendations and eligibility for rebates. The program also provides a heat pump specialist to conduct a virtual quality-control check after the heat pump is installed.

### **VISIT A HEAT PUMP NEAR YOU**

United Kingdom

The Visit A Heat Pump Near You program [The Visit A Heat Pump Near You program](#) is a pilot service run by Nesta, a United Kingdom independent charity with several societal improvement aims, including accelerating decarbonization of household activities in the United



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<sup>187</sup> <https://nextzero.org/west-boylston/heating-cooling/heat-pump-assessment/>

<sup>188</sup> <https://nextzero.org/west-boylston/heating-cooling/heat-pump-assessment/>

<sup>189</sup> <https://www.centerforecotechnology.org/heatpump/>

<sup>190</sup> [https://www.sheld.org/uploads/South-Hadley-Pathway-Report-2023-Standard.pdf?\\_cchid=109947fedaafd2aecc425c8cf779ff6d](https://www.sheld.org/uploads/South-Hadley-Pathway-Report-2023-Standard.pdf?_cchid=109947fedaafd2aecc425c8cf779ff6d)

<sup>191</sup> <https://www.centerforecotechnology.org/heatpump/>

<sup>192</sup> <https://www.centerforecotechnology.org/carbon-based-incentives-report/>

<sup>193</sup> <https://www.centerforecotechnology.org/about/#cet-about-anchor-history>



Kingdom. Nesta's specific goals are to reduce UK household carbon emissions by 28 percent by 2030, compared with 2019 levels, and to reach zero household carbon emissions by 2048.<sup>194</sup>

With support from local authorities, community energy groups, installers, manufacturers, and consumer organizations, Nesta conducted a pilot version of the Visit A Heat Pump Near You program in London and Glasgow in 2022. The program invited prospective heat pump customers to schedule a visit of a heat pump in two volunteer homes and two showrooms. Visiting a heat pump in a residence or residence offered participants the opportunity to observe how heat pumps operate (as depicted in **Error! Reference source not found.**), experience the thermal comfort they provide, and ask questions about the technology in real time. This allows for a tactile experience where people can hear, see, and feel for themselves how a heat pump works, giving participants an opportunity to use a heat pump, albeit for a limited time, without making an investment. Most of the pilot participants already had basic knowledge of heat pumps, primarily from online resources, prior to their visit. A few others had real-life experience with heat pumps. The program bridges that gap, providing an opportunity to observe a heat pump in a home similar to one's own, which was especially appreciated by some participants.<sup>195</sup>



**Figure 14. Visitors on a home tour learning about heat pumps**

Source: <https://www.visitahheatpump.com/>

During the heat pump visits, the Visit A Heat Pump Near You program provides both formal resources (informational guide and FAQ document) and informal conversations about the installation process. Participants can ask questions of current users that may help them understand the reliability and longevity of heat pumps. This service provides more personalized information compared to online research, and participants reported that the visit improved their understanding of how heat pumps work and their confidence that a heat pump was the right choice for them. Informal post-visit follow-up conversations were also common among hosts and participants, indicating that continued support and social interactions facilitated by the program may be important to participants.<sup>196</sup>

After completing the pilot, Nesta announced plans to scale up the program, to have up to 1,000 participants utilize their service between February 2023 and November 2023. Nesta planned to

<sup>194</sup> <https://www.visitahheatpump.com/about>

<sup>195</sup> <https://www.nesta.org.uk/project-updates/bringing-the-heat-pump-experience-to-life/>

<sup>196</sup> <https://www.nesta.org.uk/project-updates/bringing-the-heat-pump-experience-to-life/>

recruit between 25 and 50 locations for this stage of the program.<sup>197</sup> There are currently 25 Visit a Heat Pump hosts listed on the website, which are searchable by postcode, type of heat pump, and property type.<sup>198</sup> Nesta created YouTube videos and Instagram posts advertising the program to both potential participants and current residential heat pump owners who want to host a visit and share their experiences. In the videos, current heat pump owners express interest in answering questions participants may have and discussing what they've learned about the convenience and costs of having a heat pump.<sup>199</sup>

#### Summary of activities related to technology characteristics:

- **Observability** - Nesta advertised the Visit A Heat Pump Near You program using social media such as YouTube and Instagram. These posts highlighted current heat pump owners who expressed excitement at sharing their experiences with people who have questions or concerns about heat pumps.
- **Trialability** - By visiting homes and showrooms with heat pumps, participants can experience the heating and cooling they deliver, as well as their other impacts (e.g., noise, aesthetics, convenience).
- **Non-energy impacts** - Heat pump hosts share their experiences with the comfort, noise, and convenience of heat pumps.
- **Complexity of installation** - During home visits, participants were able to ask questions specific to installing heat pumps in their own homes. After their visit, participants were sent follow-up resources, including the next steps to begin the process of installing a heat pump. Some individuals also received follow-up support from their hosts through informal conversations.

### Private sector

Five efforts to promote heat pumps led by private-sector entities are summarized, highlighting the activities that target the most challenging technology characteristics.

#### **AIRBNB SUBSIDIZES HOSTS' HEAT PUMP INSTALLATIONS**

France, United Kingdom and United States (Massachusetts)



[Massachusetts](#)

[United Kingdom](#)

[France](#)

In 2021, the property rental service company Airbnb committed to becoming a net zero company by 2030. In September 2022, Airbnb conducted a study of 260 hosts, in part to evaluate why Airbnb hosts do not renovate their properties to address poor insulation or energy efficiency. More than half of those surveyed do not renovate for financial reasons and 20 percent cited a lack of information and felt unsure where to start. Additionally, 44 percent of those surveyed were unaware

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<sup>197</sup> <https://www.nesta.org.uk/project/visit-a-heat-pump/>

<sup>198</sup> <https://app.visitheatpump.com/>

<sup>199</sup> [https://www.youtube.com/watch?v=zPA-bW\\_dGDE](https://www.youtube.com/watch?v=zPA-bW_dGDE)

of existing subsidies for energy improvement renovations. In response to these findings, Airbnb is developing an awareness campaign and a dedicated resource center where hosts can learn more about energy efficiency.

Airbnb also launched three branches of the Sustainable Hosting Program, which offers financial assistance to rental property hosts who wish to make efficiency upgrades and offers advice on renovations through partnering organizations. Airbnb has committed to distributing €1 million to fund selected host renovations, including upgrades to heat pumps.<sup>200</sup>

The first branch was launched in France in 2022, in partnership with Effy, an <sup>201</sup> and utilities management consultancy. If selected from among eligible online applications, hosts are able to discuss with an Effy advisor (for free) recommended renovations and financial assistance offered by the government and Airbnb.<sup>202</sup> If hosts choose a contractor proposed by Effy, the company will oversee the contract, providing an advisor to hosts throughout the process and handling all billing.<sup>203</sup> Effy also manages the application process for the MaPrimeRénov' financial assistance from the French government, which ranges from €4,000 - 10,000 depending on household income.<sup>204</sup> Airbnb offers hosts between €1,000 - 2,200 to support renovations, which is automatically from their bill with Effy.

Airbnb launched a second branch of this program in the United Kingdom through a partnership with the Energy Saving Trust, an independent organization that promotes energy efficiency. This program originally offered £1,000 - 3,000 for energy-related renovations, though support has since been capped at £1,000.<sup>205</sup> Eligible renovations include heat pumps, along with a range of other energy-efficient renovations.<sup>206</sup> In 2023, Airbnb announced an extension of the original Sustainable Hosting Plan into the Sustainable Hosting Hub and a new partnership with British bank NatWest.<sup>207</sup> Through this online hub, hosts complete an assessment and receive recommendations. They are then connected to an online marketplace of local installers and contractors and provided with a list of available local grants and government initiatives. Eligible hosts can receive up to £1,000 from Airbnb to offset the cost of upgrades, including installing a heat pump. Hosts may also be eligible for the Boiler Upgrade Scheme, which supports households in England and Wales with up to £5,000 for switching to a heat pump.<sup>208</sup> Hosts are also provided with financing options through NatWest. The program will stop receiving new applications in October 2024.

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<sup>200</sup> <https://news.airbnb.com/fr/airbnb-investit-un-million-deuros-dans-un-nouveau-plan-hebergement-durable-a-destination-des-hotes/>

<sup>202</sup> <https://www.effy.fr/presentation-offre/parteneriat-airbnb-effy>

<sup>203</sup> <https://www.effy.fr/presentation-offre/parteneriat-airbnb-effy> ,  
<https://www.connexionfrance.com/article/Practical/Property/Airbnb-launches-1million-eco-friendly-plan-for-hosts-in-France>

<sup>204</sup> <https://www.thelocal.fr/20230719/how-france-surged-ahead-with-heat-pump-installation#:~:text=If%20you%20combine%20grants%20through,heat%20pump%20installation%20costs%2C%20middle%2D>

<sup>205</sup> <https://www.thelocal.fr/20230719/how-france-surged-ahead-with-heat-pump-installation#:~:text=If%20you%20combine%20grants%20through,heat%20pump%20installation%20costs%2C%20middle%2D>

<sup>206</sup> <https://www.airbnb.com/e/shpterm>

<sup>207</sup> <https://shorttermrental.com/news/natwest-airbnb-hosts-uk-energy-efficiency/>

<sup>208</sup> <https://news.airbnb.com/en-uk/airbnb-launches-1m-sustainable-hosting-plan/>

The Sustainable Hosting Plan was expanded in 2023 when Airbnb began partnering with Adobe Energy Management (AEM), an energy consulting organization, to subsidize weatherization and heat pump installation for Massachusetts hosts. First, AEM matches hosts with a Home Performance Contractor to schedule a free energy assessment that provides suggested upgrades for their home. AEM then works with hosts to answer questions and discuss financing options for weatherization and heat pump installation.<sup>209</sup> This includes evaluating whether homeowners are eligible for Mass Save rebates, a collaboration of Massachusetts electric utilities and energy-efficiency service providers that offers up to \$10,000 in rebates for converting to air-source heat pumps, with additional rebates available for weatherization upgrades.<sup>210</sup> Airbnb is offering eligible homeowners grants of up to \$2,000 upon completion of air-source heat pump installations (as well as up to \$500 toward weatherization upgrades).<sup>211</sup> This program and its application are available in seven different languages, according to Airbnb's website.

#### Summary of activities related to technology characteristics:

- **Trialability** – While not the explicit aim of the program, Airbnb's Sustainable Hosting Plan creates opportunities for guests to experience heat pumps during their stay at a participating property.
- **Complexity of installation** – The Airbnb program advises selected hosts on their suitability for heat pumps and guides hosts through the process of selecting a contractor through various mechanisms (online marketplace, consultations with contractors, providing multiple quotes to compare, etc.), as well as offering financial support to pay for heat pump installation.

#### **BODYHEAT**

Glasgow, United Kingdom



[The BodyHeat system](#), which includes a novel application of heat pumps, was installed at the SWG3 dance club in Glasgow, in part to increase the public's awareness of heat pump technology. The system captures body heat from dancers, stores it in 12 underground boreholes, and then uses it to heat or cool the venue later. This heat pump-driven system has allowed the club to switch off its gas boiler permanently, reducing carbon emissions and energy use. BodyHeat claims that installation at the single SWG3 site could save up to 70 tons of carbon per year, with additional opportunities at venues such as gyms, offices, and festivals (through mobile systems).<sup>212</sup>

While not a residential application, the BodyHeat system's installation at SWG3 has had educational value. Its public setting gives club-goers the opportunity to experience heat pump cooling (albeit in a non-traditional system configuration) without purchasing the technology themselves. The nightclub context – a place associated with fun, socializing, and cultural trends – introduces a layer of levity and relatability to the technology for building occupants.

