BIENNIAL OREGON HEAT PUMP REPORT

Submitted to the

OREGON LEGISLATURE

by the

OREGON DEPARTMENT OF ENERGY

September 15, 2025

This report has been prepared by the Oregon Department of Energy for submission to the Oregon Legislature according to the requirements of House Bill 3409 (2023). ODOE's objective with this report was to identify and analyze key barriers and opportunities affecting the adoption of heat pumps in Oregon residential and commercial sectors to inform the Legislature of the current state of the heat pump industry.

ACKNOWLEDGEMENTS

Oregon Department of Energy Project Team

- David Hutchinson, Energy Policy Analyst: heat pump reporting and analytics
- Bailey Harris, GIS Analyst
- Andy Cameron, Energy Efficiency & Conservation Manager

Consulting Partners

The following agencies, organizations, and consulting firms were key partners in understanding the barriers and challenges facing the heating/cooling industry in Oregon. Each participant provided essential industry data that was instrumental in developing this report, and their contributions provided greater understanding of the heat pump industry as a whole.

- Earth Advantage
- Central Electric Cooperative
- Community Energy Project
- Idaho Power
- Energy Trust of Oregon
- Verde
- Umatilla Electric Cooperative
- Northwest Energy Efficiency Alliance (NEEA)
- Bonneville Power Administration (BPA)

TABLE OF CONTENTS

EXECUTIVE SUMMARY

As reported in the Oregon Department of Energy's 2024 Biennial Energy Report, energy consumption in residential and commercial buildings accounted for 34 percent of annual greenhouse gas emissions in Oregon in 2021. In an average residence, 64 percent of a building's energy use is dedicated to heating and cooling needs, making building HVAC efficiency an essential step toward reducing carbon emissions.

Heat pumps represent an energy efficient and increasingly cost-effective solution for reducing carbon emissions in residential heating and cooling applications. According to a recent national study, these systems have the potential to yield an average total energy savings of 31 to 47 percent, depending on the efficiency of the installed heat pump, and 41 to 52 percent when combined with building upgrades such as better insulation.[1] For the 49 million homes analyzed in the study that use electricity, fuel oil, or propane for heat and have air conditioning, 92 percent to 100 percent of homes would see energy bill savings, with median savings of $300 to $650 a year depending on heat pump efficiency.[1] In homes currently heated with natural gas that have existing AC systems, savings vary widely depending on the performance of the installed heat pump, with 38 to 99 percent of consumers seeing median energy bill savings of $70 to $380 per year. In homes currently heated with natural gas that do not have existing AC systems, 5 to 58 percent of consumers see median bill savings up to $40 per year *or* additional costs of up to $410.[2(p. 9)]

A correctly sized and installed heat pump can deliver a reduction in annual metric tons of carbon dioxide equivalent (MTCO2e) emissions of 36 to 64 percent per dwelling, a savings of 2.5-4.4 MT/year. Full heat pump adoption in all buildings and dwellings in Oregon would deliver an estimated reduction of approximately 4,546,500 to 8,001,800 MTC02e per year,[3] the equivalent of removing about 988,400 to 1,739,500 passenger vehicles from the road, or about 30 to 50 percent of the current total number of passenger vehicles in Oregon.[4]

State of the Heat Pump Industry

Market Value

Determining the market value of the heat pump industry is difficult because the total number of heat pump installations in the state is unknown. At this time, it is unlikely that an accurate valuation can be made without requiring the reporting of sales and installation data by installers.

Market Share and Rate of Adoption

Heat pumps are growing in popularity. Data shows that heat pumps currently occupy a significant share of the heating and cooling market in the residential and commercial sectors. ODOE developed a model for this study and found that heat pumps will occupy a total market share of approximately 25 percent (about 458,500 heat pump systems in use) by December 31, 2025. Additionally, ODOE projects an approximate yearly market share increase of about 3 percent (about 50,700 new heat pump installations per year) across the residential and commercial sectors.

State Goal

In June 2023, the Oregon Legislature passed House Bill 3409, setting a statewide goal of at least 500,000 new residential or commercial heat pumps by 2030. Modeling shows that by December 31, 2025, Oregon will have increased the total number heat pumps by around 121,700 installations. At the estimated rate of growth of 50,700 per year, it is estimated that Oregon will achieve the statewide goal of 500,000 new heat pump installations by about mid-2033.

Barriers to Heat Pump Adoption (Financial)

Cost of Installation

According to Energy Trust of Oregon installation cost data, residential single family heat pump installation costs can vary from an average of $9,000 to $11,000 depending on the efficiency and size of the installed unit. When compared to the expected installation costs of a traditional system (i.e., gas furnace, electric resistance etc.), installation of a heat pump system presents an increase in overall project costs of 57.7 percent (average cost increase of a heat pump installation). This can be a barrier to heat pump adoption, especially among low-income households.[5]

Poor Building Envelope Condition

Buildings with low-quality or not enough insulation, old or inefficient windows and doors, or poor air tightness will not realize the greatest energy and bill savings potential with a new heat pump. In addition, there may be costs to make necessary envelope improvements to prepare a home for heat pump installation, such as improvements/alterations to existing ductwork, insulation of existing ductwork, changes to electrical systems, or other related improvements.

Barriers to Heat Pump Adoption (Non-financial)

Understanding Heat Pump Technology

Because the technology is relatively new to the marketplace, homeowners may not understand how a heat pump works or how it differs from traditional heating and cooling systems, even after receiving an explanation from a qualified installer. This may make homeowners reluctant to adopt the more energy efficient technology.

Heat pump knowledge may also be a barrier among installers and architects. For professionals, it can be difficult to keep pace with new developments in heat pump technology as installers are required to update their skills and knowledge continuously to stay current with new systems. Additionally, contractors may encounter barriers in their day-to-day operations that can negatively affect their views of heat pump technologies. Higher up-front cost and incentive complexity, negative customer feedback due to perceived bill increases or comfort issues, unfamiliarity with newer heat pump systems, and longer installation times may influence installer perception of heat pump systems.[6]

Workforce and Skill Issues

Shortages in qualified technicians can result in increased costs, as well as higher risk of poor-quality installations as homeowners turn to contractors who are less familiar and lack training on heat pump technology. Installers who do not have experience with heat pump technology may also charge higher prices to cover the risk of working with unfamiliar equipment. Additionally, the ongoing development of new technologies, such as variable speed compressor systems, have more complex installation requirements and controls, requiring additional training to ensure quality installation.

This complete report is available online: https://www.oregon.gov/energy/Data-and-Reports/Pages/Reports-to-the-Legislature.aspx

INTRODUCTION

Study Background

HB 3409 directed the Oregon Department of Energy to evaluate the adoption of heat pump technologies in the state and generate a biennial report for the Legislature that includes:

- An analysis on the nature and state of the market for heat pump technologies, including the size and value of the market and variety of available technologies and appliances.
- An analysis of the financial and non-financial barriers preventing the adoption of heat pump technologies by residents of the state.
- An assessment of the state's progress in achieving its goal of 500,000 additional heat pump installations by 2030.
- An estimated date of when the state will accomplish its goal.

Study Process

Oregon does not currently have a singular data source for heat pump installation data. ODOE relied on the expertise of consulting partners and industry leaders to understand Oregon's heat pump landscape (see Acknowledgements, p. i). For the legislative directives listed above, this report provides insights based on the data and analysis with consulting partners. Specifically for the directive to assess the state's progress in achieving its goal of 5000,000 heat pump installations by 2030, ODOE has analyzed market trends from multiple views of the heat pump industry and built a model that allowed the agency to estimate the current number and forecast future heat pump installations for the purpose of determining Oregon's progress toward state goals.

Community Engagement

ODOE endeavored to consult with some of the primary partners in the heat pump industry. This was accomplished by identifying entities actively engaged in heat pump installations, incentives, initiatives, or programs and inviting them to participate as consulting partners. Consulting partners collected targeted data from the field to provide an accurate representation of the industry while incorporating expert experience and perspectives. ODOE also welcomed written feedback from partners on the key factors affecting the heat pump industry.

ODOE held a public webinar in October 2024 to provide details on the proposed project plan, scope, data collection plan, and timeline for this report. The public was encouraged to provide feedback on current and future project plans and their comments were considered in the study and report.

Data Limitations

The data available to ODOE to conduct this study were limited. Data was provided by consulting partners and through the U.S. Energy Information Administration's Residential Energy Consumption Survey data. While the goal was to collect comprehensive data of the entire state of Oregon, available data is more readily available in central and western Oregon. ODOE relied on multiple sources of data collected for varied purposes of consulting partners. Some of the individual datasets lacked important factors necessary for analysis or aggregated data too broadly. However, ODOE was able to use these different datasets to compile sufficient information to develop this report and reasonable estimates to forecast progress on the 500,000 heat pump state goal in a model. The data limitations that currently exist should be taken into consideration when reading the results of this analysis. ODOE will be working to gather more relevant information that should make future iterations of this report more robust.

HEAT PUMP TECHNOLOGY TRENDS IN OREGON

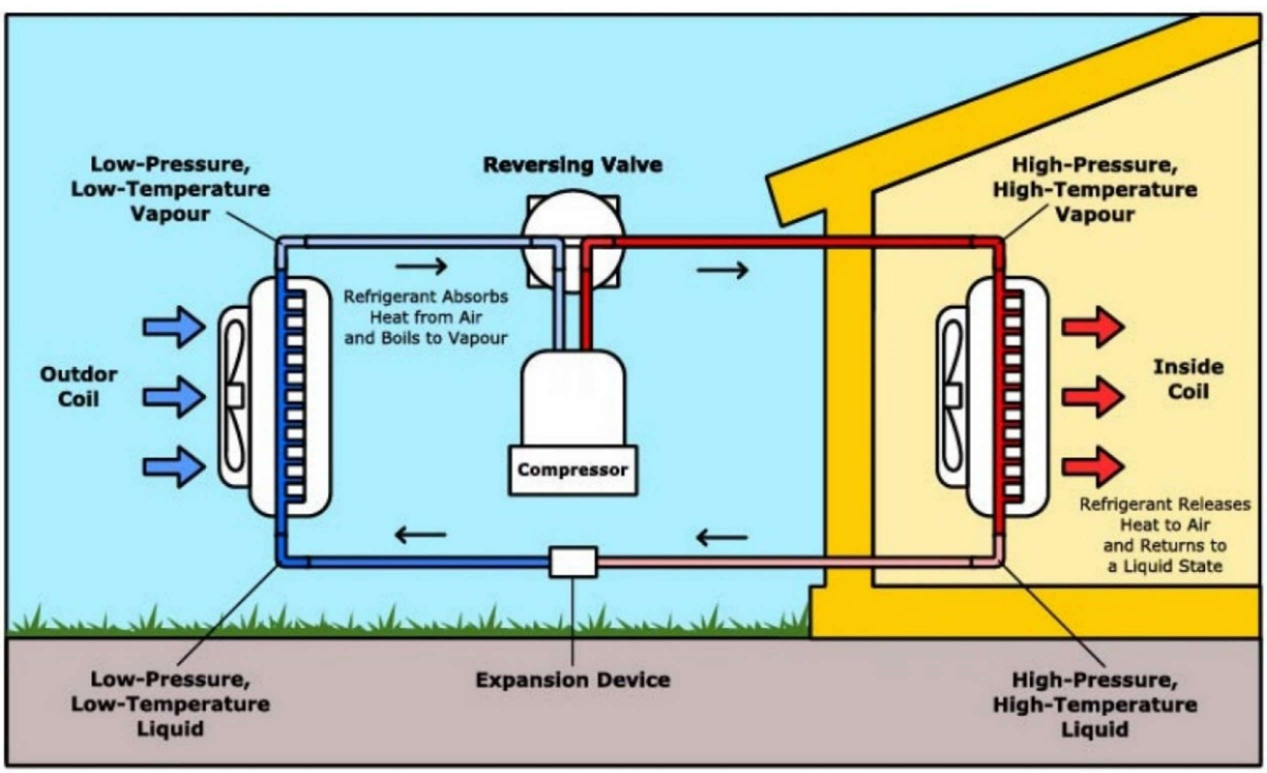
Heat Pump Technology in Oregon

Heat Pump systems can be highly energy-efficient, offer long-term cost savings on utility bills, provide both heating and cooling to improve home safety, improve indoor air quality by eliminating the risk of carbon monoxide from gas combustion, and be a cost-effective alternative to purchasing separate furnace and air conditioner units. Building heating and cooling needs represent one of the largest contributing factors in greenhouse gases in the residential sector. This national trend is reflected in Oregon where heating and cooling accounts for 34 percent of C02 emissions.[7(p. 1)] Electrification through heat pump adoption is a critical step in achieving decarbonization goals while meeting the cooling needs of Oregon residents, as identified by the Oregon Cooling Needs Study. For the purpose of this study of heat pump technology in Oregon, ODOE chose to focus on the most common heat pump technologies used in the state according to available data.