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<sup>209</sup> <https://abodeem.com/airbnb/frequently-asked-questions/>

<sup>210</sup> <https://news.airbnb.com/helping-hosts-in-massachusetts-make-their-homes-more-energy-efficient/>

<sup>211</sup> <https://abodeem.com/airbnb-will-help-some-hosts-pay-for-new-heat-pumps/>

<sup>212</sup> <https://www.bodyheat.club/>

In 2021, SWG3 hosted The New York Times Climate Hub<sup>213</sup> during the 26th United Nations Climate Change Conference (COP26), which was attended by representatives from nearly 200 countries. This event drew international media attention, expanding the educational potential of the heat pump project beyond those who could experience it in person. Undoubtedly aided by the unconventional and diverting setting, the heat pumps installed at SWG3 were cast as a story of innovation, environmental consciousness, and popular culture, framing heat pumps as appealing and accessible to a broad audience. Publications have also touted the potential for long-term environmental benefits through headlines like: “BODYHEAT: How SWG3 IS Heating Up the Dance Floor to Cool Down the Planet,”<sup>214</sup> “Can Dancing Save the Planet? A Scottish Night Club is Turning Body Heat into Energy,”<sup>215</sup> “This Glasgow Nightclub is Turning Your Dance Moves into Renewable Energy,”<sup>216</sup> and “COP26: Can Clubbers’ Dance Moves Create Renewable Energy?”<sup>217</sup>

The BodyHeat system at SWG3 has continued to capture public and media imagination, garnering extensive coverage, including more than 130 news articles from its initial launch in 2021, to its winning of Glasgow’s “Best Bar None” award in 2023.<sup>218</sup> News items appeared in technical and specialized publications, as well as mainstream news outlets. The broad outreach undoubtedly increased heat pumps’ visibility among diverse audiences.

Summary of activities related to technology characteristics:

- **Observability** - BodyHeat's project at SWG3 nightclub allows an observable demonstration of its innovative heat pump technology in action. The visible transformation of human-generated heat into a renewable energy source in a popular social setting makes the technology's benefits and functionality evident to the public.
- **Trialability** – By implementing the technology into a familiar environment like a nightclub, BodyHeat provides a real-world scenario for people to experience the effectiveness of heat pump technology firsthand, facilitating a practical trial in an engaging, communal setting.

**HEAT PUMP QUOTE CONSULTATION SERVICES AND GUIDES**



<sup>213</sup> <https://townrockenergy.com/portfolio/swg3-bodyheat/>

<sup>214</sup> <https://sustainablebrands.com/read/cleantech/bodyheat-swg3-heating-up-dance-floor-cool-down-planet>

<sup>215</sup> <https://www.sbs.com.au/news/datetime/article/can-dancing-save-the-planet-a-scottish-nightclub-is-turning-body-heat-into-energy/00i97odk6>

<sup>216</sup> <https://www.dazeddigital.com/science-tech/article/54750/1/glasgow-nightclub-swg3-turn-dance-moves-into-renewable-energy-townrock-bodyheat>

<sup>217</sup> <https://www.bbc.com/news/av/uk-scotland-59194559>

<sup>218</sup> [https://uk.finance.yahoo.com/news/glasgow-venue-wins-award-using-06000094.html?guccounter=1&guce\\_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce\\_referrer\\_sig=AQAAAK-T\\_16w8mt5Jgc6LkOCxMYUQsYoultLFdAuAAYJOTUPyPnTV5Frr8\\_3N8eKwMtXFIHuLiFjFpgOWLz4rIKcqliDI9wP73CruTfSfX8E6nSm-0hctI8u0sQ0rAb6beu\\_ghgPcno53IWofnZABIZcpbBL5mCkC-com05i10vHsJl](https://uk.finance.yahoo.com/news/glasgow-venue-wins-award-using-06000094.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAK-T_16w8mt5Jgc6LkOCxMYUQsYoultLFdAuAAYJOTUPyPnTV5Frr8_3N8eKwMtXFIHuLiFjFpgOWLz4rIKcqliDI9wP73CruTfSfX8E6nSm-0hctI8u0sQ0rAb6beu_ghgPcno53IWofnZABIZcpbBL5mCkC-com05i10vHsJl)



One of the challenges for customers looking to install heat pumps is that quotes from installers often differ substantively. It is common for different system configurations, equipment sizes, or manufacturers to be recommended. This makes comparing quotes and deciding on the best option more difficult for customers. To address this challenge, several heat pump quote consultation services and guides have emerged in the United States.

EnergySage published “How to Compare Heat Pump Q: Complete Guide” in August 2022, which includes a sample heat pump quote and explains key information they advise homeowners to look for in a quote. The guide recommends that homeowners review the qualifications of a contractor and determine their eligibility for a free home energy assessment prior to installing a heat pump.<sup>219</sup>

Similarly, EnergyTrust of Oregon published an article, “How to Read a Heat Pump Contractor Bid”, in March 2023 that includes advice on comparing heat pump equipment, important fees within a heat pump contract, and guidance on estimating heat pump operating costs. EnergyTrust also provides advice on the number of quotes homeowners should obtain before selecting a contractor and the importance of having air ducts assessed prior to heat pump installation.

HVAC.com provides another free resource for evaluating heat pump quotes. To receive a quote evaluation, consumers upload a photo or file of the quote and complete a form. Evaluators review the price, system sizing, and industry best practices to create a <sup>220</sup> report.<sup>221</sup> This free beta service, HVAC.com identifies positive and negative aspects of the submitted quotes. As part of this service, HVAC.com may include an offer to meet with a HVAC professional upon sending the QuoteScore to consumers.<sup>222</sup>

These organizations offer additional services beyond heat pump guides and quote evaluations. EnergySage, for example, maintains an online marketplace that connects people shopping for energy efficient technologies with installers and manufacturers. These services are free for customers, while service providers must pay a fee and undergo a vetting process to participate in the online marketplace.<sup>223</sup> EnergySage also offers free Heat Pump Advising Sessions and its website includes information such as how heat pumps work and the benefits of heat pumps, compared with traditional HVAC systems.<sup>224</sup> Similarly, EnergyTrust includes a link to its free contractor search tool where users can search by type of service and zip code.<sup>225</sup> The HVAC.com website includes an online chat with an advisor and provides articles related to HVAC technologies such as “Best Heat Pump” and “Is a Heat Pump Right for Me?”.

Paid services also exist for heat pump consultation such as those offered by Abode, a private energy management and consulting service company based in Massachusetts. Abode offers three types of

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<sup>219</sup> <https://www.energysage.com/heat-pumps/how-to-compare-heat-pump-quotes/>

<sup>221</sup> <https://www.hvac.com/>

<sup>222</sup> <https://www.hvac.com/terms-of-use/>

<sup>223</sup> <https://www.energysage.com/about-us/company/>

<sup>224</sup> <https://www.energysage.com/shop/heat-pumps/> , <https://meetings.hubspot.com/alizav/heat-pump-meeting->

<sup>225</sup> <https://www.energytrust.org/find-a-contractor/>



paid heat pump consultation services: a review of up to three contractor quotes (\$150), a 45-minute consultation with a specialist (\$150), or in-home tech support (custom price). Each of these services has a direct link on Abode’s website and various installation steps are included in the price, such as discussing a homeowner’s specific energy needs and the price of different heat pumps.<sup>226</sup> The online intake form allows for residents of seven Northeastern states (Massachusetts, Connecticut, Maine, New Hampshire, New Jersey, New York, and Vermont) to receive a heat pump quote evaluation. The form asks for utility data from the previous year and information about the home and current HVAC system, including insulation and square footage. The intake form also asks how residents plan to use the heat pump once installed, whether residents are seeking to replace their existing system, whether they are trying to stop using their existing heating system (but perhaps retain it as backup), and their motivation for installing a heat pump. Residents can answer an open-ended question to provide, explaining more detail about the goals of their heat pump project and any additional context that their evaluators should know about before uploading and submitting their heat pump quotes.<sup>227</sup> Abode’s website also provides resources such as heat pump buying guides and YouTube videos on stages of the heat pump journey.

Summary of activities related to technology characteristics:

- **Complexity of installation** - These organizations all offer various services that assist people with comparing quotes for heat pump installation and provide advice on what to consider when choosing a heat pump installer. This information reduces the prior knowledge required for someone choosing a heat pump contractor. Searchable databases enable consumers to locate heat pump installers in their area.

**HEAT PUMP STARTUP COMPANIES**



Startup companies like BlocPower,<sup>228</sup> Enpal,<sup>229</sup> Zero,<sup>230</sup> Sealed,<sup>231</sup> Elephant Energy,<sup>232</sup> and Dandelion<sup>233</sup> use innovative, streamlined approaches to accelerate the adoption of heat pump technology in residential settings. These companies are navigating the financial and technical challenges of introducing relatively new technology and engaging with consumers to facilitate understanding and ease the adoption process. Educational outreach efforts undertaken by these startups highlight how they simplify complex technical information to make heat pump technology

<sup>226</sup> <https://abodeem.com/homeowners/paid-consulting-service/>

<sup>227</sup> <https://abodeem.iotform.com/form/212714914707052>

<sup>228</sup> <https://www.blocpower.io/>

<sup>229</sup> <https://www.enpal.de>

<sup>230</sup> <https://www.zerohomes.io/>

<sup>231</sup> [www.sealed.com](http://www.sealed.com)

<sup>232</sup> <https://elephantenergy.com/solutions-heat-pumps/>

<sup>233</sup> <https://dandelionenergy.com/>

more accessible and relatable to the typical homeowner. Tailored installation services alleviate the perceived complexity and inconvenience of integrating new systems into existing residential infrastructures.

These companies recognize that knowledge and understanding are vital in overcoming technical and financial barriers to new technology. They provide many resources that use experiential language and real-life scenarios to give potential customers a vivid picture of living with a heat pump. The functionality and benefits of heat pumps are presented in attractive, easily digestible formats. For example, Sealed has developed extensive guides and resources on heat pumps, including comprehensive written resources, a virtual home tour, and dozens of videos that explain the technology. It also offers videos of interviews with homeowners that are well produced and information dense, while remaining accessible to a broad audience.<sup>234</sup>

Startups like Zero and Dandelion make the installation process more user friendly and less daunting for homeowners. Zero's approach allows homeowners to use a smartphone application to automatically generate a digital model of the interior of their home. Completing the scan, along with video and images taken by homeowners, allows for an immediate and detailed remote assessment. Homeowners can then speak to a Zero representative via video call who will walk through the design and provide a quote. Zero then schedules a contractor, processes rebates, and performs the installation, all facilitated through their homeowner's smartphone application.

Dandelion, specializing in geothermal solutions, has adopted a similar strategy but with a focus on geothermal systems. It offers tailored plans that suit a wide range of residential infrastructures. This bespoke service ensures a smoother installation process, especially as companies navigate the financial complexities of various rebate and tariff options for customers. Companies like Enpal and BlocPower, and Heatpumps London<sup>235</sup> also take this approach.

#### Summary of activities related to technology characteristics:

- **Observability** - Startups like BlocPower, Enpal, and Heatpumps London offer comprehensive guides and resources to inform customers about heat pump operations and the benefits and experience they deliver.
- **Complexity of installation** - Startups like Zero and Dandelion offer remote assessments and tailored system plans, schedule contractors, process rebates, and perform the installation. Zero uses a smartphone application to streamline communications with customers.

#### **PUBLICATION OF HEAT PUMP TESTIMONIALS**

Boston, Massachusetts

**The Boston Globe**

Heat pumps are integral to Massachusetts' strategy to achieve its climate goals, and the state hopes to have one million residential heat pumps installed by 2030 – on par with the number of fossil fuel-based heating systems that will be replaced. Reaching the goal would require installing 100,000 heat pumps annually. In 2020, however, just 461 installations took place. Barriers to adoption are

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<sup>234</sup> [www.sealed.com](http://www.sealed.com)

<sup>235</sup> <https://www.heatpumps.london/>

thought to include high initial costs and low contractor and consumer confidence. Many potential heat pump customers report that contractors have dissuaded them from fully replacing their heating system because heat pumps will not provide adequate heating at low temperatures. Experts say this is a myth stemming from poorly performing heat pumps that were available in the 1980s.<sup>236</sup> Modern, cold-climate heat pumps have proven effective during New England winters for several years. Nevertheless, the perception that heat pumps provide insufficient heating remains a challenge hindering customer (and contractor) uptake.

To address such concerns among its readers, days before a severe cold snap hit New England in February 2023, [the Boston Globe](#) asked readers with newly installed heat pumps to note how their heat pumps performed during the storm and to share their experiences with the paper. The request made clear that the intention was to understand whether the heat pumps could deliver adequate heating despite significantly lower temperatures, addressing concerns about performance in cold climates. The article said:

*This weekend, bitter cold in New England will put heat pumps to the test. Some models of heat pump are designed to work in cold temperatures down to minus 20 degrees. But this weekend, some regions will see temperatures drop even lower than that. Do you live in New England and have a heat pump in your home? The Globe wants to hear from you about how it fares.*

Readers were asked to report their experiences via Twitter and through an online survey, which asked for the type of heat pump they have, whether they have a backup system, their location, and whether they were willing to be interviewed for an article. Respondents were also asked how well their heat pumps worked throughout the “bitter cold,” and whether they experienced any issues.<sup>237</sup>

Several days after the severe cold temperatures subsided, the Globe published an article featuring testimonials from readers who had shared their experiences.<sup>238</sup> This excerpt illustrates the anxieties that the article aimed to alleviate:

*Jamie Foundas decided last month to finally get rid of oil heat in his 1960s-era Natick home and put in electric heat pumps. ...But would it work? The manufacturer claimed it would, even in extreme cold. Then, late last week, as forecasts called for a pipe-bursting arctic blast, he said to himself: “OK, now prove it.”*

*He stood at his kitchen sink Saturday morning, with all of New England in a deep freeze, watching a thermometer that showed the temperature outside: 8 degrees below zero. Inside, it was 68, just where he’d set the thermostat. “I saw that and thought, ‘OK, it does do what it’s supposed to do.’ ”*

Most readers who shared their experience reported similarly positive outcomes, with indoor temperatures remaining comfortable. Boston City Councilmember Matt O’Malley shared his experience via a humorous post on Twitter, which was mentioned in the Globe article (**Error!**

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<sup>236</sup> <https://www.bostonglobe.com/2021/08/21/science/massachusetts-should-be-converting-100000-homes-year-electric-heat-actual-number-461/?p1=Article Inline Text Link>

<sup>237</sup> <https://www.bostonglobe.com/2023/02/04/science/how-did-your-heat-pump-fare-cold-we-want-hear-you/>

<sup>238</sup> <https://www.bostonglobe.com/2023/02/08/science/heat-pumps-had-their-first-major-test-last-weekend-heres-how-it-went/>

Reference source not found.). HVAC contractors corroborated customers' positive experience with heat pumps during the severe cold. The article reported that "installers said they received very few calls for service on broken systems."

The article framed the severe cold event as a test of heat pump performance, explicitly addressing the concerns of potential heat pump customers. As one reader said, "I think as a stress test, this went really well". A heat pump installer was quoted as saying, "Our region experienced record-breaking low temperatures with essentially zero service issues as a result... For us, this was a clear indication that air-source heat pumps can maintain in New England weather." Similarly, a spokesperson for MassSave, the organization that issues rebates for heat pumps, said, "we can't imagine a better demonstration of how heat pump technologies can perform than during last weekend's weather." The director of a clean energy advocacy organization stated, "this moment was critical for instilling confidence in heat pump users".

The article garnered 374 comments with vigorous discussion about performance, the need for a backup heating source, and comparisons with older heat pump models. The conversations reflect misperceptions, false information, customer confusion, and widely varying opinions about heat pumps.

The Globe is not alone in publishing articles highlighting the natural experiment that severe weather posed for newly installed heat pumps. Efficiency Maine produced a brochure on its customers' heat pump performance during the same cold snap in February 2023.<sup>239</sup> Likewise, the Colorado Sun referenced the unusually cold weather in January 2023 as the impetus for an article on heat pump performance in that state.<sup>240</sup> The defining characteristics of such pieces are that they target the myth of poor performance in cold weather by spotlighting the experience of local community members.

#### Summary of activities related to technology characteristics:

- **Observability** – The article raised awareness of heat pump performance by publishing readers' experiences during a severe cold spell, addressing one of customers' potential major concerns.
- **Non-energy impacts**– The article reported that most heat pump users were comfortable despite significantly lower outdoor temperatures.



**Figure 15. Social media post touting heat pump performance during cold snap**

Source:

<https://www.bostonglobe.com/2023/02/08/science/heat-pumps-had-their-first-major-test-last-weekend-heres-how-it-went/>

<sup>239</sup> <https://www.energymaine.com/docs/Cold-Snap-2023-Heat-Pump-Performance.pdf>

<sup>240</sup> <https://coloradosun.com/2023/01/26/heat-pumps-work-colorado/>

## Programs targeting Disadvantaged/Hard-to-reach communities or multifamily sector

Seven efforts to promote heat pumps within disadvantaged/hard-to-reach communities (or the multifamily sector) are summarized, highlighting the activities that target the most challenging technology characteristics.

### **BASSETT AND AVOCADO HEIGHTS, ADVANCED ENERGY COMMUNITY'S ADVANCED ENERGY NETWORK**

Los Angeles County, California



The [Bassett and Avocado Heights, Advanced Energy Community \(BAAEC\)](#) is a group of local non-profit organizations, community groups, and energy technology leaders that have convened to promote renewable energy production within the community. The BAAEC is partnering with 50 homeowners to create a network of advanced homes. Participants who qualify for the program receive up to \$50,000 in energy upgrades, including heat pump water heaters. The BAAEC encourages participation in the Advanced Homes network by touting the financial benefits (no upfront costs, bill savings) and non-energy impacts (such as use of renewable energy, peace of mind and improved air quality) from the home upgrades.

To make the process of adopting heat pump water heaters easier for disadvantaged communities, program administrators have developed a simple, four four-step process for becoming an advanced home. Once the homeowners have verified their qualifications, BAAEC representatives conduct a free inspection of the home to evaluate its current condition and suitability for a variety of upgrades (e.g., heat pump water heater, rooftop solar, battery energy storage system) and assist the homeowners in completing the advanced homes enrollment form.<sup>241</sup>

The BAAEC website and outreach materials are available in Spanish to reach a broader audience of disadvantaged communities. They also use established channels to access community members, for example, posting flyers (in English and Spanish) on a community middle school website<sup>242</sup> and participating in community events such as the one depicted in Figure 16.

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<sup>241</sup> <https://advancedenergycommunity.org/enroll-now/advanced-energy-homes/>

<sup>242</sup> <https://tms.bassettusd.org/apps/news/article/1542491>





Figure 16: BAAEC outreach event promoting Advanced Homes network<sup>243</sup>

Summary of activities related to technology characteristics:

- **Observability** – The BAAEC sets up information tables at local events or in public spaces and distributes flyers that provide information about their Advance Homes program and other energy efficiency programs.
- **Non-energy impacts** – The BAAEC emphasizes the non-energy benefits of heat pumps on its website, such as improved air quality, adopting “cool new technology,” and “peace of mind”.

**COMMUNITY HEAT PUMP DEVELOPMENT (CHPD) PROGRAM**  
Oregon

The Community Heat Pump Deployment Program (CHPD) implemented by the nonprofit Earth Advantage, was established to provide Oregon homeowners in climate-vulnerable communities with cost-effective and efficient heat pump systems. The program prioritizes households that are part of environmental justice communities identified by the Oregon Department of Energy's Community Heat Pump



<sup>243</sup> <https://advancedenergycommunity.org/community-stories/>



Deployment Program.<sup>244</sup> The program also prioritizes individuals who have income levels at or below 60 percent, 80 percent, or 200% of state percent state median income, areaarea median income, and federalthe federal poverty level, respectively. This initiative is driven by the objective of ensuring equitable access to environmentally sustainable heating and cooling solutions. In 2022, the Oregon Legislature allocated \$8.5 million to the Oregon Department of Energy for the procurement and installation of heat pumps (and other sustainable energy technologies).

The program is implemented in collaboration with local utilities and community-based organizations. Their role involves conducting outreach activities, acquiring and installing residential heat pump equipment, as well as conducting associated weatherization and electrical upgrades. The program facilitates the installation of heat pumps in owner-occupied single-family homes through community-based partners. These partners play a crucial role in guiding interested homeowners through the eligibility assessment and helping with the application process. Successful applicants receive financial assistance and tips on how to operate and maintain heat pumps. Applicants can access information on the application process or pose questions through the community-based partners or on Earth Advantage's website. In some cases, installation partners may have their own eligibility and prioritization criteria.<sup>245</sup>

#### Summary of activities related to technology characteristics:

- **Observability** – Earth Advantage provides a section of FAQs about their program and heat pump performance, along with an energy report that offers comprehensive information on heat pumps. Earth Advantage supplies communication materials to partners to promote heat pumps in targeted communities through various channels (e.g., email, websites, flyers, phone calls, and in-home consultations).
- **Non-energy impacts** - The program highlights the many benefits heat pumps offer to overall comfort, health, and well-being.
- **Complexity of installation** - Earth Advantage has partnered with a network of installers in Oregon who assist potential recipients throughout the entire process, from filling out an application to installing a heat pump.

### **COOLING PORTLAND**

Portland, Oregon

[The Portland Clean Energy Community Benefits Fund \(PCEF\)](#) launched a five-year initiative to address the needs of low-income households, including resilience to extreme heat.<sup>246</sup> One program goal is to distribute up to 15,000 portable heat pump/cooling units to reduce heat-related risks, especially for priority populations such as low-income individuals



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<sup>244</sup> Environmental justice communities are those that are more likely to experience the negative impacts of environmental hazards and are often underrepresented in decision-making processes related to the environment. These include individuals who identify as having an ethnicity or racial heritage other than White, those who belong to tribal, rural, and coastal communities, seniors, youth, persons with disabilities, or those who do not have a heating/cooling system.

<sup>245</sup> [https://d1o0i0v5q5lp8h.cloudfront.net/earadv/live/assets/documents/EA\\_CHPDP\\_RFQ\\_.pdf](https://d1o0i0v5q5lp8h.cloudfront.net/earadv/live/assets/documents/EA_CHPDP_RFQ_.pdf)

<sup>246</sup> <https://www.portland.gov/bps/cleanenergy/about-cooling-portland>

and people of color, while promoting energy efficiency and sustainability. Since its inception in 2022, the program has installed 7,180 heat pumps as of December 2023.<sup>247</sup> **Error! Reference source not found.**

Cooling Portland is a collaboration of PCEF (grant manager), Earth Advantage (equipment procurement and distribution oversight), and Community Distribution Partners that serve low-income residents, including housing provider organizations and community-based organizations.<sup>248</sup> The latter identify and prioritize recipients, schedule deliveries, facilitate installation, and provide educational materials.

To request a cooling unit, residents of Portland are directed to eight community-based organizations that can determine eligibility and assist with the application process. These organizations reflect some of the cultural and ethnic diversity of the city's disadvantaged communities and hard-to-reach communities**Error! Reference source not found.** They include groups serving Asians and Pacific Islanders (Asian Pacific American Network of Oregon), African Americans (African American Alliance for Homeownership), Latinx (Latino Network, Verde), Indigenous Americans (Native American Youth and Family Center, Northwest Native Chamber), Somali Americans (Somali American Council of Oregon), and faith communities (Ecumenical Ministry of Oregon). Individuals who live in a housing unit managed by one of six participating housing providers can request that the property manager determine their eligibility for the program.

To be eligible for the program, residents of Portland must have an income level of 60 percent or less of the area median income (adjusted for household size). They can be renters or homeowners. Priority is given to vulnerable populations, including individuals over 60 years old, those with medical conditions, and those living alone. The program offers translation and interpretation services in multiple languages to ensure accessibility to various linguistic groups.

#### Summary of activities related to technology characteristics:

- **Observability** – The website has a live dashboard that displays real-time information about the program installations. A testimonial was featured on Fox 12 News in Portland, highlighting the benefits of adopting a portable heat pump, especially during extreme weather conditions.
- **Non-energy impacts** – The website highlights the non-energy impacts of a heat pump, emphasizing comfort and safer living conditions in response to extreme heat events.
- **Complexity of installation** – Cooling Portland provides a detailed list of contact information for its installer partners, and offers a comprehensive guide with pictures of portable heaters and troubleshooting tips. The portable heat pump also comes with an attached sticker containing a phone number that customers can call with questions or maintenance or troubleshooting requests.

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<sup>247</sup> <https://www.earthadvantage.org/climate-justice/heat-response-program.html>

<sup>248</sup> <https://www.portland.gov/bps/cleanenergy/about-cooling-portland>

## **DISTRICT OF COLUMBIA SUSTAINABLE ENERGY UTILITY (DCSEU) HEAT PUMP PROGRAM**

District of Columbia



The [District of Columbia Sustainable Energy Utility \(DCSEU\)](#) is an organization led by the Sustainable Energy Partnership that aims to help residents and businesses in Washington, D.C. reduce energy consumption and lower costs. To achieve this goal, DCSEU provides several types of resources to encourage adoption of heat pumps and heat pump water heaters, among other sustainable energy technologies. In addition to financial incentives, DCSEU provides technical assistance and informational resources (e.g., educational materials, workshops, and training sessions) to inform DC residents about sustainable energy technologies and practices. A blog post aimed at encouraging residents to consider heat pumps, for example, touts their efficiency, affordability of operation, comfort, and convenience (e.g., “no need to take [window AC] unit(s) in and out each season”).<sup>249</sup> Through these resources, the DCSEU has helped tens of thousands of district residents and businesses make changes to their building energy technology and reduce energy costs.