Air-Source Heat Pumps

Air-to-air and air-to-water air-source heat pumps provide an efficient means of delivering heating and cooling to residential and commercial dwellings and are the most commonly installed heat pump system in single family dwellings in Oregon (and 95.27 percent of Energy Trust installations).

Figure 1: Air-Source Heat Pump Heating Cycle[8]

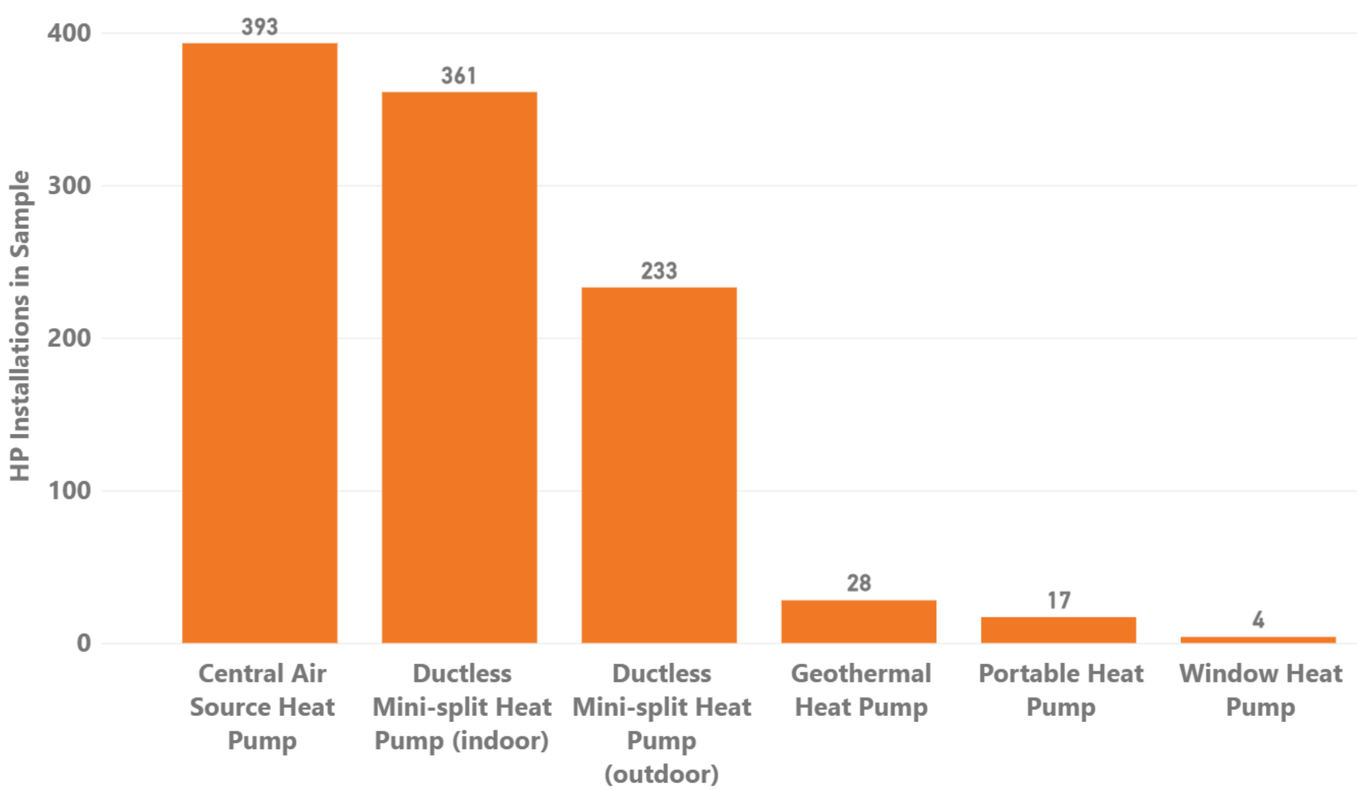


As shown by the figure above, ASHPs operate by capturing and transferring environmental heat from the air and moving it into or out of the conditioned space within a building, depending on the type of conditioning required. When heating a home, an ASHP extracts existing environmental heat from the outdoors using liquid refrigerant and pulls it indoors where the liquid is compressed and then heat is released into the living space. When cooling is needed, a reversing valve changes the direction of system flow and the process is reversed, drawing heat from indoors and releasing it outside the building as waste heat.[8]

ASHPs can deliver substantial energy savings to consumers in most scenarios. Even when installed in an older home with poor building envelope condition, a correctly sized and installed ASHP can deliver energy bill savings regardless of ASHP efficiency level. Improvements in ASHP technology such as variable speed heat pumps, continue to improve overall efficiency and increase bill savings as manufactures continue building upon these systems.

By using an existing heat source readily available in the air, ASHPs are the most easily installed and therefore common heat pump systems currently on the market and are an excellent tool for residential and commercial electrification. ASHP systems, as described below, can vary depending on the needs of the building. In Oregon, central air source heat pumps and ductless heat pump systems account for the majority of all ASHP installations. As seen in Figure 2, central air source heat pumps and ductless heat pumps represent a majority of total installations when compared to alternate heat pump systems.

Figure 2: Breakdown of Single Family Residential Heat Pumps by Type in the Northwest[9]



The installation numbers in Figure 2 represent a portion of existing heat pump systems reported in the 2022 Residential Building Stock Assessment. From this report, 1,036 heat pump equipment units installed in existing homes were analyzed to determine system popularity in the Northwest. The purpose of this visualization is to provide a regional snapshot of heat pump system popularity in the housing stock and is not intended to represent total market share in Oregon. Mini-split systems are traditionally installed as a single system, with the outdoor heat pump unit as the primary heating and cooling system. These units are often sold separately and can be mixed and matched so that one outdoor unit supplies conditioned air to multiple indoor units, resulting in indoor and outdoor unit counts reported separately.

Central Air Source Heat Pumps (Ducted Heat Pump). Central air source heat pumps, also referred to as ducted heat pumps, are the most common type of installation in Oregon. Ducted heat pumps use ventilation ducts within a building. The indoor heat pump unit replaces or supplements a traditional electric or fossil fuel furnace and works in tandem with an outdoor unit, an external heat exchanger. Ducted heat pumps are ideal for homes with preexisting ducted heating and cooling systems as they can be installed within that existing infrastructure. While more efficient than traditional systems, the use of ductwork to transport conditioned air results in lower overall system efficiency due to energy loss during transit. This can be reduced by insulating ductwork, but using air to transport heat is still less efficient that using refrigerants/other liquids

Ductless Heat Pumps (Mini-Split). Ductless heat pumps, also referred to as mini-split heat pumps, require minimal construction during installation and are an effective choice for apartments, additions, or small homes without pre-existing ductwork. Mini-splits consist of an outdoor compressor/condenser and an indoor air-handling unit (thus the “split”) that allows for zoned heating and cooling of living spaces and they tend to be smaller than ducted heat pumps (thus the “mini”). System efficiency can vary depending on the quality of the unit being installed; however, many models can support up to four indoor air-handling units connected to one outdoor unit. Mini-split systems also benefit from their lack of ductwork by reducing the heat loss associated with central forced air ducted systems (sometimes as high as 30 percent), because the heat is exchanged at the end of the system loop in the room, as opposed to heated air being transported through ductwork. While not always the final installed system, according to a 2021 survey, 96 percent of HVAC installation companies in the Northwest reported installing ductless systems, and multiple Northwest distributors won top national accolades from their manufacturing partners for top sales performance.[10]

Hybrid Heat Pumps (Dual Fuel). Hybrid, or dual fuel heat pumps, combine the efficiency of a heat pump with the heat output of a gas furnace. This allows the heat pump to handle the majority of heating needs during milder winters while providing additional furnace support during colder temperatures.[8] Available data on current trends in hybrid heat pump adoption rates is limited; however, NEEA is currently engaged in providing insight into this technology through its research into dual fuel and gas heat pumps, and has convened two [dual-fuel work groups](https://) to coordinate regional efforts with this technology.

Packaged Terminal Heat Pumps. Packaged terminal heat pumps (PTHPs) are a self-contained heat pump system that can be used to heat and cool living spaces. PTHPs are excellent replacements for through-wall AC units and provide affordable energy efficient heating and cooling for hotels, dormitories, and multifamily buildings. While local data remains limited, PTHPs are growing in popularity with an expected annual growth rate of 6.8 percent.[11]

Geothermal Heat Pumps

Geothermal heat pumps (GHPs), or ground source heat pumps (GSHP), use the consistent temperature of the earth to exchange thermal energy from underground, providing consistent heating and cooling. Ground temperature is stable throughout the year, resulting in cooler temperatures during the summer, and warmer temperatures during winter. GHPs take advantage of the constant subsurface temperatures to provide low energy heating and cooling by exchanging heat through a ground heat exchanger. Due to heavy construction requirements, installation costs of a GHP can be several times greater than a standard heat pump system; however, this cost is often offset due to low operating costs and long system life expectancy.[12] GHPs represent only 2.7 percent of the current installations.