A subset of D.C. residents in single-family homes are eligible for free HVAC upgrades through the DCSEU program. Homeowners enrolled in government assistance programs like the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), and the Low-Income Home Energy Assistance Program (LIHEAP) are eligible to have heat pump systems installed at no cost. To participate, residents must work with HVAC installers and quality assurance inspectors who have been authorized by DCSEU.

To offset potential bill increases from switching to a heat pump, DCSEU requires/strongly recommends that tenants participate in Solar for all Community<sup>250</sup> or Single-Family Rooftop Solar<sup>251</sup> programs.<sup>252</sup> The Solar for All Community program provides solar panels to low-income households at no cost, while the Single-Family Rooftop Solar program offers rebates to homeowners who have solar panels installed. These programs are designed to help residents in the District of Columbia save money on their electricity bills and reduce their carbon footprint by producing clean energy.

### Summary of activities related to technology characteristics:

- **Observability** – The FAQ section of DCSEU’s website provides information on heat pump performance.
- **Non-energy impacts** – The program emphasizes the non-energy impacts (e.g., increased comfort, control, home value, improved air quality in the home, convenience) of heat pumps throughout DCSEU’s webpage.
- **Complexity of installation** – Potential program participants complete an online form to express interest and determine eligibility. To ease the installation process, if eligible, the applicant is contacted by a designated installer. The website also provides a list of

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<sup>249</sup> <https://www.dcseu.com/news-blog/news-blog/blog-posts/should-you-go-ductless-this-spring>

<sup>250</sup> <https://doee.dc.gov/solarforall>

<sup>251</sup> <https://www.dcseu.com/solar-for-all>

<sup>252</sup> The DCSEU website provides conflicting information about whether participation in a solar PV program is required to receive a free heat pump system.

authorized contractors who can install heat pumps and offers a chat box to facilitate communication between residents and program administrators.

## **ENERGIZE! HEAT PUMP PILOT PROGRAM** King County, Washington



One hundred twenty homes in King County, Washington benefit from the installation of free or discounted heat pumps through the new [Energize Skyway & White Center](#).<sup>253</sup> A partnership with the county, utilities, and local community groups, the program will provide heat pumps at substantial discounts, ranging from 80 percent to 100 percent, to 120 low-to-moderate-income households. While financial incentives are a critical component of the program's strategy to promote heat pump adoption, the Energize program recognizes that offering financial incentives alone is not enough to attract participation.<sup>254</sup> Customers need information and practical support to navigate the process, which Energize provides using a case-management approach and educating participants.

The process begins with a 60- to 90-minute workshop offered to residents interested in installing a heat pump.<sup>255</sup> The workshops provide information on the efficiency of heat pumps, using accessible terms to explain complex technologies to those without technical knowledge. Figure 17 **Error! Reference source not found.** displays an image from a webinar in which space conditioning heat pumps are likened to (familiar) refrigerators to allay concerns about providing cooling during hot weather. The workshops also explain likely energy costs and the overall benefits of transitioning to heat pumps.<sup>256</sup> They are held at venues in the community and childcare is provided. Virtual workshops are also offered.<sup>257</sup> Workshops are recorded to improve accessibility for members of DACs/HTR communities who are not able to attend.

Recognizing the diversity of the community, the program offers materials in multiple languages, including Spanish, Korean, Vietnamese, Russian, and Somali. This ensures that crucial information is accessible to a broader audience, fostering inclusivity. The program also has a well-organized, easy-to-understand Heat Pump 101 tab<sup>258</sup> and FAQ page<sup>259</sup> that addresses general questions about heat pumps, types of heat pumps and their longevity, financial issues, installation, and installers. Video testimonials of previous heat pump adopters are also shared during workshops to make the learning process engaging and interactive.<sup>260</sup>

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<sup>253</sup> <https://kingcounty.gov/en/legacy/services/environment/stewardship/sustainable-building/heat-pumps>

<sup>254</sup> <https://www.energysmarteastside.org/>

<sup>255</sup> <https://www.energizekingcounty.org/howitworks>

<sup>256</sup> <https://forms.office.com/Pages/ResponsePage.aspx?id=u27GUXr27UGSBjEI00kyRr7wsEYe889KggrR9M0-7WBURThYUFM4Uz4VU43VEVOTk42RktYWTNKWC4u>

<sup>257</sup> <https://mywesthill.org/event/energize-workshop/>

<sup>258</sup> <https://www.energysmarteastside.org/learn>

<sup>259</sup> <https://www.energizekingcounty.org/faq>

<sup>260</sup> <https://www.energizekingcounty.org/event-recordings>

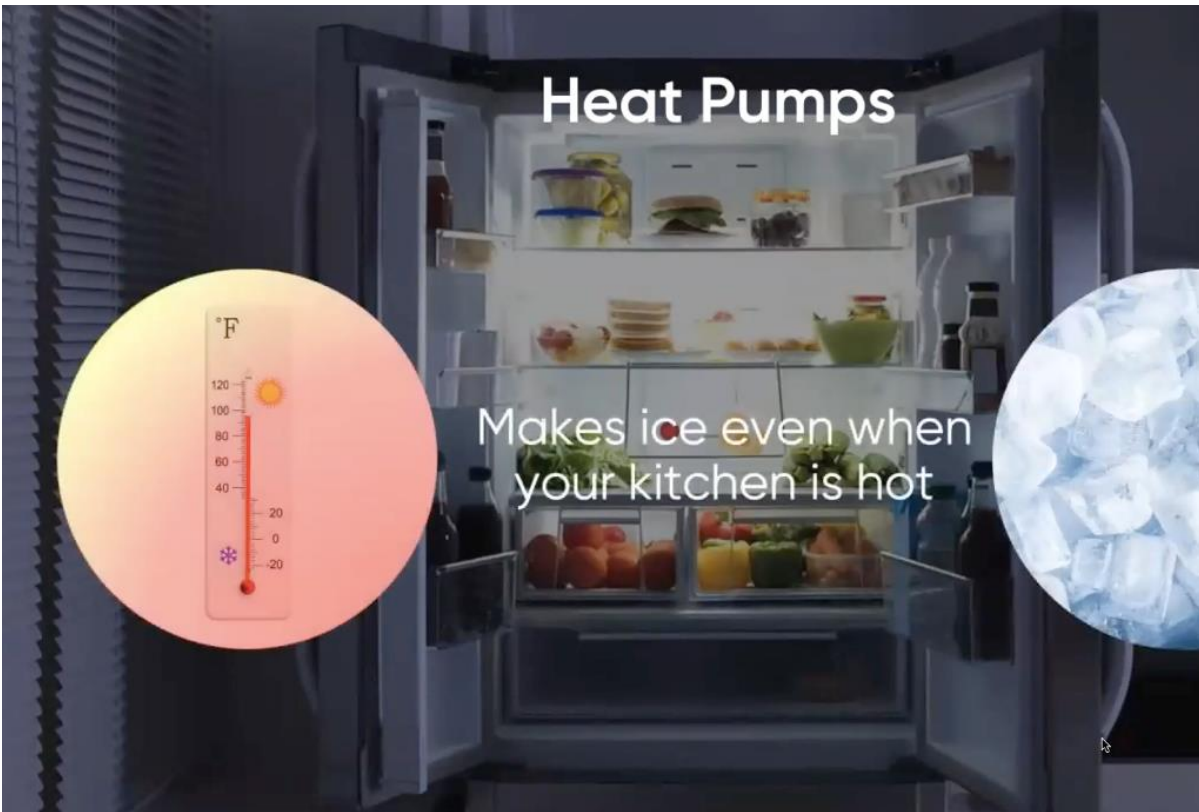


Figure 17: Image explaining heat pumps using refrigerator<sup>261</sup>

After the workshop, participants may apply to the heat pump program and if selected, are assigned a case manager who provides hands-on support.<sup>262</sup> This includes assistance with application documentation, coordination with installers, and guidance on applying for weatherization and other utility discount programs.

Summary of activities related to technology characteristics:

- **Observability** – The program has a well-organized Heat Pump 101 tab and FAQ page that provides information on heat pump history and types, installation, and maintenance. Video testimonials of previous heat pump adopters are also shared during workshops to make the learning process engaging and interactive.
- **Non-energy impacts** – The website highlights non-energy benefits such as comfort and improved air quality and offers supplemental resources to learn more.<sup>263</sup>
- **Complexity of installation** – The program assigns a case manager to assist participants with the application process, as well as coordinating with heat pump installers to ensure a smooth installation process.

<sup>261</sup> <https://www.energizekingcounty.org/event-recordings>

<sup>262</sup> <https://www.energizekingcounty.org/howitworks>

<sup>263</sup> <https://www.enerlowgysmarteastside.org/>



## MAINEHOUSING HEAT PUMP PROGRAM

Maine



[The Maine State Housing Authority](#) commonly known as

MaineHousing, is a self-governing agency that provides housing-related assistance to Maine residents, including through the implementation of federal and state housing programs. When the governor of Maine established a goal to install 100,000 heat pumps by 2025 as part of the state's decarbonization efforts, MaineHousing was tasked with facilitating the installation of heat pumps in the homes of low-income residents. Since its inception, the program has installed more than 3,000 heat pumps in single-family homes.<sup>264</sup>

The MaineHousing heat pump program prioritizes households that are well-suited for heat pumps (as a secondary heat source) and enrolled in government assistance programs such as the Home Energy Assistance Program (HEAP) and the Central Heating Improvement Program (CHIP). To begin the process of installing a heat pump, interested homeowners reach out to Community Action Agencies (CAAs) located throughout the state. These agencies provide educational materials on heat pumps to eligible homeowners to help them make an informed decision. The CAA then matches the homeowner with a vendor who schedules an assessment and installation visit. Successful applicants receive a free heat pump installed by a participating contractor.<sup>265</sup>

During installation, to ensure the heat pump system is properly maintained and functions optimally, the contractor educates the customer on the basics of heat pump operation, maintenance, and troubleshooting. Specifically, the vendor instructs the homeowner on how to properly operate the heat pump in conjunction with the primary heating system, how to clean indoor component filters and outdoor coils, how to use heat pump controls, and how to address common error messages.

### Summary of activities related to technology characteristics:

- **Observability** – The program offers information on how heat pumps function and the performance advantages of using heat pumps in easy-to-understand language.
- **Non-energy impacts** – The program ensures that residents are aware of non-energy benefits of heat pumps by highlighting the enhanced comfort, control, and reduced costs they offer.
- **Complexity of installation** – Assistance with the program application process is provided by local Community Action Agencies.

## MASSLANDLORDS

Massachusetts



[MassLandlords](#) aims to enhance the landscape of rental housing in

Massachusetts by supporting landlords in running profitable, compliant, and high-quality businesses, with a special focus on housing stability, property rights and safety and climate. The organization offers many resources supporting landlords to learn about heat pumps. Online resources and in-person events generate discussions that focus on topics such as the benefits of using heat pumps

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<sup>264</sup> <https://www.mainehousing.org/data-research/program-data/heat-pump-program-metrics>

<sup>265</sup> <https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program>



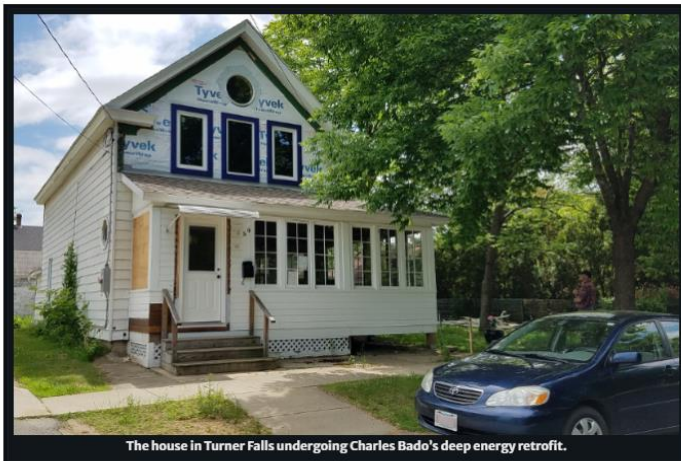
for heating and cooling, with an emphasis on ductless mini-split systems, ideal for retrofitting existing homes and multi-family properties. Information is also provided on rebate programs, financing opportunities, and guidance on training tenants for proper usage. Some events have featured HVAC experts,<sup>266</sup> but all events feature a "No Sales Pitch" guarantee from MassLandlords.