Thermal Energy Networks (TENs) can use ground-source heat pumps to provide heating and cooling to connected buildings by harnessing thermal energy and transferring it throughout the shared network. The potential for energy efficient, networked heating and cooling can provide communities with more localized and reliable energy efficient solutions. [13]

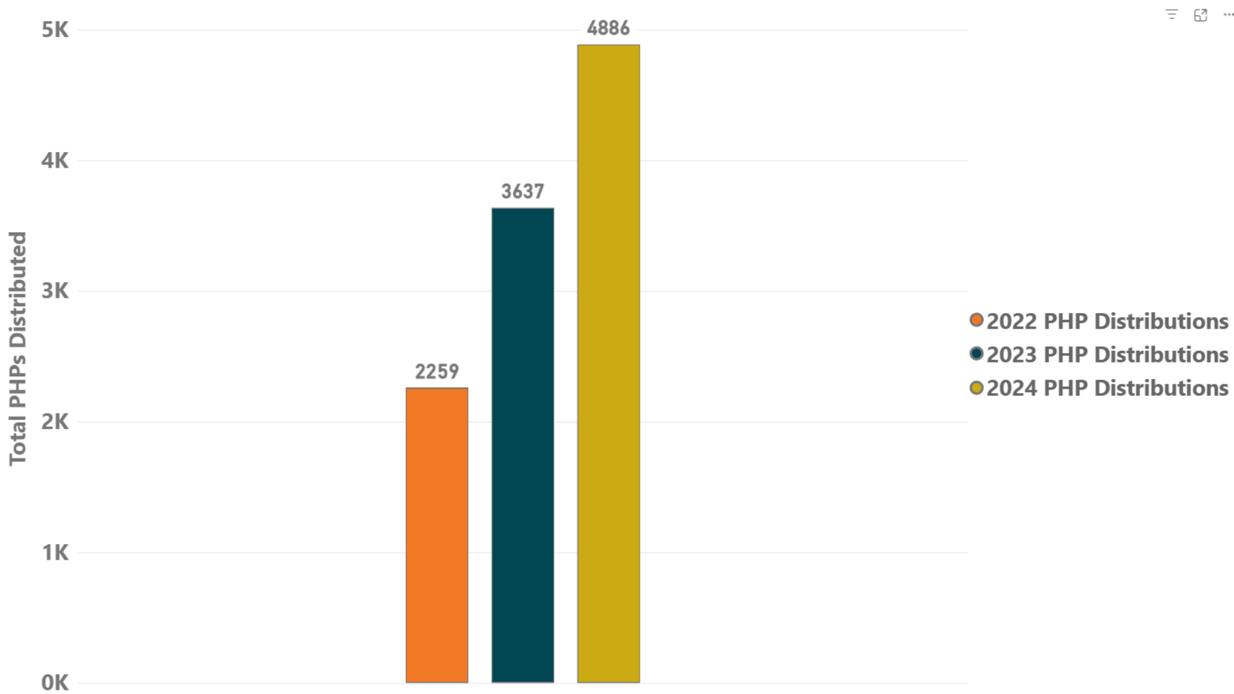
Alternative Heat Pump Technologies

While ASHPs represent the largest market share of heat pump technologies and are the primary focus of this study and state installation goals, additional technologies also provide benefit to Oregon residents. Non-permanent heat pump solutions are rising in popularity among Oregon residents. ODOE's consulting partners report an ever-increasing demand for portable heat pumps (PHPs), specifically among low-income and vulnerable residents unable to afford the higher cost of permanent installations.

Portable Heat Pump Systems (PHPs). Portable heat pumps are compact devices that are easily moved throughout the home to provide heating and cooling where it is needed. PHPs are commonly used in homes where permanent installation is not an immediate option; this can be due to the high cost of standard heat pump installations or other restrictive factors in the home. PHPs make up only 1.64 percent of installed heat pumps. Additionally, PHPs are more energy efficient than traditional space heaters or direct electric heating systems and can reduce energy consumption when used as a replacement. However, PHPs are limited by their capacity, require access to operable windows not designated for egress, and are not suitable for large spaces. This requires the use of multiple PHP units to provide more comprehensive heating and cooling. PHPs also require available floor space near their place of installation, which can be a barrier in residences with small or restrictive floor plans. According to ODOE's partners, demand for PHP systems among low-income and vulnerable residents is increasing at a significant pace.

> **"Portable heat pumps can be a life-saving measure for the communities most vulnerable to extreme heat, particularly those who can't afford or aren't permitted to install whole-home systems. We've heard over and over from individuals and families who rely on these heat pumps for essential relief, comfort, and peace of mind."**
>
> **– Earth Advantage**

Figure 3: Earth Advantage's Portable Heat Pump Distribution by Year



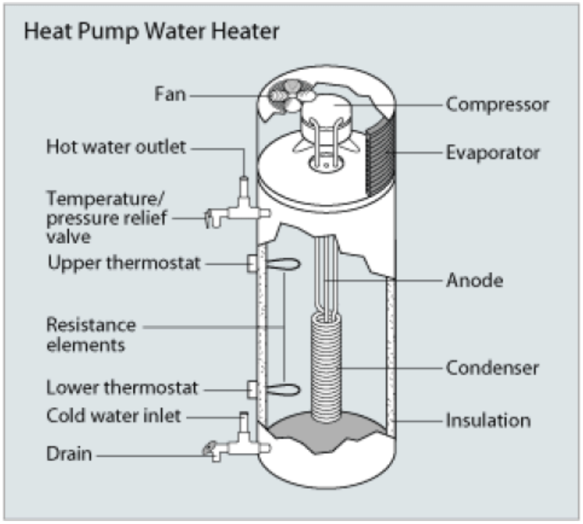
Data provided by Earth Advantage's PHP programs show year-over-year increases in demand for income-based PHP incentives as residents seek new ways to provide essential cooling to their homes while reducing the impact to their energy bills. Extreme heat is an increasingly pressing issue for the health and safety of Oregonians, and for residents unable to install permanent systems, PHPs are an increasingly sought out solution for delivering life-saving cooling.

Window Heat Pumps. Window-mounted heat pumps (WHPs) are self-contained heating and cooling units installed in a window or wall opening. WHPs are commonly used in apartment buildings or structures without central heating and cooling systems, or where permanent installation is not possible due to cost or building restrictions. Operation and use of WHPs are similar to standard window AC units and are capable of delivering energy efficient heating and cooling. WHPs can save space as their placement does not take up floor space that would be needed for a PHP unit. Like PHPs, window heat pumps are capacity restricted, require access to operable windows not designated for egress, and not suitable for large spaces. Air tightness and proper insulation will also affect unit efficiency.

Heat Pump Water Heaters. Heat pump water heaters use heat pump technology to heat water rather than a traditional direct fossil fuel or electric boiler. Rather than generating heat directly, heat pump water heaters use available heat in the surrounding air to provide hot water to buildings.

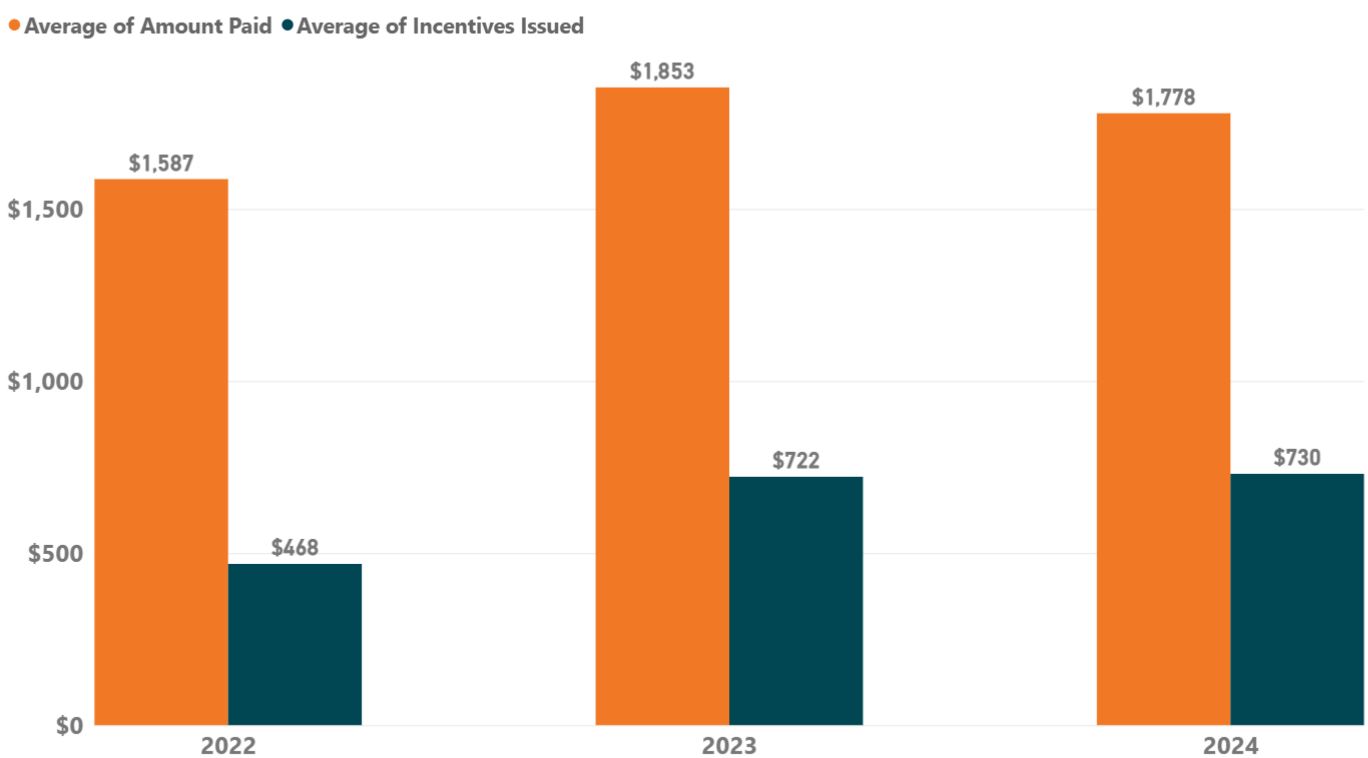
To operate efficiently, heat pump water heaters should be installed in locations that remain above 40˚ F (4.4˚C) year-round and provide at least 1,000 cubic feet (28.3 cubic meters) of air space around the water heater.[14] This makes heat pump water heaters ideal for installation in spaces with excess heat, such as a furnace room, as use of available waste heat will increase their efficiency and capture lost energy. Additionally, while they are recommended to operate in larger spaces, new data suggests that this requirement can be lessened through the use of passive or active ventilation. Proper ventilation systems allow heat pump water heaters to exchange the air within their immediate area and provide effective water heating in smaller spaces.[15]

Figure 4: Heat Pump Water Heater Diagram[14]



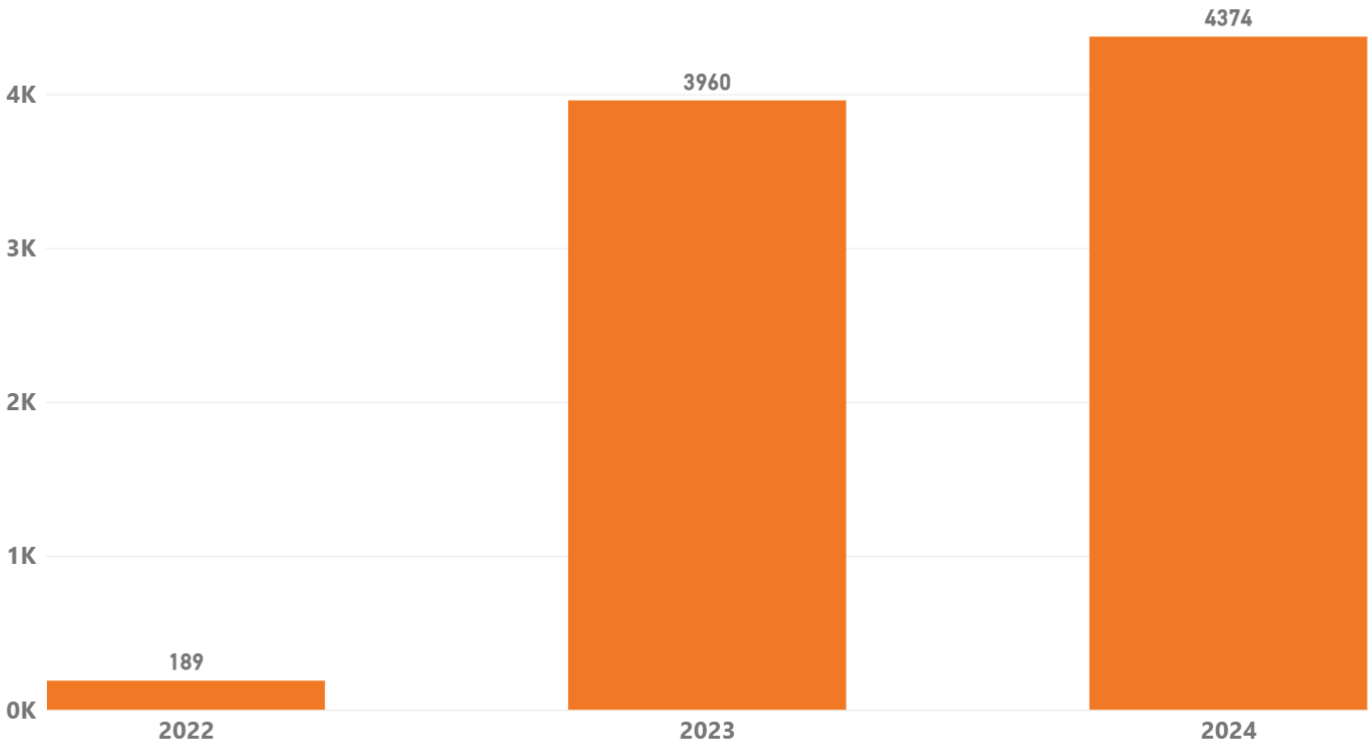
The overall cost of installation for heat pump water heaters is relatively low when compared with air source heat pump heating and cooling systems. Energy Trust of Oregon incentive data reports an average installation cost between $1,500 and $1,900. This cost can vary depending on the size of the project and overall efficiency of the unit being installed, with larger, more efficient systems exceeding the reported average. However, when compared with expected cost of installation of a traditional gas or electric water heater of $800 - $1,800, heat pump water heaters remain relatively competitive in the current market, especially when supported through incentives.[16] A 2022 study by NEEA found that homeowners are willing to pay between $1,350 and $1,500 for an efficient heat pump water heater, indicating these units are considered desirable even at that higher price point.[17]

Figure 5: Average Cost of Heat Pump Water Heater Installation and Average Incentive Issued by Energy Trust of Oregon by Year



Energy Trust incentive uptake among Oregon residents indicates an increase in demand as demonstrated in Figure 6. This upward trend is also reflected in a recent study by NEEA that found heat pump water heater market share increasing from around 8 percent in 2018, 10 percent in 2019, and 12 percent in 2020.[18(p. 37)] It is clear that adoption is rising steadily in the state and will likely continue to do so as Oregon residents look for new, affordable ways to reduce their home energy bills.

Figure 6: Heat Pump Water Heater Installations Supported by Energy Trust of Oregon by Year



Heat Pump Efficiency Data

There are many factors that can influence the final expected efficiency of a heat pump system. The most common influencers are building envelope age and condition, quality of insulation, air tightness, proper sizing and installation of the heat pump unit, and correct set up and use of system controls.

Each of these factors can affect, either positively or negatively, the final efficiency delivered by the heat pump system.

Energy Savings

Even with variables associated with heat pump installations, energy savings can be expected regardless of heat pump efficiency levels. According to a recent study by Lawrence Berkely National Laboratory and the National Renewable Energy Laboratory, heat pumps have the potential to cut home site energy use by 31 to 47 percent, depending on the efficiency of the installed heat pump, and 41 to 52 percent when combined with building upgrades such as better insulation.[1] For the 49 million homes analyzed in the study that use electricity, fuel oil, or propane for heat and have air conditioning, 92 percent to 100 percent of homes would see energy bill savings, with median savings of $300 to $650 a year depending on heat pump efficiency. Overall savings are lower, however, in homes or buildings that do not have preexisting air conditioning systems, as the introduction of additional cooling load during warmer periods would increase overall building energy use, offsetting some of the energy savings. For the 6 million homes in the study that use electricity, fuel oil, or propane without pre-existing AC use, the percentage of residents that see total energy consumption savings would be reduced to 73 to 86 percent.[2(p. 9)] In Oregon, natural gas and electric are the most commonly used heating fuels and these results are not applicable to buildings that primarily heat with natural gas.

In homes currently heated with natural gas that have existing AC systems, savings vary strongly depending on the performance of the installed heat pump, with 38 percent to 99 percent of consumers seeing median energy bill savings of $70 - $380 per year. In homes currently heated with natural gas that do not have existing AC systems, 5 percent to 58 percent of consumers see median bill savings up to $40 per year *or* additional costs of up to $410.

A home with a minimally efficient air source heat pump and no improvements to building envelope and insulation can expect to see a reduction in total energy consumption of 31 to 47 percent. This translates to an estimated reduction in metric tons of annual carbon dioxide equivalent ($MTC0_2e$) of 2.5 metric tons per household per year depending on the type of ASHP and factors within the grid. Overall energy savings improve significantly as ASHP efficiency increases and steps are taken to address inefficiencies in the building envelope. In a scenario where a high-efficiency cold climate ASHP is installed alongside building envelope upgrades, energy consumption is reduced by an average of 41 to 52 percent, and carbon emissions reduced by up to 4.4 $MTC0_2e$ per household.[2(p. 5,6)] It is important to note, however, that heat pump efficiency data can vary depending on the type of study conducted. The data collected by NREL, while comprehensive, is a single study that provides a potential range of energy savings data representative of national averages.

Regional data analysis contracted by the Northwest Power and Conservation Council highlights that achieving potential savings with heat pump installations in the Pacific Northwest is challenging and has been complicated by many factors including inconsistent sizing, installation and set up among contractors, gaps in consumer education, and reliance on inefficient back-up electric resistance heat. The collaboration of utilities and regional entities are engaged in ongoing efforts to ensure energy savings achievement for heat pump installations that will add a focus on reducing reliance on backup resistance heat by improving the performance of installed heat pumps.[19]

Oregon's progress toward the heat pump installation state goal will have a substantial impact on total carbon emissions. It is estimated that by December 31, 2025, Oregon will have approximately 458,500 total homes, multi-family residences, and commercial buildings outfitted with heat pumps. This translates to a statewide potential carbon reduction range of 1.15 to 2.02 million $MTC0_2e$ per year. Of that total potential reduction, 304,200 to 535,400 $MTC0_2e$ per year has been reduced since the passage of HB 3409, and an estimated 126,750 to 223,100 $MTC0_2e$ reductions per year will be added with new heat pump installations beyond 2025.

The potential emissions reduction of heat pump systems is immense. For comparison, a typical passenger vehicle in the United States emits approximately 4.6 $MTC0_2e$ per year.[20] Full heat pump adoption could be the equivalent of removing about 988,400 to 1,739,500 passenger vehicles from the road, or about 30 to 50 percent of the current total number of passenger vehicles in Oregon.

Efficiency Ratings

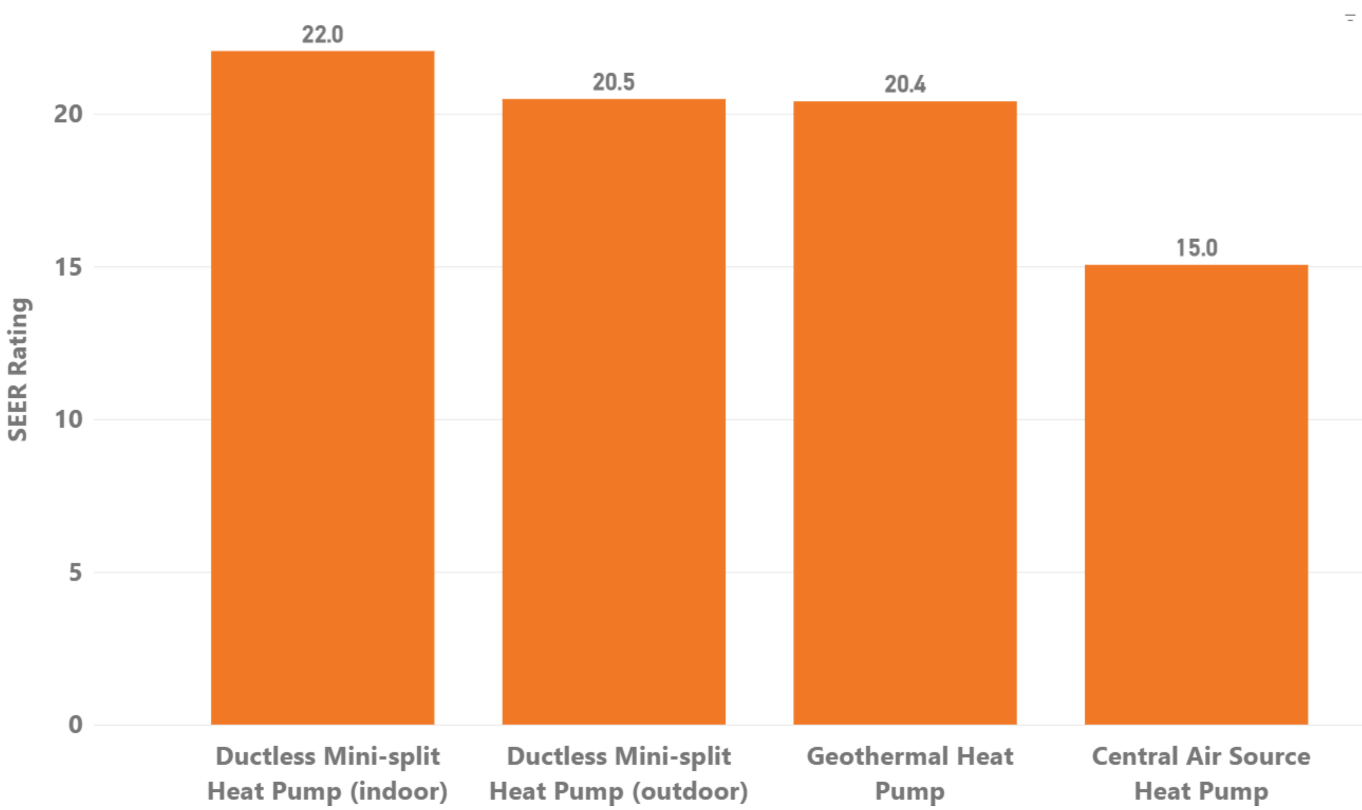
Heat pump technologies are unique because they can provide comprehensive space conditioning (heating and cooling) to a building in a single system. Thanks to this functionality, heat pump efficiency ratings are represented separately from traditional ratings for other heating systems and are calculated using different metrics. This report focused on the following efficiency ratings represented in the available datasets:

- Seasonal Energy Efficiency Rating (SEER)
- Energy Efficiency Rating (EER)
- Heating Seasonal Performance Factor (HSPF)

Calculating the efficiency of a heat pump system's cooling ability is accomplished using the SEER and EER rating metrics while heating efficiency is measured using the HSPF rating system.