MassLandlords also offers opportunities for landlords to learn about heat pumps from each other. The organization's blog features case studies where landlords can hear about others' experiences firsthand, to better understand deep energy retrofits and benefits of installing heat pumps, such as the one presented in **Error! Reference source not found..** Events include presentations made by other landlords who have successfully integrated heat pumps<sup>267</sup>, highlighting the benefits of heat pumps for heating and air conditioning, showcasing low or zero capital costs due to state funding and other rebates, and describing how community action councils could help landlords access these benefits.

### Deep Energy Retrofit Case Study: Massachusetts Single Family Home

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In Massachusetts, a deep energy retrofit is a renovation that improves a building's thermal efficiency so much as to make heating and cooling free or very low cost. This case study comes to us from Charles Bado of Omnibus Design, residential designer, former building inspector, and veteran of deep energy retrofits.



The house in Turner Falls undergoing Charles Bado's deep energy retrofit.

Charles' other work has been featured on GreenBuildingAdvisor.com. He was kind enough to show us the home he's renovating in Turner Falls (Franklin County, MA), and walk us through his latest deep energy retrofit to see what lessons we could extract for multifamilies. Any errors or misunderstandings are our own.



The Turner Falls house shows a typical installation of heat pumps: spaced far enough from the building to permit air flow, high enough off the ground to avoid typical snow drift, and close enough to have the fluid tubing quickly enter the wire mold-like casing.

**Figure 18. MassLandlords' case study on heat pump retrofit of rental property**

Source: <https://masslandlords.net/deep-energy-retrofit-case-study-massachusetts-single-family-home/>

MassLandlords offers interactive tools, such as the air-source heat pump vs. furnace calculator,<sup>268</sup> developed by Nomer Caceres, which aids owners, managers, and builders in assessing the operational costs of all-electric buildings. The members-only spreadsheet enables users to model

<sup>266</sup> <https://masslandlords.net/2023-04-03-southbridge/>

<sup>267</sup> <https://masslandlords.net/2023-06-07-statewide/>

<sup>268</sup> <https://masslandlords.net/heat-pump-vs-furnace/>

apartments, natural gas furnaces or boilers, and various air-source heat pumps, facilitating a comparison of their annual operating costs. The tool addresses growing reliance on natural gas by highlighting concerns such as safety, environmental impact, availability issues, and non-renewability. It emphasizes the need for a transition to air-source heat pumps, providing predictable operating costs and supporting informed decision making. The calculator showcases diverse heat pump models and their cost effectiveness compared to natural gas systems, with considerations for efficiency, climate, and system optimization. The tool's limitations are acknowledged, focusing solely on operating costs and urging users to consult HVAC professionals for comprehensive decision making. It promotes the importance of insulation, proper system selection, and consideration of factors like solar power for a sustainable and cost-effective heating solution.

The website also provides resources on the installation and monetization<sup>269</sup> of heat pumps in rental housing, highlighting their efficiency as a competitive alternative to natural gas. It emphasizes considerations for equipment siting and maintenance, detailing the basic anatomy and thermodynamics of heat pumps. One article outlines a four-phase approach to transitioning from fossil fuel use to heat pumps, involving chimney removal, foam insulation, and air-sealing, followed by heat pump installation and solar panel integration.<sup>270</sup> The gradual transition allows for monetization at each stage and a value proposition for landlords, particularly in older buildings. The conclusion stresses the environmental and business benefits of coupling heat pumps with solar panels, with the phased approach providing a practical strategy for implementation.

#### Summary of activities related to technology characteristics:

- **Observability** - Events are held where successful landlords share their experiences. A blog features case studies about deep energy retrofits of rental units that have had success installing heat pumps. The operating cost calculator estimates the typical costs to run heat pumps based on input parameters, giving landlords some visibility into potential costs and return on investment.
- **Non-energy impacts** - The heat pump versus furnace calculator highlights the safety and environmental benefits of the former.

## Overview of strategies to address technology characteristics

This section synthesizes the range of options gleaned from the case studies, to address four technology characteristics that were identified as hindering adoption of residential heat pumps by California energy efficiency program managers.

### Observability

Efforts that increase the observability of heat pumps target a host of key topics, including the following: how heat pumps work, how they perform, the benefits they provide, the costs associated with installing and operating them, the availability of installers and rebates, and others' decisions to install a heat pump. The programs profiled in the case studies use a wide range of methods to convey information about the key topics. These include educational resources (e.g., reports, guides,

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<sup>269</sup> <https://masslandlords.net/resources/heat-pumps-rental-properties/>

<sup>270</sup> <https://masslandlords.net/resources/heat-pumps-rental-properties/>

explainer videos, FAQs, blog, flyers); media communications (e.g., clips from webinars, user interviews, and working heat pumps on social media, newspaper articles, television features); software (e.g., calculators to estimate operating costs, and cost compared to alternative technologies; mobile app to track energy use and bill after installing heat pump; interactive, virtual heat pump experience); events (e.g., heat pump parties, community outreach); and individuals (e.g., local heat pump owners and ambassadors). The experience of local heat pump owners is shared through home visits, video tours, testimonials, case studies, and gatherings. Heat pump installations themselves are made visible through neighborhood campaigns, lawn signs, a live dashboard counting heat pump installations, and locating them within communal spaces.

## **Trialability**

Four broad methods of addressing the low trialability of heat pumps were observed among the case studies. The most common approach is active exposure, in which opportunities are created to enable prospective customers to gain direct (though limited) experience with heat pumps. This could happen through dedicated showrooms and show homes (including mobile tiny homes), as well as home visits hosted by heat pump owners.

A second set of case studies provides examples in which the public gains direct experience with heat pumps through passive exposure. In these instances, the visitors have an unexpected chance to experience how a heat pump works, even if they had not sought out that opportunity. Examples of this approach include a heat pump installation at a dance club in Glasgow and the heat pump upgrades at Airbnb properties.

A third approach observed in at least one of the case studies offers visitors to a website the opportunity to virtually with a heat pump. The interactive programs encourage users to engage with the aspects of a heat pump as they would in the home (e.g., through the controls device, indoor unit). While not as immersive as an in-person interaction, virtual interactions allow prospective heat pump customers to gain some limited experience with heat pumps.

Finally, several programs offer prolonged, direct experience with heat pumps without a requirement to purchase them. Rental programs offer customers a lower-cost, time-bound opportunity to use heat pumps in their homes. While not the express purpose of this sales model, it has the indirect benefit of addressing low trialability. Similarly, Cooling Portland, which distributes portable heat pumps to income-qualified residents, aims to provide a resource for mitigating the impacts of extreme heat, but it also gives recipients experience with heat pumps. That exposure will be part of their knowledge base when faced with an opportunity to obtain a heat pump in the future.

## **Non-energy impacts**

Collectively, the case studies highlighted a long list of non-energy benefits that customers would derive from heat pumps to help encourage their adoption. These included:

- Economic factors
  - Cost savings
  - Increased property value
- Physical well-being
  - Increased thermal comfort

- Reduced noise
- Improved indoor air quality
- Healthier or enhanced living conditions
- Improved safety (from removing gas-burning equipment)
- Enhanced ability to mitigate extreme heat (by adding cooling)
- Practical considerations
  - Convenience (i.e., avoiding the need to install window units each summer)
  - Flexibility in space conditioning
  - Reliability of equipment
  - Longevity of equipment
- Psychological benefits
  - Improved quality of life
  - Sense of well-being and environmental responsibility
  - Peace of mind
  - Satisfaction from installing a “cool new technology”

According to the program resources in the case studies, the most common negative non-energy impact of heat pumps is their high upfront costs. Programs address this by providing financial incentives (or information on them) and return on investment calculators to illustrate how the lower operating costs make the initial investment cost effective. The only other negative non-energy impact of heat pumps noted by one case study was limited market availability, relative to gas furnaces. This limitation is addressed by providing a list of many approved contractors and reassuring customers that supply chain disruptions experienced during COVID-19 were beginning to ease.

Two primary modes of promoting the non-energy benefits of heat pumps were observed among the case studies. The most common outlets for information highlighting heat pumps’ non-energy benefits were educational materials. These materials include descriptions of heat pumps’ benefits on program websites, FAQs (including those related to non-energy impacts), comparison tables (outlining differences between heat pumps and gas-fired equipment), and cost calculators (which estimate heat pump operating costs in absolute terms and relative to gas-fired equipment). The second broad mode of communicating non-energy benefits was individual customer accounts of their experiences with heat pumps in their homes. These experiences were conveyed in person at public events or organized home visits, or digitally through videos of customer testimonials, home tours, case studies profiling the experience of local customers.

### **Complexity of installation**

Many of the efforts to promote heat pump adoption featured in the case studies aim to reduce the complexity of the installation process for prospective customers. They educate customers about the installation process by compiling general information (e.g., equipment type, financial incentives, cost comparisons, contractor lists, heat pump preparations) and providing tips on specific aspects of the process (e.g., equipment sizing, completing rebate forms).

To give customers an idea of what to expect during the installation process, many resources explicitly describe the process through homeowners’ experiences, FAQs, events, and lists outlining the steps to installing a heat pump. Customers are also provided support in the decision-making and



installation process via interactive tools. These tools include decision-support software (e.g., a quiz that generates personalized upgrade recommendations, pre-screening/pre-approval for financial incentives or program participation). More customized advice and support is offered through in-person resources, including heat pump coaches, home visit hosts, and dedicated program support personnel (e.g., energy advisors, energy concierges, case managers). To assist customers in selecting a contractor, resources including a list of questions to ask contractors and their references, lists or “networks” of approved contractors (offered by most programs), and tips or expert guidance on quote comparisons are also available. Resources to support customers with equipment selection and purchase include product selection guides, a heat load estimator tool, and an online marketplace to simplify procurement. Resources specifically aimed at streamlining the installation process include online platforms that offer simple ways to compile and submit information a virtual home assessment or online survey to facilitate home assessment, project design, and post installation monitoring.

Finally, businesses have emerged that attempt to eliminate virtually all the complexity involved in heat pump installation by providing a one-stop-shop service model. These include startup heat pump companies that conduct home energy assessments, design and install custom heat pump systems, and handle rebate and financing paperwork on behalf of their customers. At least one program provided a similarly comprehensive set of services for multifamily building owners looking to upgrade to heat pumps.

## **Stakeholder Feedback**

Interviews were conducted with five individuals from two implementers of energy-efficiency programs tasked with promoting residential heat pumps in California. The participants were asked to discuss the challenges associated with selected technology characteristics that influence residential heat pump adoptability. The need for examples of approaches that other programs take to address the challenges, and the most useful format by which to present such information, were also discussed. The conversations took place via Zoom and lasted approximately one hour. The section below summarizes the feedback received from stakeholders.

### **Observability**

Program implementers agreed that heat pumps lack visibility, compared to technologies like solar and EVs. HVAC systems are meant to be unobtrusive, ideally located out of sight and operating with minimal noise. Given that reality, increasing observability of heat pumps means raising awareness of their presence and performance without necessarily making the equipment itself more visible. Program implementers speculated that low customer awareness may make installers somewhat reluctant to introduce heat pumps, which would require educating customers about complex technology. They were optimistic that grassroots campaigns, using tools like lawn signs, media, and peer networks, could help increase heat pump awareness and visibility and help contractors have more productive conversations with prospective customers. The program implementers expressed interest in resources that provide examples of such efforts.

One program implementer noted that there are many outreach efforts related to heat pumps, ranging from flyers to demonstration homes to neighborhood ambassador programs. The challenge seems to be that the efforts of different organizations (e.g., utility programs, non-governmental organizations, government campaigns) are siloed. They noted that examples of coordinated

campaigns to raise awareness of heat pumps would be useful to avoid duplication of effort and create synergies.

### **Trialability**

Program implementers cited several examples of efforts to address low trialability of heat pump water heaters. One cited a demonstration tiny home that allows visitors at events like county fairs to see, feel, and touch the hot water produced by a heat pump water heater. The Learn & Earn program gives installers involved in the TECH Clean California program a free heat pump water heater to install and use at home, which has reportedly been successful at encouraging adoption among customers. A plumbing company's 100 percent money-back, satisfaction guarantee on heat pump water heaters, which promises to replace a newly installed heat pump water heater with a gas-fired one if the customer is unhappy with the former after an emergency replacement was made, was also cited as a successful effort to address low trialability.

Program implementers agreed that addressing the low trialability of heat pump water heaters is somewhat easier than doing so for space conditioning heat pumps. They could not think of any examples of programs on the HVAC side like those available for water heaters. There was general agreement that it would be useful to have examples of efforts to address the low trialability of heat pumps generally, but especially those for space conditioning.