Seasonal Energy Efficiency Rating (SEER). The SEER rating measures how efficiently a system cools a given space and the amount of electricity needed to maintain the conditioned space. A SEER rating equals the cooling output of a system divided by its overall energy consumption during the cooling season. A higher SEER rating results in a greater energy reduction and financial savings during the cooling season.[21(p. 1)]

Figure 7: Average SEER Rating of Installed Heat Pump Unit by Type[9] (NEEA RBSA Data)

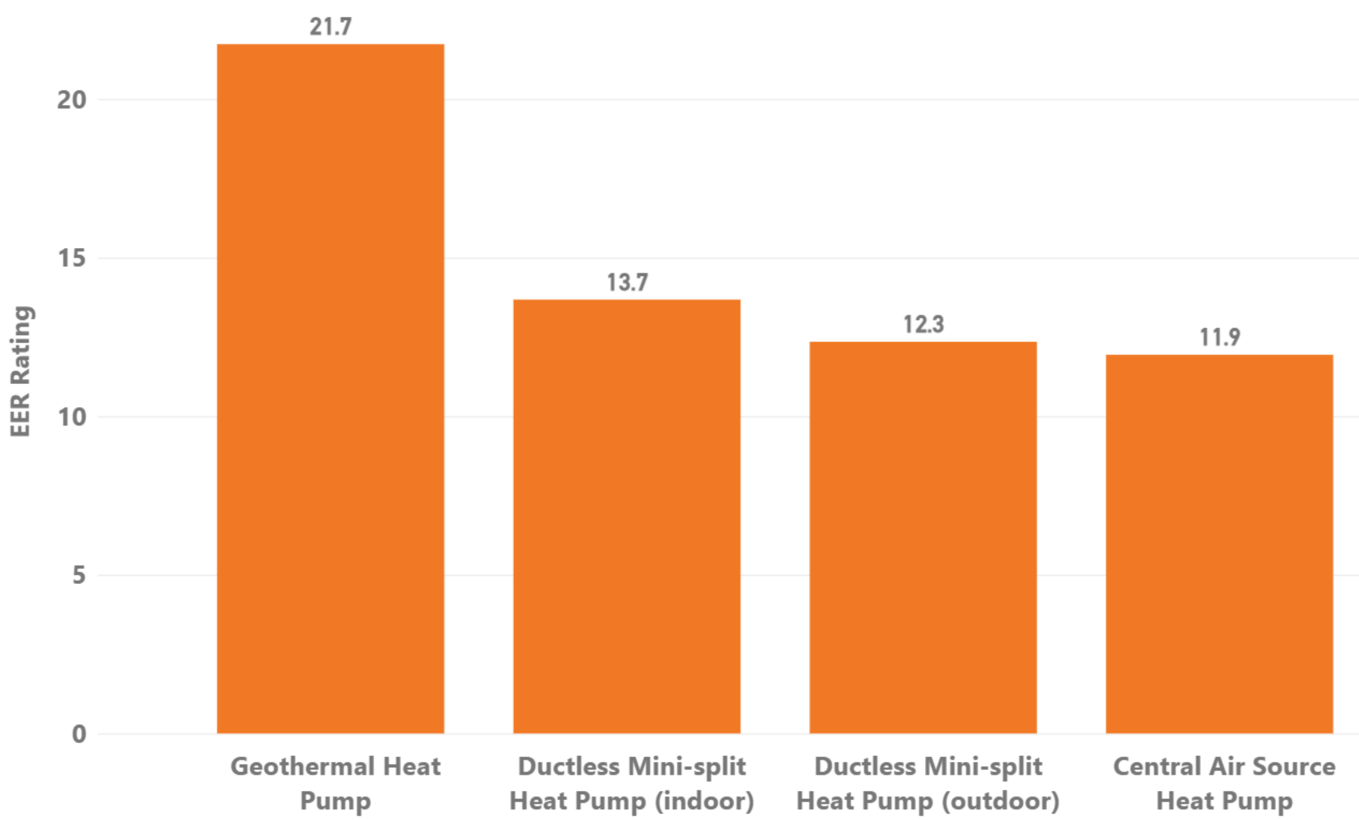


As shown in Figure 7, in existing homes, ductless mini-split heat pump systems emerge as the leader in installed SEER rating efficiency with an average rating of 20.3 to 22. This is an increase from the average SEER rating of 15 to 18.9 seen with a central ASHP installation.

Mini-split heat pumps and central ASHPs operate differently and therefore have different levels of efficiency. Mini-split heat pump systems do not need ductwork to transport conditioned air to the intended living space, so they don't have the 30 percent energy loss associated with traditional forced air systems. Losses are especially prominent if the ducts traverse unconditioned or uninsulated space such as an attic or crawlspace.[22] Oregon Residential Specialty Code N1105.3 requires all duct systems and air handling equipment in new buildings to be located fully withing the building's thermal envelope; this requirement was effective on April 1, 2024, so homes built prior to that date may have greater risk of energy loss from inefficient duct work. Additional factors such as duct age, airtightness, build quality, and duct insulation can also have a detrimental effect on ASHP efficiency.

Energy Efficiency Rating (EER). An EER rating is similar in its function to the SEER rating system but measures the "instantaneous" efficiency rather than efficiency over an entire season. A system with a higher SEER and EER rating can be expected to deliver an overall greater energy reduction and financial savings to the consumer.

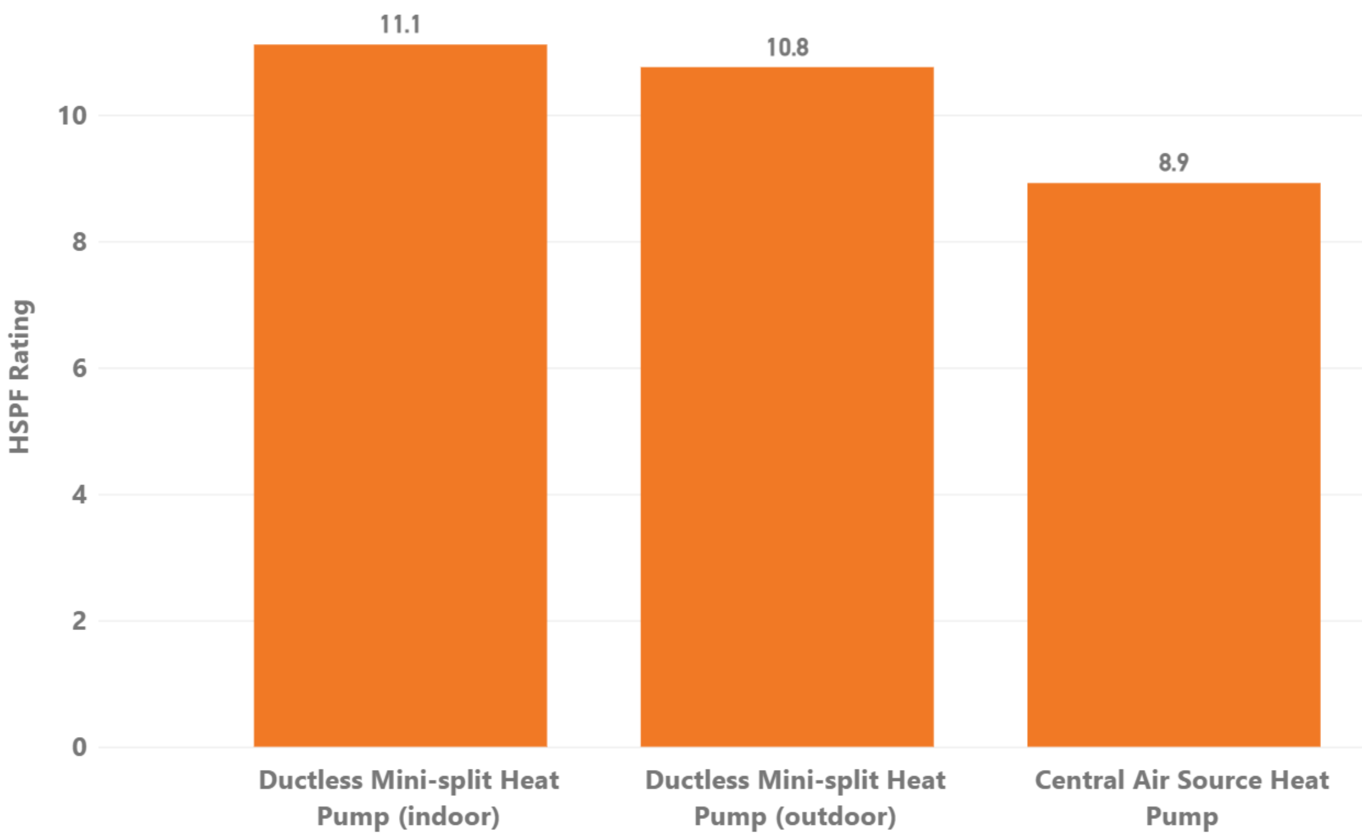
Figure 8: Average EER of Installed Heat Pump Unit by Type (ETO Data)



When rated under EER metrics, geothermal heat pumps are able to achieve a consistently higher efficiency score thanks to their utilization of a more consistent and moderate temperature source (subsurface temperatures). This allows GHPs to operate at their most efficient level more consistently throughout the year, where ASHPs are more vulnerable to efficiency loss due to changes in source temperature.

Heating Seasonal Performance Factor (HSPF). HSPF is calculated by comparing total heat generated during the heating season against the amount of electricity consumed, also factoring in outdoor temperature as an additional variable. A system with a higher HSPF rating can be expected to have lower rates of energy consumption and lower operating costs.

Figure 9: Average HSPF Rating of Installed Heat Pump Unit by Type[9] (NEEA RBSA Data)



Efficiency ratings are a helpful tool to understand how different types of heat pumps can affect carbon emissions reduction and energy efficiency. While one system type may appear more efficient overall in delivering heating and cooling, they are not always the most suitable choice for installation due to the cost of installation and building or environmental limitations.

In-Field Performance

Current energy efficiency rating metrics do not account for all relevant factors in determining a system's realized performance. Studies have shown that there is a substantial degree of in-field performance variation when compared with the expectations calculated using conventional metrics. Results showed that in many cases, heating efficiency exceeded set expectations while cooling energy savings fell short of expectations.[23(p. 11)] In a study conducted by ASHRAE, evidence showed that actual efficiency improvement was significantly smaller than the estimated 80 percent when comparing a heat pump unit with a SEER rating of 18 to a unit with a rating of 10. Actual in-field performance was found to range between 45 and 76 percent even while operating with decreased dehumidification capacity.[23(p. 5)] The study reported that during standard energy efficiency rating tests, critical control firmware is intentionally disabled to simplify the testing process, and the units are tested in fixed test modes. These special modes facilitate the testing process but allow for significant variations in real-life operating efficiency (similar to car MPG ratings). Issues emerging from these testing processes can create deviations in realized efficiency after a heat pump installation is completed.

In addition to these deviations, influencing factors such as installation quality (e.g., unit sizing, duct airtightness, proper refrigerant charge, etc.), occupant behavior, and loss of heat or cooling from ductwork outside of conditioned spaces are largely overlooked under the current efficiency rating metrics. These shortcomings can result in an installed heat pump system underdelivering on expected energy reductions and financial savings, if the known factors are not properly addressed prior to installation. This phenomenon could negatively affect public perception of heat pump efficiency overall if the final product is not meeting expectations due to shortcomings within the current efficiency metrics.