### **Non-energy impacts**

One program implementer noted that, while customers are generally satisfied with heat pump water heaters, space-conditioning heat pumps impact user experience in more pronounced ways. Customers sometimes need to adjust to the noise heat pumps generate or to the presence of indoor units with ductless equipment. Customers do not understand the defrost mode, which impacts customers' "biggest focus", that is, comfort. Another implementer noted that the non-energy impacts of heat pumps are not yet fully leveraged in programs' promotional activities. There was a general consensus that examples of how programs and projects promote heat pumps' non-energy impacts would be useful. Program implementers expressed particular interest in efforts to leverage impacts such as load flexibility, individual room temperature control, and air quality for health and safety. They also noted the need for examples of messaging about the non-energy impacts to help broaden their appeal. These messages could help transcend political divides, perhaps by emphasizing the economic and other benefits of heat pumps, rather than their climate impact.

The impact of heat pumps on household energy bills was raised as a source of uncertainty and concern. It was noted that this issue would be particularly pronounced when adding cooling. While critical for ensuring health and comfort, affordability is a concern for low-income customers already facing energy burdens. Targeted rate design and bill protection may be needed. Program implementers expressed interest in learning about how programs outside California address the issue of operating costs.

### **Installation complexity**

Program implementers reported that heat pumps pose complexity for both customers and installers due to the technical knowledge required to understand and install. Anything that requires customer oversight, decision, or approval can create challenges. In addition, the "process burden" for activities like incentive applications can pose barriers for both homeowners and contractors. Program



implementers expressed a need for information on innovative approaches to simplifying processes (e.g., eliminating unnecessary steps) and reducing information requirements for both installers and customers.

On the technical side, one program implementer noted that the home upgrades sometimes required to install heat pumps (e.g., panel, wiring) pose additional challenges. They expressed a need for strategies to identify homes that already meet the infrastructure requirements for heat pumps. This would allow programs and installers to prioritize those homes and avoid surprises that add time and cost to heat pump installations, which often puts customers off.

### **Tailoring the approach**

Several stakeholders remarked that many of the specific activities discussed had a distinctly local scope. For example, electricity customers of a Montana utility can access energy advisors by phone or in person to ask for support while considering or installing a heat pump system. It was also noted that home visits and heat pump parties leverage social capital within a community. The stakeholders speculated that an effective approach in one community (e.g., home visits) may not be feasible, appropriate, or effective for all communities. Alternatives that target the same barriers in a different way (e.g., a mobile tiny house with heat pumps) are needed. This is particularly true in California, given its vast geographic scope and diversity. Stakeholders discussed the need for a wide range of options to address the challenges associated with heat pump adoption, with respect to the four technology characteristics discussed. The precise approach should be tailored to the needs of each region or community.

The range of activities gleaned from 39 case studies and compiled in this report and the accompanying database are a novel resource. Specifically tailored to energy-efficiency program management in California, these insights offer an unprecedented wealth of information, and can serve as a roadmap for navigating the complexities of heat pump adoption. Program managers can use this resource to pinpoint effective strategies and materials aimed at overcoming the challenges associated with heat pumps, particularly their low observability and trialability. This resource also equips managers with valuable insights on how to streamline the installation process, which will enable consumers to capitalize on the many benefits of heat pumps, including non-energy benefits. This multifaceted approach not only enhances the effectiveness of energy-efficiency programs, but also positions program managers as key players in the promotion of sustainable and innovative solutions to meet California's climate goals.

## **Recommendations**

Consumer awareness of heat pumps is low in California. Efforts are needed to raise the visibility of heat pumps themselves, as well as general knowledge of how they work, the experience they offer, the costs of installing and operating them, and the availability of installers and rebates. Creating awareness and educating consumers requires a multi-pronged approach that is tailored to the needs of a community or region. Broad media campaigns can develop basic awareness and understanding. Smaller, more locally targeted efforts, such as outreach events, can deepen both understanding of and trust in heat pumps, particularly when they leverage trusted community members or organizations as technology ambassadors. Coordinating broad and targeted messaging improves the

effectiveness of these efforts. California should look to examples of coordinated efforts like those undertaken in Maine and Finland and consider how to create a similar strategy that will work for the state.

Opportunities for passive exposure grow as more people (and businesses) install heat pumps. The addition of attractive and persuasive signage can make any heat pump installation an educational opportunity. This approach requires little effort or money. A standard set of placards (in a variety of languages) could be created and disseminated to businesses and public spaces. Highly visible displays in numerous locations within a given community would leverage the social norm effect, suggesting to visitors that many in their community have purchased a heat pump. Further research is needed to understand which types of locations and messaging strategies would be most effective among California's diverse regions and populations.

The non-energy impacts of energy technologies help further drive their adoption. California programs should leverage the many and varied non-energy benefits of heat pumps (e.g., targeted space conditioning, convenience, quiet operation, reduced environmental impacts compared to gas-fired alternatives) to generate interest in installing them. Likewise, having a clear understanding of characteristics that customers do not like about heat pumps (e.g., defrost cycle, highly visible indoor units) is critical to both refine the technology and educate customers on what to expect of their equipment. More research is needed to better understand how heat pumps impact customers, how to leverage their non-energy benefits, and how to mitigate potential negative impacts.

Converting interest in heat pumps into purchase decisions requires reducing the friction customers experience at all points in the installation process. The one-stop-shop approach holds a lot of potential given the convenience it offers, especially if it can be designed to incorporate best practices, such as gathering and comparing three contractor bids. More targeted efforts to reduce complexity for potential heat pump customers, such as pre-screening tools that convert to rebate applications and quote comparison services, are also needed. Further research is needed to determine the cost effectiveness of the various approaches to simplifying installation for customers, so that funding can be steered towards those interventions that would yield the biggest return on investment.

This report makes clear that there are myriad activities taking place that promote residential heat pumps across North America and Europe. This creates an enormous opportunity to learn from the experience of other programs and leverage their foundational work to create robust resources and strategies to inform and persuade customers to install heat pumps. This report can be seen as a next step on the path to widespread consumer adoption. Just as prospective heat pump customers like to learn from heat pump owners in their community, heat pump program managers can also benefit from peer-to-peer, direct exchanges. This report may act as a jumping-off point, or opportunity for program managers with similar mandates to connect, providing inroads to initiate such conversations and spark an exchange of ideas and innovation.

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## Heat Pump Programs Reviewed

### Utility programs

[Comfort Advantage](#)

[Educational, Interactive Tiny House \(EdITH\)](#)

[Flathead Electric](#)

[Heat pump rental program: Saint John Energy DeMark Home Ontario](#)

[Heat pump rental program: Solidcare Home Improvements](#)

[Heat pump rental program: The HVAC Service Solutions](#)

[Heat pump rental program: DeMark Home Ontario](#)

[Lane Electric](#)

[National Grid Heat Pump Campaign](#)

[Rocky Mountain Power](#)

[White River Valley Electric Cooperative](#)

### **Government programs**

[Efficiency Maine](#)

[Green Homes Network](#)

[Heat Pump Ready Programme](#)

[Home Energy Navigator](#)

[Making the Switch](#)

[NYSERDA Heat Pump Programs](#)

### **Non-governmental organizations**

[Air Source Heat Pump \(ASHP\) Collaborative](#)

[Clean Energy Resource Team \(CERTs\)](#)

[Electrify Everything Minnesota](#)

[Energize Delaware Affordable Multifamily Housing Program](#)

[Finnish Heat Pump Association \(SULPU\)](#)

[HeatSmart Alliance](#)

[Hot Water Solutions](#)

[Love Electric](#)

[Marin Green Home Tour](#)

[NextZero Heat Pump Assessment](#)

[Visit a Heat Pump Near You](#)

### **Private sector activities**

[Airbnb: Sustainable Hosting Program U.S.](#)

[Airbnb: Sustainable Hosting Program U.K.](#)

[Airbnb: Sustainable Hosting Program France](#)

[BodyHeat](#)

[Heat Pump Quote Consultation Services and Guide: Abode](#)

[Heat Pump Quote Consultation Services and Guide: EnergySage](#)

[Heat Pump Quote Consultation Services and Guide: EnergyTrust of Oregon](#)

[Heat Pump Quote Consultation Services and Guide: HVAC.com](#)

[Heat Pump Start-Up Company: BlocPower](#)

[Heat Pump Start-Up Company: Enpal](#)

[Heat Pump Start-Up Company: Heatpumps London](#)

[Heat Pump Start-Up Company: Zero](#)

[Heat Pump Start-Up Company: Dandelion](#)

[Heat Pump Start-Up Company: Elephant Energy](#)

[Heat Pump Start-Up Company: Sealed](#)

[News article of Heat Pump Testimonials](#)

**Programs targeting Disadvantaged/Hard-to-reach communities or multifamily sector**

[Bassett and Avocado Heights, Advanced Energy Community's Advanced Energy Network](#)

[Community Heat Pump Development \(CHPD\) Program](#)

[Cooling Portland](#)

[District of Columbia Sustainable Energy Utility \(DCSEU\) heat pump program](#)

[Energize! Heat Pump Pilot Program](#)

[Maine Housing Heat Pump Program](#)

[MassLandlords](#)

## Appendix A: Repository of program resources by technology characteristic

### Observability

Type of experience	Type of resource	Program name	Program links
Owner experience	Case studies	Love Electric	<a href="https://loveelectric.org/case-study/upgrades-to-existing-home-eagle-co/">https://loveelectric.org/case-study/upgrades-to-existing-home-eagle-co/</a>
Owner experience	Case studies	Marin Green Home Tour	<a href="https://www.maringreenhometour.org/homes">https://www.maringreenhometour.org/homes</a>
Owner experience	Home visits	Visit a Heat Pump Near You	<a href="https://www.visitahheatpump.com/">https://www.visitahheatpump.com/</a>
Owner experience	Landlords' experiences	Energize Delaware Multifamily Affordable Housing Program	<a href="https://www.energizedelaware.org/Residential/Affordable-Multifamily-Housing/">https://www.energizedelaware.org/Residential/Affordable-Multifamily-Housing/</a>
Owner experience	Lawn signs	HeatSmart Alliance	<a href="https://www.canarymedia.com/articles/heat-pumps/heat-pump-coaches-help-neighbors-ditch-fossil-heat-in-massachusetts">https://www.canarymedia.com/articles/heat-pumps/heat-pump-coaches-help-neighbors-ditch-fossil-heat-in-massachusetts</a>
Owner experience	Neighborhood campaign	Heat Pump Ready Programme (Clean Heat Streets)	<a href="https://www.cleanheatstreets.com/">https://www.cleanheatstreets.com/</a>
Owner experience	User testimonials	Efficiency Maine	<a href="https://www.energymaine.com/heat-pump-testimonials/">https://www.energymaine.com/heat-pump-testimonials/</a>
Owner experience	User testimonials	Green Home Networks	<a href="https://greenhomesnetwork.energysavingtrust.org.uk/">https://greenhomesnetwork.energysavingtrust.org.uk/</a>
Owner experience	User testimonials	Home Energy Navigator	<a href="https://homeenergynav.ca/testimonials/">https://homeenergynav.ca/testimonials/</a>
Owner experience	Video homes tours	Marin Green Home Tour	<a href="https://www.youtube.com/watch?v=AOoQna34M4M&amp;t=34s">https://www.youtube.com/watch?v=AOoQna34M4M&amp;t=34s</a>
Owner experience	Video user testimonials	Energize! Heat Pump Pilot Program	<a href="https://www.energizekingcounty.org/event-recordings">https://www.energizekingcounty.org/event-recordings</a>