Heat Pump Incentives in Oregon

Incentives play a significant role in promoting heat pump adoption in Oregon. As noted earlier, heat pump installations have a high cost of installation compared to traditional HVAC systems. This higher cost represents one of the most significant barriers to adoption, especially among low-income households. Understanding the benefits and limitations of current incentive programs can help inform future program development. It is important to note, however, that customers can participate in multiple incentive programs at the same time, and project totals may have some overlap. Additionally, local utilities may offer incentive programs, such as Emerald People's Utility District's Residential Incentive Programs, The City of Ashland's Residential Incentive Program, and Umatilla Electric Cooperative's Heat Pump HVAC Program. A significant portion of ductless heat pump installations have received utility rebates and support from NEEA programs.[24(pp. 9–12)] ODOE's Energy Hub for Incentive Programs and Projects in Oregon (HIPPO) provides Oregonians with comprehensive information on available incentives and programs.

In 2023, the Oregon Legislature passed HB 3630, directing the Oregon Department of Energy to create a single resource for navigating energy efficiency incentives and rebates. ODOE's Energy HIPPO serves as a centralized hub offering information, technical support, and connections to contractors and financing for energy upgrades. The website features an incentive finder tool that connects Oregonians with incentive providers, helping make home energy upgrades more accessible and affordable.

As data for many incentive programs are diverse and not readily available, this report includes program data from Energy Trust and ODOE heat pump incentive programs.

Specifically, this report focuses on the following factors relating to heat pump incentives:

- Average distribution of installation
- Cost of installation by county/region
- Level of incentive granted

Oregon Department of Energy

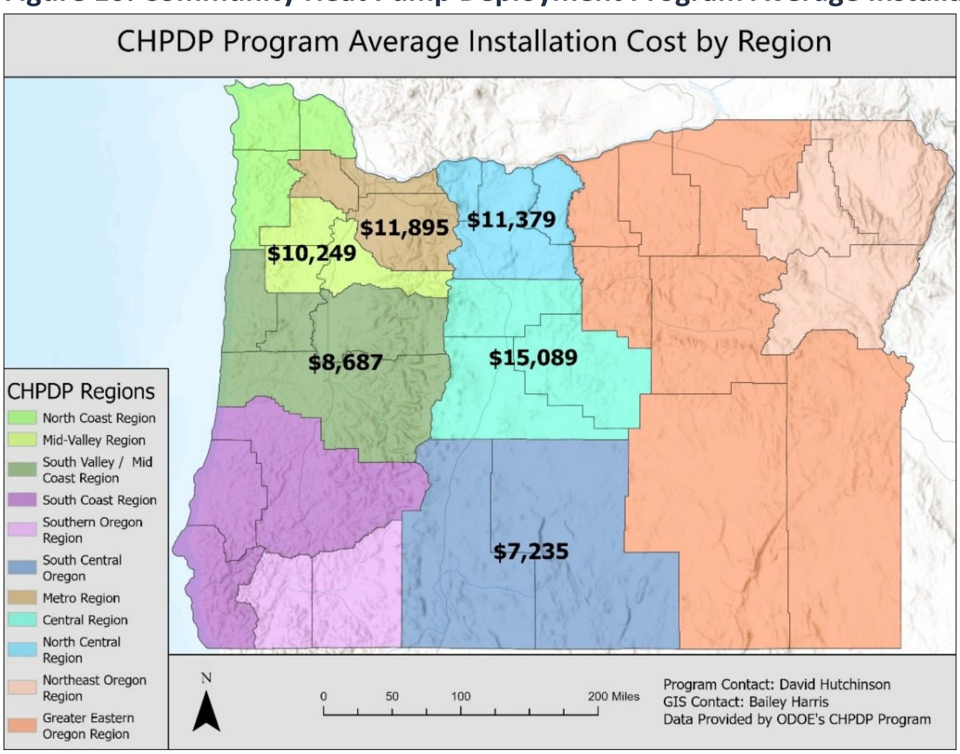
ODOE has administered three incentive programs in recent years targeting heat pump installations in Oregon. These programs provide funding for owner-occupied homes and rental home properties across the state. The requirements and incentive amounts vary depending on the program.

- Community Heat Pump Deployment Program
- Oregon Rental Home Heat Pump Program
- Oregon Heat Pump Purchase Program

Community Heat Pump Deployment Program (CHPDP). This program provides direct funding for the purchase and installation of a heat pump in an owner-occupied residence. The Oregon Department of Energy partnered with regional administrators to implement the program across the state. Administrators evaluate applications and issue final incentive funding toward installations. Incentives are issued based on heat pump efficiency, with minimum efficiency heat pumps receiving up to $5,000 and higher efficiency heat pumps receiving up to $7,000. While the incentives are available in all regions in the state, not all program reporting data has been submitted by regional administrators at the time of this report. As a result, not all regions are currently represented in the following datasets, and the number of completed projects is not comprehensive. A more comprehensive program summary will be included in the *2027 Biennial Oregon Heat Pump Report*. For many regions, program funding is currently exhausted; additional funding will be required for any additional heat pump installation incentives beyond the current allotments.

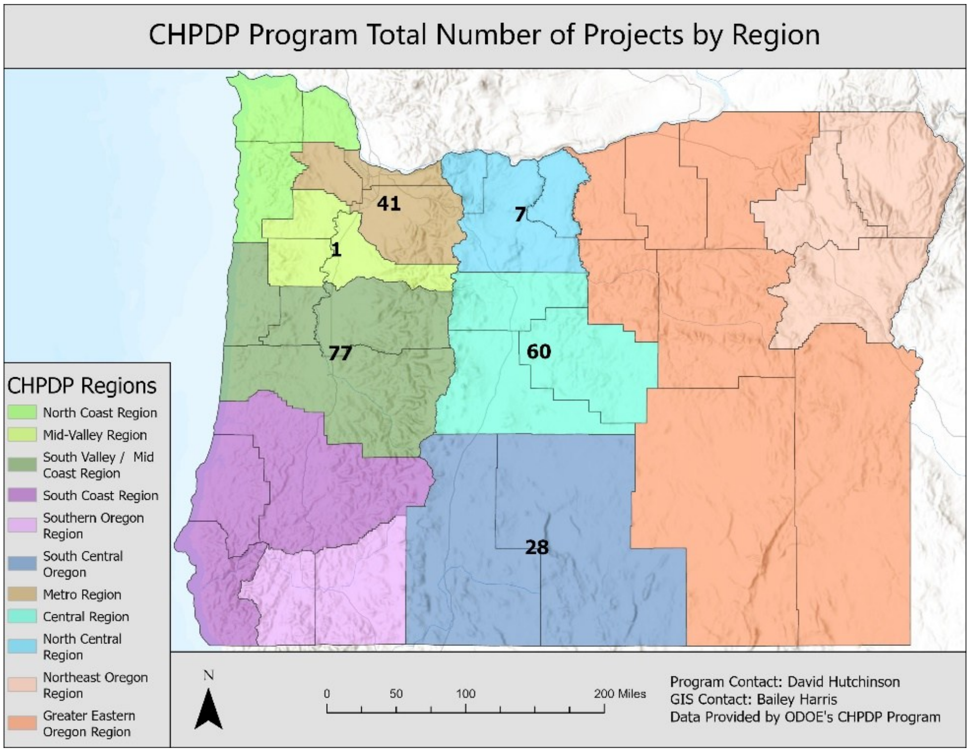
As seen in Figure 10, cost of installation varies by region, with higher costs reported for projects in the north central, metro, and mid valley regions.

Figure 10: Community Heat Pump Deployment Program Average Installation Cost by Region



Note: While the incentives are available in all regions in the state, not all program reporting data has been submitted by regional administrators at the time of this report.

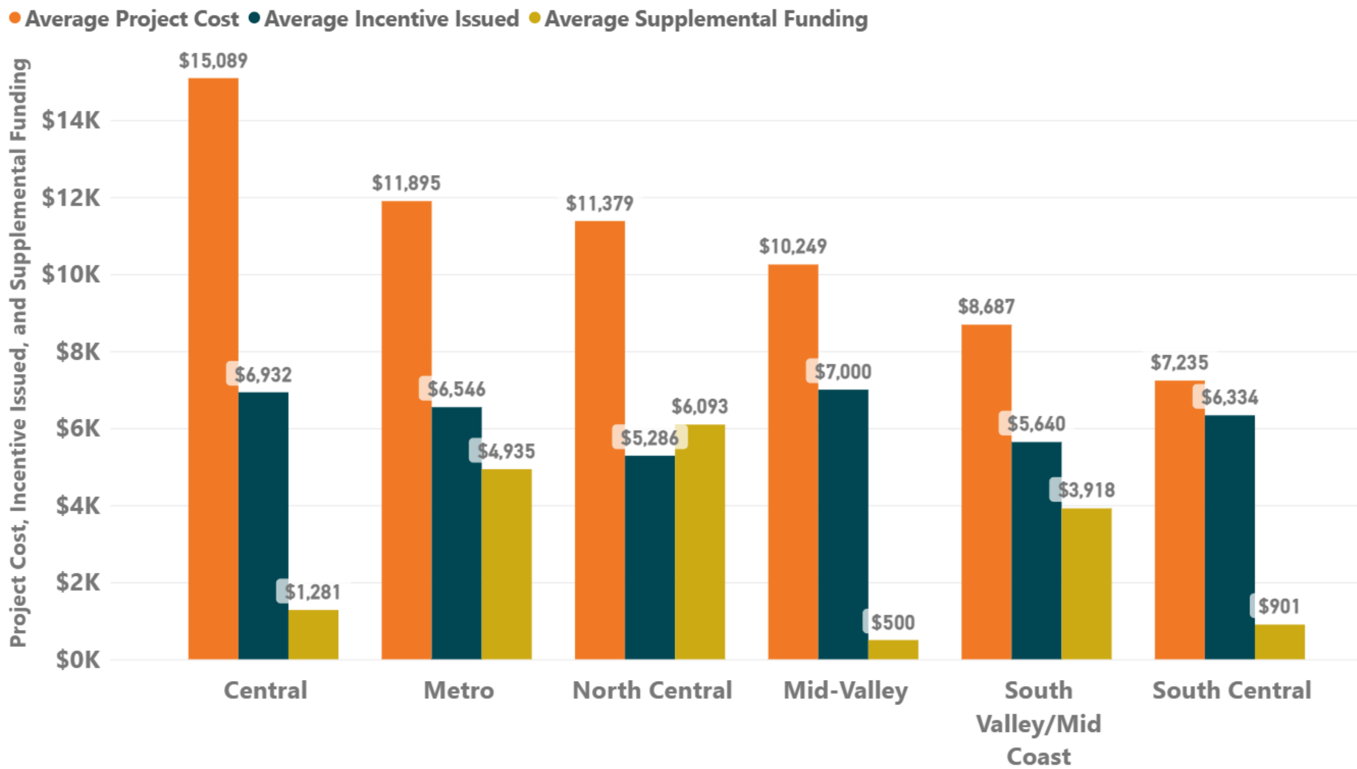
Figure 11: Community Heat Pump Deployment Program Total Number of Projects by Region



Note: While the incentives are available in all regions in the state, not all program reporting data has been submitted by regional administrators at the time of this report.