Owner experience	Video user testimonials	Making the Switch	<a href="https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html">https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html</a>
Costs	Cost comparison to alternative equipment	Making the Switch	<a href="https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html">https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html</a>
Costs	Cost comparison to alternative equipment	White River Valley Electric Cooperative	<a href="https://www.pickhvac.com/central-air-conditioner/seer/savings-calculator/">https://www.pickhvac.com/central-air-conditioner/seer/savings-calculator/</a>
Costs	Cost comparison to electric water heater	Efficiency Maine	<a href="https://www.efficiencymaine.com/at-home/water-heating-cost-comparison/">https://www.efficiencymaine.com/at-home/water-heating-cost-comparison/</a>
Costs	Cost of ownership	PSE&G Long Island	<a href="https://c03.apogee.net/mvc/home/hes/land/el?utilityname=psegliny&amp;spc=hcc">https://c03.apogee.net/mvc/home/hes/land/el?utilityname=psegliny&amp;spc=hcc</a>
Costs	Energy cost and usage calculator	Singing River	<a href="https://c03.apogee.net/mvc/home/hes/profile?utilityname=singingriver">https://c03.apogee.net/mvc/home/hes/profile?utilityname=singingriver</a>
Costs	Heating cost comparison	Efficiency Maine	<a href="https://www.efficiencymaine.com/at-home/heating-cost-comparison/">https://www.efficiencymaine.com/at-home/heating-cost-comparison/</a>
Costs	Operating cost tracker	Singing River's Smarthub mobile app	<a href="https://singingriver.com/smarthub/">https://singingriver.com/smarthub/</a>
Ambassadors	Heat pump coaches	HeatSmart Alliance	<a href="https://heatsmartalliance.org/coaching/">https://heatsmartalliance.org/coaching/</a>
Ambassadors	Heat pump installation counter	Cooling Portland	<a href="https://www.earthadvantage.org/climate-justice/hrp-information.html">https://www.earthadvantage.org/climate-justice/hrp-information.html</a>
Ambassadors	Plumber testimonials	Efficiency Maine heat pump water heater program	<a href="https://www.efficiencymaine.com/docs/EM-HPWH-Plumber-Testimonials.pdf">https://www.efficiencymaine.com/docs/EM-HPWH-Plumber-Testimonials.pdf</a>
Events	Community outreach	Cape Ann Climate Coalition Heat Pump Party	<a href="https://capeannclimatecoalition.org/heat-pump-party-on-october-1-at-1130-am/">https://capeannclimatecoalition.org/heat-pump-party-on-october-1-at-1130-am/</a>

Events	Heat pump parties	Sarah Lazarovic's Heat Pump Party	<a href="https://www.cbc.ca/player/play/2195349571829">https://www.cbc.ca/player/play/2195349571829</a>
Events	Tabling	Advanced Homes	<a href="https://advancedenergycommunity.org/community-stories/">https://advancedenergycommunity.org/community-stories/</a>
Public installation	Dance club	BodyHeat dance club	<a href="https://www.bodyheat.club/">https://www.bodyheat.club/</a>
Public installation	Vacation rentals	Airbnb Sustainable Hosting Program	<a href="https://abodeem.com/Airbnb/">https://abodeem.com/Airbnb/</a> ; <a href="https://www.airbnb.com/e/shp">https://www.airbnb.com/e/shp</a> ; <a href="https://www.effy.fr/presentation-offre/partenariat-airbnb-effy">https://www.effy.fr/presentation-offre/partenariat-airbnb-effy</a>
Media	Newspaper article	Boston Globe article	<a href="https://www.bostonglobe.com/2023/02/08/science/heat-pumps-had-their-first-major-test-last-weekend-heres-how-it-went/">https://www.bostonglobe.com/2023/02/08/science/heat-pumps-had-their-first-major-test-last-weekend-heres-how-it-went/</a>
Media	Newspaper article	Colorado Sun article	<a href="https://coloradosun.com/2023/01/26/heat-pumps-work-colorado/">https://coloradosun.com/2023/01/26/heat-pumps-work-colorado/</a>
Media	Newspaper article	Cooling Portland	<a href="https://www.opb.org/article/2022/06/28/portland-heat-response-program-ac-cooling-units/">https://www.opb.org/article/2022/06/28/portland-heat-response-program-ac-cooling-units/</a>
Media	Social media post of operational heat pumps	Electrify Everything Minnesota	<a href="https://www.tiktok.com/@electrifyeverythingmn/video/725970810790153514">https://www.tiktok.com/@electrifyeverythingmn/video/725970810790153514</a>
Media	Social media post of operational heat pumps	Electrify Everything Minnesota	<a href="https://www.instagram.com/p/CwAoGkJNjms/">https://www.instagram.com/p/CwAoGkJNjms/</a>
Media	Social media post of user interviews	Electrify Everything Minnesota	<a href="https://www.tiktok.com/@electrifyeverythingmn/video/7293159753994521902">https://www.tiktok.com/@electrifyeverythingmn/video/7293159753994521902</a>
Media	Social media post of webinars	Electrify Everything Minnesota	<a href="https://www.tiktok.com/@electrifyeverythingmn/video/7314337042689690910">https://www.tiktok.com/@electrifyeverythingmn/video/7314337042689690910</a>
Media	TV feature	Cooling Portland	<a href="https://www.kptv.com/2023/06/29/cooling-portland-program-provides-thousands-ac-units-vulnerable-community-members/">https://www.kptv.com/2023/06/29/cooling-portland-program-provides-thousands-ac-units-vulnerable-community-members/</a>

Educational resources	Brochure	Comfort Advantage	<a href="https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_bklt_12-2-2015-web-1.pdf">https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_bklt_12-2-2015-web-1.pdf</a>
Educational resources	Community educator	Mr. Heat Pump	<a href="https://wpln.org/post/what-is-a-heat-pump-why-are-they-planet-friendly-and-why-dont-more-americans-have-them/">https://wpln.org/post/what-is-a-heat-pump-why-are-they-planet-friendly-and-why-dont-more-americans-have-them/</a>
Educational resources	Customer questions	Ask Alexis	<a href="https://www.cleanenergyresourceteams.org/ask-alexis">https://www.cleanenergyresourceteams.org/ask-alexis</a>
Educational resources	Explainer video	PSE&G Long Island	<a href="https://youtu.be/2UI3yqUcp9Q">https://youtu.be/2UI3yqUcp9Q</a>
Educational resources	Explainer video (HPWH)	Efficiency Maine	<a href="https://www.energymaine.com/at-home/water-heating-solutions/heat-pump-water-heaters/">https://www.energymaine.com/at-home/water-heating-solutions/heat-pump-water-heaters/</a>
Educational resources	Explainer video (HPWH)	Hot Water Solutions	<a href="https://www.youtube.com/watch?v=f7KeX8bse-0">https://www.youtube.com/watch?v=f7KeX8bse-0</a>
Educational resources	FAQs	Affordable Home Electrification	<a href="https://www.dcseu.com/affordable-home-electrification">https://www.dcseu.com/affordable-home-electrification</a>
Educational resources	FAQs	Efficiency Maine	<a href="https://www.energymaine.com/heat-pumps-faq/">https://www.energymaine.com/heat-pumps-faq/</a>
Educational resources	FAQs	Energize! Heat Pump Pilot Program	<a href="https://www.energizekingcounty.org/faq">https://www.energizekingcounty.org/faq</a>
Educational resources	FAQs	Maine Housing Heat Pump Program	<a href="https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.">https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.</a>
Educational resources	FAQs	Community Heat Pump Development Program	<a href="https://www.earthadvantage.org/climate-justice/community-heat-pump-deployment-program.html">https://www.earthadvantage.org/climate-justice/community-heat-pump-deployment-program.html</a>
Educational resources	Guide to central heat pumps	Home Energy Navigator	<a href="https://homeenergynav.ca/wp-content/uploads/2022/11/HEN_HeatPump_Central_ConsumerGuide_2022_v2.pdf">https://homeenergynav.ca/wp-content/uploads/2022/11/HEN_HeatPump_Central_ConsumerGuide_2022_v2.pdf</a>

Educational resources	Guide to heat pumps in new construction	Singing River Electric	<a href="https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_bklt_12-2-2015-web-1.pdf">https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_bklt_12-2-2015-web-1.pdf</a>
Educational resources	Heat pump 101	Energize! Heat Pump Pilot Program	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Educational resources	Heat pump water heater overview	Efficiency Maine	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Educational resources	Interactive guide of equipment types	WattSmart Homes	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Educational resources	Myths and facts sheet	Efficiency Maine	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Educational resources	Report on heat pumps and HPWHs	Community Heat Pump Development Program	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Educational resources	Repository of HP water heater resources	Efficiency Maine	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Installer resources	Workshops for installers & contractors	County of Ventura Sustainability Division Webinar Series	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>
Installer resources	Customer materials	Community Heat Pump Development Program	<a href="https://www.energysmarteastside.org/learn">https://www.energysmarteastside.org/learn</a>

## Trialability

Type of experience	Type of resource	Program name	Program links
Active exposure	Demonstration house	Educational, Interactive Tiny House (EdITH)	<a href="https://www.les.com/sustainability/educational-interactive-tiny-house">https://www.les.com/sustainability/educational-interactive-tiny-house</a>
Active exposure	Home tour	Visit a Heat Pump Near You	<a href="https://www.visitaheatpump.com/">https://www.visitaheatpump.com/</a>
Passive exposure	Private installations	Airbnb Sustainable Hosting Program	<a href="https://abodeem.com/Airbnb/">https://abodeem.com/Airbnb/</a> ; <a href="https://www.airbnb.com/e/shp">https://www.airbnb.com/e/shp</a> ; <a href="https://www.effy.fr/presentation-offre/partenariat-airbnb-effy">https://www.effy.fr/presentation-offre/partenariat-airbnb-effy</a>
Passive exposure	Public installations	BodyHeat	<a href="https://www.bodyheat.club/">https://www.bodyheat.club/</a>
Virtual interaction	Interactive software	Rocky Mountain Power	<a href="https://wattsmarthomes.com/heat-pump-comfort/">https://wattsmarthomes.com/heat-pump-comfort/</a>
In-home experience	Heat pump rentals	Heat Pump Rental Programs	<a href="#">Saint John Energy</a> , <a href="#">Solidcare Home Improvements</a> , <a href="#">The HVAC Service Solutions</a> , <a href="#">DeMark Home Ontario</a>
In-home experience	Portable heat pumps	Cooling Portland	<a href="https://www.earthadvantage.org/climate-justice/heat-response-program.html">https://www.earthadvantage.org/climate-justice/heat-response-program.html</a>

## Non-energy impacts

Type of experience	Type of resource	Program name	Program links
Descriptions of benefits	Comparison table	NYSERDA	<a href="https://cleanheat.ny.gov/central-air-source-heat-pump-for-a-one-story-home/">https://cleanheat.ny.gov/central-air-source-heat-pump-for-a-one-story-home/</a>
Descriptions of benefits	FAQs	Love Electric	<a href="https://loveelectric.org/common-questions/">https://loveelectric.org/common-questions/</a>
Descriptions of benefits	Program websites	Advanced Homes	<a href="https://advancedenergycommunity.org/features/advanced-energy-homes/">https://advancedenergycommunity.org/features/advanced-energy-homes/</a> , <a href="https://advancedenergycommunity.org/">https://advancedenergycommunity.org/</a>
Descriptions of benefits	Program websites	Affordable Home Electrification: Income-qualified Heat Pump Program	<a href="https://www.dcseu.com/affordable-home-electrification">https://www.dcseu.com/affordable-home-electrification</a>
Descriptions of benefits	Program websites	Community Heat Pump Development Program	<a href="https://www.earthadvantage.org/climate-justice/community-heat-pump-deployment-program.html">https://www.earthadvantage.org/climate-justice/community-heat-pump-deployment-program.html</a>
Descriptions of benefits	Program websites	Cooling Portland	<a href="https://www.earthadvantage.org/climate-justice/hrp-information.html">https://www.earthadvantage.org/climate-justice/hrp-information.html</a>
Descriptions of benefits	Program websites	Dandelion Energy	<a href="https://dandelionenergy.com/how-geothermal-works">https://dandelionenergy.com/how-geothermal-works</a>
Descriptions of benefits	Program websites	Energize! Heat Pump Pilot Program	<a href="https://www.energysmarteastside.org/">https://www.energysmarteastside.org/</a>
Descriptions of benefits	Program websites	Flathead Electric	<a href="https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/residential-rebate-programs/heat-pumps/air-source-heat-pumps/">https://www.flatheadelectric.com/energy-solutions/energy-efficiency-rebate-programs/residential-rebate-programs/heat-pumps/air-source-heat-pumps/</a>
Descriptions of benefits	Program websites	Maine Housing Heat Pump Program	<a href="https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.">https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.</a>
Descriptions of benefits	Program websites	SULPU	<a href="https://www.sulpu.fi/lampopumput/">https://www.sulpu.fi/lampopumput/</a>
Customer reports of benefits	Home visits	Visit a Heat Pump Near You	<a href="https://www.youtube.com/watch?v=zPA-bW_dGDE">https://www.youtube.com/watch?v=zPA-bW_dGDE</a>
Customer reports of benefits	Testimonials	Energize! Heat Pump Pilot Program	<a href="https://www.energizekingcounty.org/event-recordings">https://www.energizekingcounty.org/event-recordings</a>
Customer reports of benefits	Testimonials	Home Energy Navigator	<a href="https://homeenergynav.ca/testimonials/">https://homeenergynav.ca/testimonials/</a>
Customer reports of benefits	Video testimonials	Making the Switch	<a href="https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html">https://www.saanich.ca/EN/main/community/sustainable-saanich/climate-change/climate-friendly-homes/making-the-switch.html</a>
Descriptions of benefits	Comparison table	NYSERDA	<a href="https://cleanheat.ny.gov/central-air-source-heat-pump-for-a-one-story-home/">https://cleanheat.ny.gov/central-air-source-heat-pump-for-a-one-story-home/</a>