Regional data show a program-sponsored heat pump installation would cost consumers between $7,200 and $15,100, with a potential incentive between $5,000 and $7,000 (35 to 97 percent total project cost reduction). This level of incentivization provides significant savings in overall project costs and brings the heat pump installation within the expected cost of a traditional HVAC installation (an average of $3,300 - $6,900 based on Energy Trust data). Customers provided additional supplemental funding to cover the remaining project costs not covered by incentives.

Figure 12: Average Project Cost, Average Incentive Issued, and Average Supplemental Funding By Region



The popularity of the Community Heat Pump Deployment Program demonstrates high levels of interest in heat pumps among Oregonians. Incentives provide support for heat pump installations and encourage the adoption of energy efficient systems while remaining competitive against traditional HVAC systems. With the support of CHPDP, heat pumps have been installed in all of the program regions in Oregon. A further analysis of the program will be included in a future report.

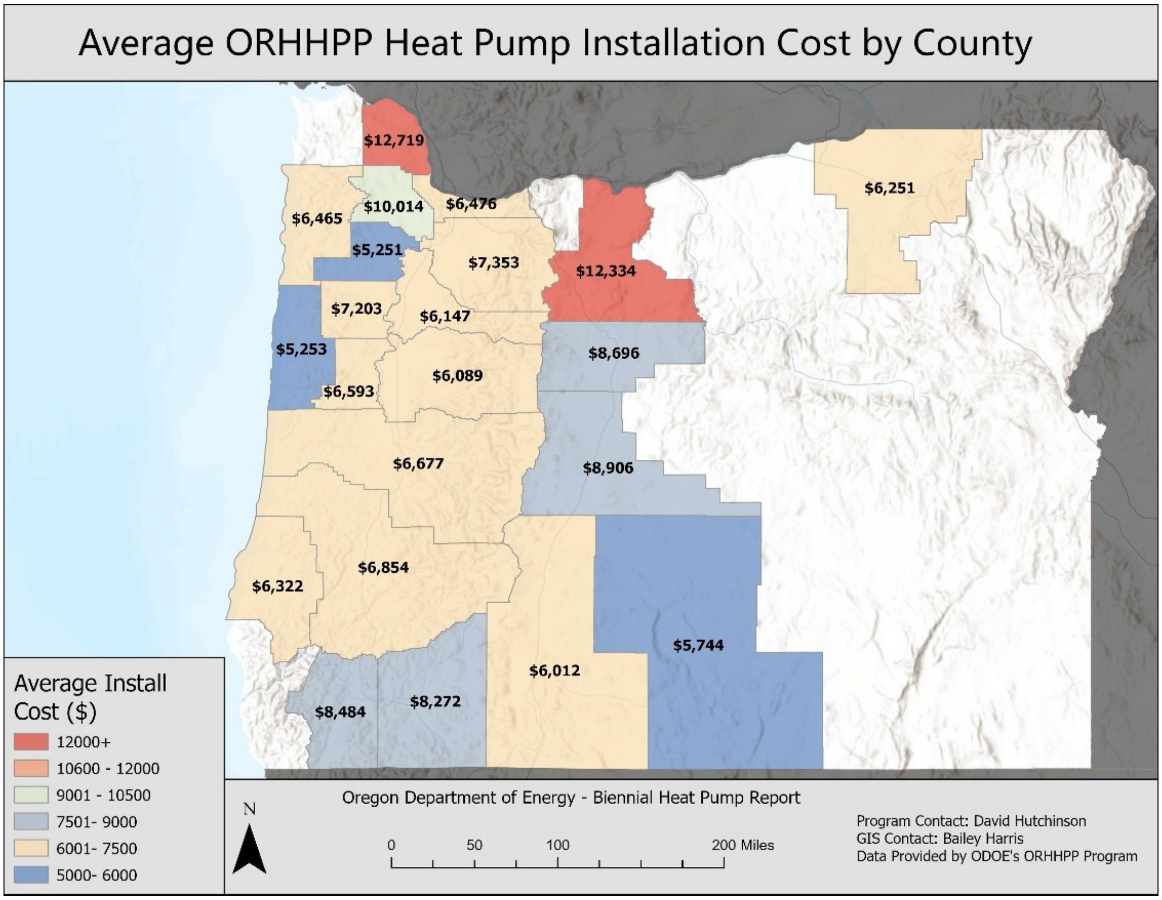
Key CHPDP Highlights:

- **High Incentive Amount:** The maximum award of $7,000 and up to an additional $4,000 in incentives for required upgrades (electrical system upgrades, air sealing, etc.) allows for greater coverage of installation costs. This is especially attractive to low-income residents who may not be able to cover the higher costs associated with heat pump installations.
- **Strong Program Uptake:** Initial analysis suggests that public interest in heat pumps is strong, with applicants taking advantage of the program.
- **Limited Program Data:** ODOE is awaiting final reports from regional administrators before further analysis can be completed. Current program data is limited in scope and does not provide a comprehensive understanding of program success.

Oregon Rental Home Heat Pump Program. This program provides rebates and grants for heat pump installations and heat pump related upgrades in dwellings used as residential tenancies, manufactured homes, and recreational vehicles located in a rented space. As one of the few programs that provide incentives for rental units, this program helps address a gap in energy efficiency program coverage in the state. Rebates of up to $7,000 support the installation of heat pumps and grants up to $4,000 support related building upgrades. The program requires that heat pumps are installed by an ODOE-approved contractor who reserves and receives rebates for eligible heat pump projects, passing the full savings along to the dwelling owner. Program funding is currently exhausted; more funding would be required for any additional heat pump installation incentives.

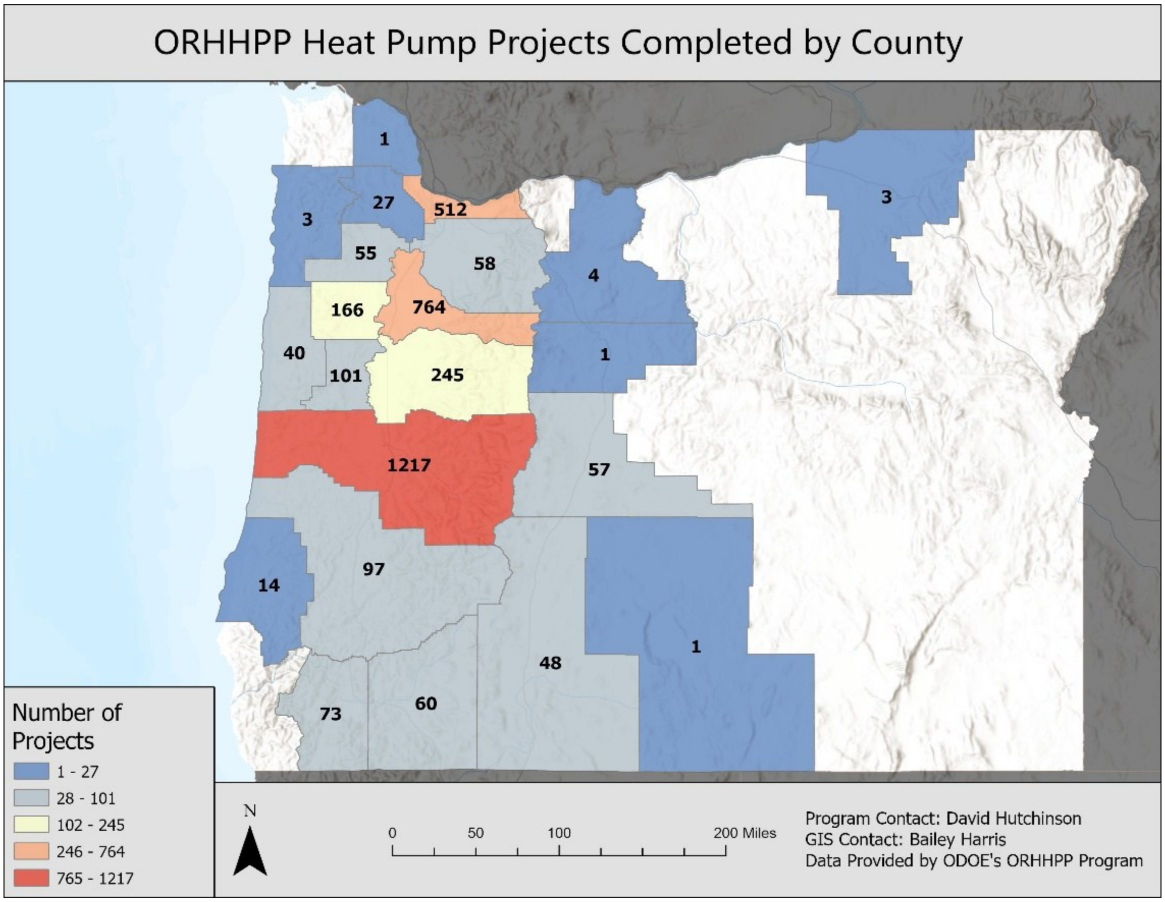
Data demonstrates continued variance in average heat pump installation costs across counties with participation in the program.

Figure 13: Average Oregon Rental Home Heat Pump Program Installation Cost by County



Program incentives demonstrated strong uptake in the Metro and Central Valley regions, with a high number of applicants receiving incentives in Lane County thanks to efforts by local contractors, local government, utilities, and advocacy groups.

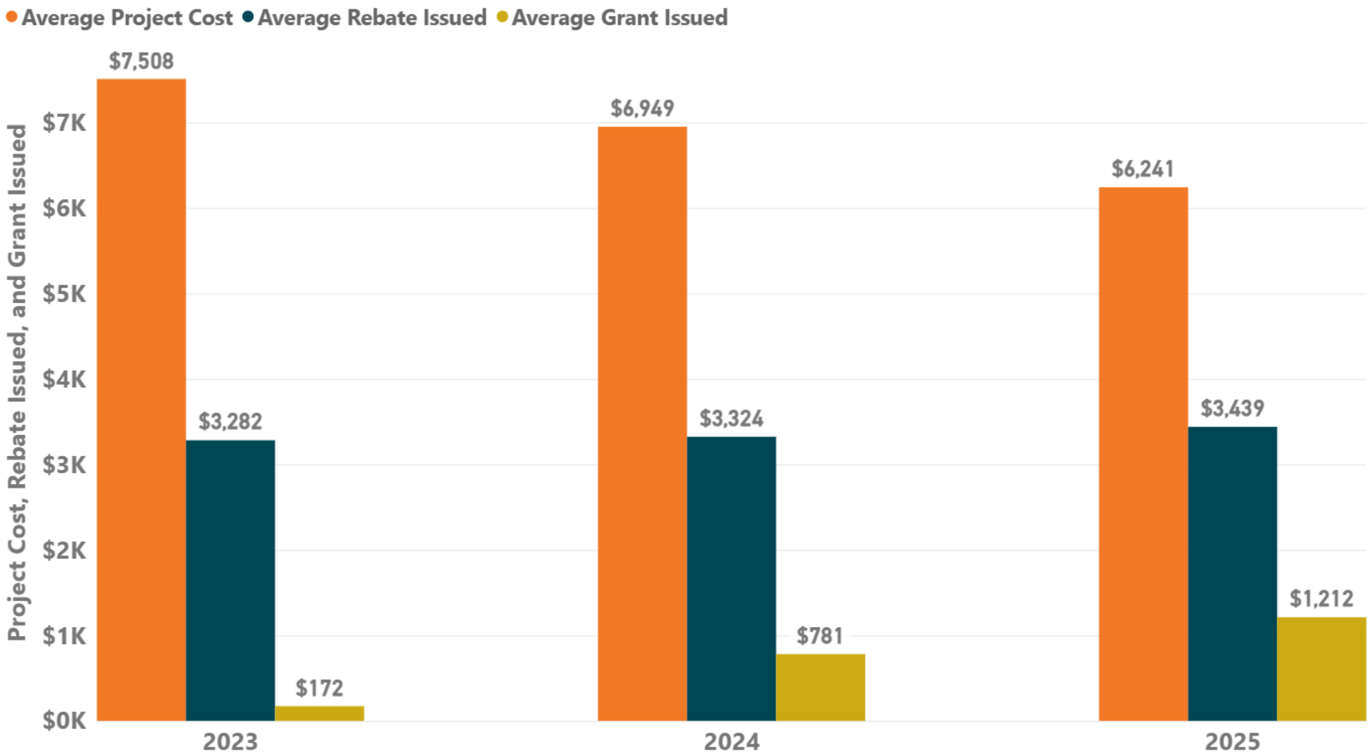
Figure 14: Oregon Rental Home Heat Pump Program Projects Completed by County



The Oregon Rental Home Heat Pump Program has made it possible for heat pumps to be equally affordable as traditional HVAC installations.