## Complexity of installation

Type of experience	Type of resource	Program name	Program links
General heat pump information	Description of equipment types	BlocPower	<a href="https://www.blocpower.io/posts/what-is-an-air-source-heat-pump">https://www.blocpower.io/posts/what-is-an-air-source-heat-pump</a>
General heat pump information	Cost comparisons of equipment options	Home Energy Navigator	<a href="https://homeenergynav.ca/wp-content/uploads/2023/06/Heating_System_Comparison-NaturalGas_vs_HeatPump-Jun2023.pdf">https://homeenergynav.ca/wp-content/uploads/2023/06/Heating_System_Comparison-NaturalGas_vs_HeatPump-Jun2023.pdf</a>
General heat pump information	Preparation for heat pumps	Electrify Everything	<a href="https://www.mncee.org/electrify-everything-mn?get-ready">https://www.mncee.org/electrify-everything-mn?get-ready</a>
General heat pump information	Buyers' guide (HP water heaters)	Hot Water Solutions	<a href="http://hotwatersolutionsnw.org/buyers-guide">http://hotwatersolutionsnw.org/buyers-guide</a>
Heat pump tips	Completing rebate forms	WattSmart Homes	<a href="https://wattsmarthomes.com/rebates/ductless-heat-pumps-ut/">https://wattsmarthomes.com/rebates/ductless-heat-pumps-ut/</a>
Heat pump tips	Heat pump maintenance requirements	Cooling Portland	<a href="https://www.earthadvantage.org/climate-justice/unit-maintenance-protocol.html#Troubleshooting">https://www.earthadvantage.org/climate-justice/unit-maintenance-protocol.html#Troubleshooting</a>
Heat pump tips	Know before you buy information	Home Energy Navigator	<a href="https://homeenergynav.ca/wp-content/uploads/2022/11/HEN-HP-Know_Before_You_Buy-Nov2022.pdf">https://homeenergynav.ca/wp-content/uploads/2022/11/HEN-HP-Know_Before_You_Buy-Nov2022.pdf</a>
Heat pump tips	Installation considerations	Efficiency Maine	<a href="https://www.energymaine.com/at-home/ductless-heat-pump-installation-considerations/">https://www.energymaine.com/at-home/ductless-heat-pump-installation-considerations/</a>
Heat pump tips	Installation considerations (HP water heaters)	Efficiency Maine	<a href="https://www.energymaine.com/at-home/water-heating-solutions/heat-pump-water-heaters/">https://www.energymaine.com/at-home/water-heating-solutions/heat-pump-water-heaters/</a>
Description of the installation process	Heat pump installation planner	NYSERDA	<a href="https://cleanheat.ny.gov/assets/planner/pdf/central-air-source-heat-pump-for-a-one-story-home.pdf">https://cleanheat.ny.gov/assets/planner/pdf/central-air-source-heat-pump-for-a-one-story-home.pdf</a>
Description of the installation process	FAQs	Minnesota ASHP Coalition	<a href="https://www.mnashp.org/homeownerfaq">https://www.mnashp.org/homeownerfaq</a>
Description of the installation process	FAQs	Energize King County	<a href="https://www.energizekingcounty.org/faq">https://www.energizekingcounty.org/faq</a>
Description of the installation process	DIY guide to installing an HPWH (Spanish)	Hot Water Solutions	<a href="https://hotwatersolutionsnw.org/installation/guia-de-instalacion-del-calentador-de-agua-con-bomba-de-calor">https://hotwatersolutionsnw.org/installation/guia-de-instalacion-del-calentador-de-agua-con-bomba-de-calor</a>
Description of the installation process	DIY guide to installing an HPWH (English)	Hot Water Solutions	<a href="http://hotwatersolutionsnw.org/installation/do-it-yourself">http://hotwatersolutionsnw.org/installation/do-it-yourself</a>
Decision support	Personalized upgrade quiz	Touchstone Energy	<a href="https://adventure.touchstoneenergy.com/">https://adventure.touchstoneenergy.com/</a>
Decision support	Interactive tool to determine suitability of HPWH	Hot Water Solutions	<a href="https://hotwatersolutionsnw.org/is-it-right-for-you">https://hotwatersolutionsnw.org/is-it-right-for-you</a>
Decision support	Rebate pre-approval form	Flathead Electric Coop	<a href="https://www.flatheadelectric.com/wp-content/uploads/HomeownerHeatPump_Pre-">https://www.flatheadelectric.com/wp-content/uploads/HomeownerHeatPump_Pre-</a>

			<a href="#">Approval_Form.pdf</a>
Decision support	Rebate pre-authorization form	Lane Electric	<a href="https://laneelectric.com/wp-content/uploads/0-Regular-DHP-Packet-9.pdf">https://laneelectric.com/wp-content/uploads/0-Regular-DHP-Packet-9.pdf</a>
Customized advice and support	Heat pump coaches	HeatSmart Alliance	<a href="https://heatsmartalliance.org/coaching/">https://heatsmartalliance.org/coaching/</a>
Customized advice and support	Heat pump coaching model	HeatSmart Alliance	<a href="https://heatsmartalliance.org/coaching-model/">https://heatsmartalliance.org/coaching-model/</a>
Customized advice and support	Heat pump coaching tools	HeatSmart Alliance	<a href="https://heatsmartalliance.org/coaching-tools/">https://heatsmartalliance.org/coaching-tools/</a>
Customized advice and support	Heat pump coaching principles	HeatSmart Alliance	<a href="https://heatsmartalliance.org/coaching-principles/">https://heatsmartalliance.org/coaching-principles/</a>
Customized advice and support	Home Assessment & Installation Plan	NextZero Heat Pump Assessment	<a href="https://nextzero.org/west-boylston/heating-cooling/heat-pump-assessment/">https://nextzero.org/west-boylston/heating-cooling/heat-pump-assessment/</a>
Customized advice and support	Home visit hosts	Energy Saving Trust	<a href="https://energysavingtrust.org.uk/tool/green-homes-network/">https://energysavingtrust.org.uk/tool/green-homes-network/</a>
Customized advice and support	Home visit hosts	Visit a Heat Pump Near You	<a href="https://www.visitaheatpump.com/">https://www.visitaheatpump.com/</a>
Customized advice and support	Program personnel	Home Energy Navigator	<a href="https://homeenergynav.ca/retrofit-roadmap/">https://homeenergynav.ca/retrofit-roadmap/</a>
Customized advice and support	Program personnel	Flathead Electric Coop	<a href="https://www.flatheadelectric.com/meet-your-energy-advisors/">https://www.flatheadelectric.com/meet-your-energy-advisors/</a>
Customized advice and support	Program personnel	Home Energy Navigator	<a href="https://homeenergynav.ca/">https://homeenergynav.ca/</a>
Customized advice and support	Program personnel	Maine Housing Heat Pump Program	<a href="https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.">https://www.mainehousing.org/programs-services/energy/energydetails/heat-pump-program#:~:text=MaineHousing%27s%20heat%20pump%20program%20pays,used%20in%20the%20correct%20way.</a>
Customized advice and support	Program personnel	Energize King County	<a href="https://www.energizekingcounty.org/howitworks">https://www.energizekingcounty.org/howitworks</a>
Customized advice and support	Program personnel	Affordable Home Electrification: Income-qualified Heat Pump Program	<a href="https://www.dcseu.com/affordable-home-electrification">https://www.dcseu.com/affordable-home-electrification</a>
Customized advice and support	Personalized summary of energy usage	National Grid Heat Pump Education Campaign	<a href="https://blogs.oracle.com/utilities/post/national-grid-removes-a-big-barrier-to-heat-pump-adoption">https://blogs.oracle.com/utilities/post/national-grid-removes-a-big-barrier-to-heat-pump-adoption</a>
Customized advice and support	Personalized audit and quote design	Zero	<a href="https://www.zerohomes.io/install#process">https://www.zerohomes.io/install#process</a>
Streamlined platforms to compile and submit information	Virtual home assessment	Heat Pump Ready Programme	<a href="https://www.heatpumpready.org.uk/projects/optimised-solutions-development/accelerating-the-heat-pump-journey/">https://www.heatpumpready.org.uk/projects/optimised-solutions-development/accelerating-the-heat-pump-journey/</a>

Streamlined platforms to compile and submit information	Virtual home assessment	White River Valley Electric Cooperative	<a href="https://adventure.touchstoneenergy.com/">https://adventure.touchstoneenergy.com/</a>
Contractor selection	Guide to reviewing contractor quotes	Energy Trust	<a href="https://www.energytrust.org/tips/how-to-read-a-heat-pump-contractor-bid/">https://www.energytrust.org/tips/how-to-read-a-heat-pump-contractor-bid/</a>
Contractor selection	Guide to comparing contractor quotes	Energy Sage	<a href="https://www.energysage.com/heat-pumps/how-to-compare-heat-pump-quotes/">https://www.energysage.com/heat-pumps/how-to-compare-heat-pump-quotes/</a>
Contractor selection	Expert quote comparisons	HVAC.com QuoteScore	<a href="https://www.hvac.com/quotescore/flow/">https://www.hvac.com/quotescore/flow/</a>
Contractor selection	Contractor Selection Report	Home Energy Navigator	<a href="https://homeenergynav.ca/retrofit-roadmap/">https://homeenergynav.ca/retrofit-roadmap/</a>
Contractor selection	Quote Comparison Report	Home Energy Navigator	<a href="https://homeenergynav.ca/retrofit-roadmap/">https://homeenergynav.ca/retrofit-roadmap/</a>
Contractor selection	List of questions to ask contractors and their references	Love Electric	<a href="https://loveelectric.org/installation-resources/">https://loveelectric.org/installation-resources/</a>
Contractor selection	Contractor question list	Efficiency Maine	<a href="https://www.energymaine.com/docs/Questions-to-ask-a-rv.pdf">https://www.energymaine.com/docs/Questions-to-ask-a-rv.pdf</a>
Equipment selection	Heat load estimator tool	Efficiency Maine	<a href="https://www.energymaine.com/estimate-your-homes-heating-needs/">https://www.energymaine.com/estimate-your-homes-heating-needs/</a>
Equipment selection	Heat load analysis tool	HeatSmart Alliance	<a href="https://heatsmartalliance.org/heat-load-analysis/">https://heatsmartalliance.org/heat-load-analysis/</a>
Equipment selection	Equipment sizing	Singing River Electric Coop	<a href="https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_broch_11_24_2015_nocrops-web-1.pdf">https://singingriver.com/wp-content/uploads/2018/01/smepa_ca_broch_11_24_2015_nocrops-web-1.pdf</a>
Equipment selection	Equipment selection guide	Hot Water Solutions	<a href="https://hotwatersolutionsnw.org/buyers-guide">https://hotwatersolutionsnw.org/buyers-guide</a>
Equipment selection	Equipment selection consultation	Flathead Electric Coop	<a href="https://www.flatheadelectric.com/meet-your-energy-advisors/">https://www.flatheadelectric.com/meet-your-energy-advisors/</a>
Procurement	Online marketplace	Energy Sage	<a href="https://www.energysage.com/about-us/company/">https://www.energysage.com/about-us/company/</a>
Installation tips	Best practices installation guide	Clean Energy Resource Teams	<a href="https://www.mnashp.org/s/ASHP-Install-Guide-FINAL_V3-gfji.pdf">https://www.mnashp.org/s/ASHP-Install-Guide-FINAL_V3-gfji.pdf</a>
One-stop shop services	Multifamily building owners	Energize Delaware Affordable Multifamily Housing Program	<a href="https://www.energizedelaware.org/Residential/Affordable-Multifamily-Housing/">https://www.energizedelaware.org/Residential/Affordable-Multifamily-Housing/</a>
One-stop shop services	Single-family residential heat pump customers	Home Energy Navigator	<a href="https://homeenergynav.ca/retrofit-roadmap/">https://homeenergynav.ca/retrofit-roadmap/</a>
Equipment selection	Heat load estimator tool	Efficiency Maine	<a href="https://www.energymaine.com/estimate-your-homes-heating-needs/">https://www.energymaine.com/estimate-your-homes-heating-needs/</a>