Under the Oregon Rental Home Heat Pump Program, an installation completed between 2023 and 2025 would, on average, cost property owners between \$6,200 and \$7,500. An applicant could expect to receive an incentive between \$3,300 and \$3,400 on average, as well as between \$200 and \$1,200 in additional grant support toward building upgrades relating to the heat pump installation. This rate of incentivization would, on average, reduce final costs to consumers by 46 to 74 percent, bringing total project cost in line or below the cost of a traditional HVAC installation as seen in Figure 19 on page 28.

Figure 15: Average Project Cost, Average Rebate Issued, and Average Grant Issued by Year



The Oregon Rental Home Heat Pump Program launched with strong engagement. Property owners and managers responded well to the available incentives, supporting the installation of energy efficient systems in rental homes, manufactured homes, and recreational vehicles in rented spaces. However, while the program has performed well in many Oregon Counties, uptake in eastern counties has been notably limited. Potential limiting factors, such as contractor availability, lower resident density, longer drive times for contractors, public awareness of programs, etc., may have contributed to limited project uptake, but more data is required to understand the specific factors.

Key ORHHPP Highlights:

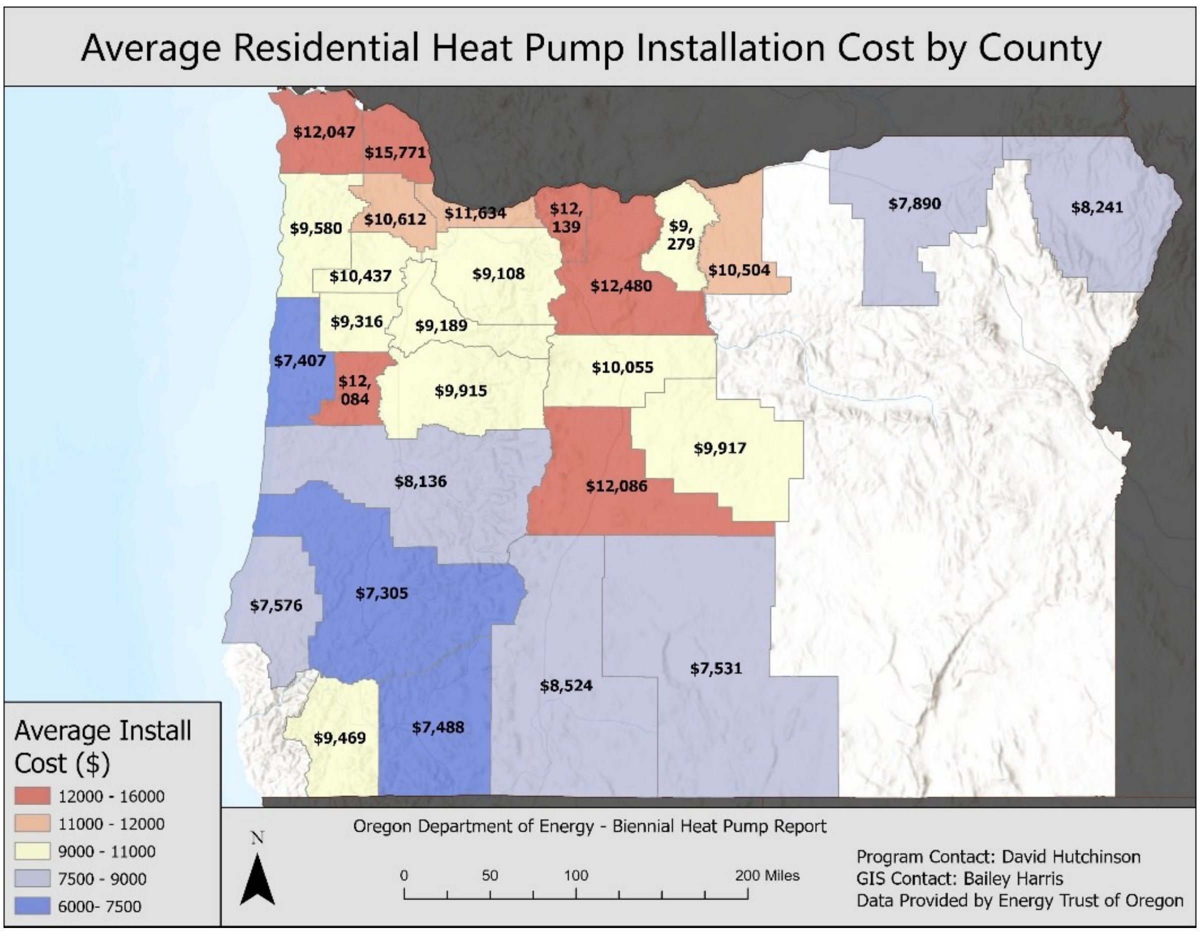
- **High Incentive Amount:** The maximum incentive award of $7,000 and additional grants of $4,000 allow for greater uptake. Savings are especially attractive for owners and building managers who are hesitant to take on the additional costs of upgrading to energy efficient HVAC systems.
- **Strong Interest:** Interest in the program was very strong. Program funding was quickly exhausted once available, and the program is closed to additional applications.
- **Poor Uptake in Eastern Counties:** Program uptake in eastern Oregon was very low, with only three installations being completed in Umatilla County.

Oregon Heat Pump Purchase Program. The Oregon Heat Pump Purchase Program is part of the state's Climate Equity and Resilience Through Action Program, funded by a U.S. Environmental Protection Agency grant, and aims to reduce harmful greenhouse gas emissions in Oregon. The program will disburse funding in two rounds – one $12,000 round opened in June 2025 and a second round is expected in 2027 (subject to change). Each round will support 6,000 incentives of up to $2,000 (1,000 for owner-occupied residences, 3,000 for rentals, and 2,000 for new constructions). Additional eligibility requirements such as heat pump efficiency minimum standards, property type, and whether the funding exceeds total project cost will determine applicant eligibility, and the final incentive amount issued. Analysis of this program will be included in the *2027 Biennial Oregon Heat Pump Report* as program data becomes available, but initial participation has already been high for existing owner-occupied residences.

Energy Trust of Oregon

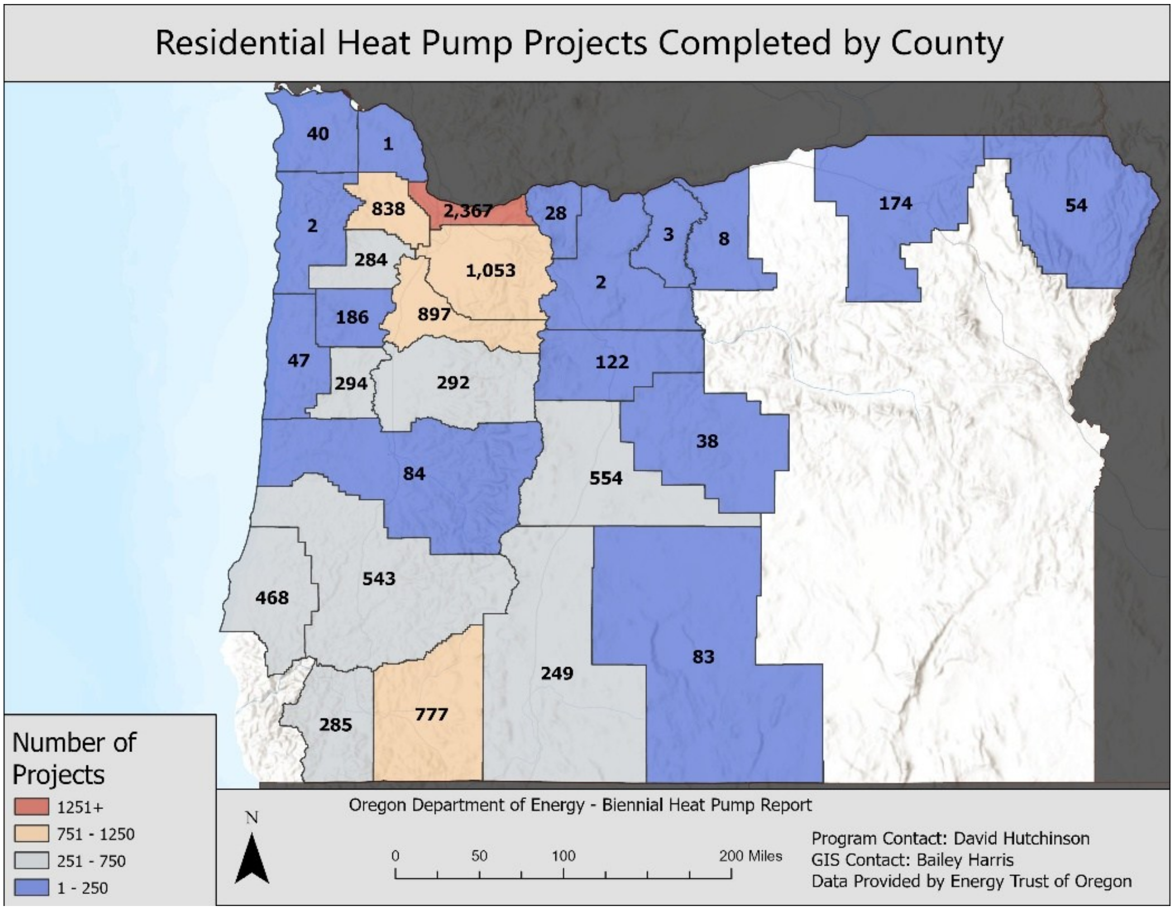
Energy Trust of Oregon offers a variety of heat pump incentives and rebates in the organization's service area. These incentives target projects with existing direct electric resistance heating, and vary depending on the type of residence, utility, and whether the home is a rental property. Additional installation requirements can include specific factors such as minimum efficiency rating, requirements that the unit operate as the primary heating and cooling system, or that the installed above code unit must replace a specified preexisting system type.

Figure 16: Average Single Family Residential Heat Pump Installation Cost by County



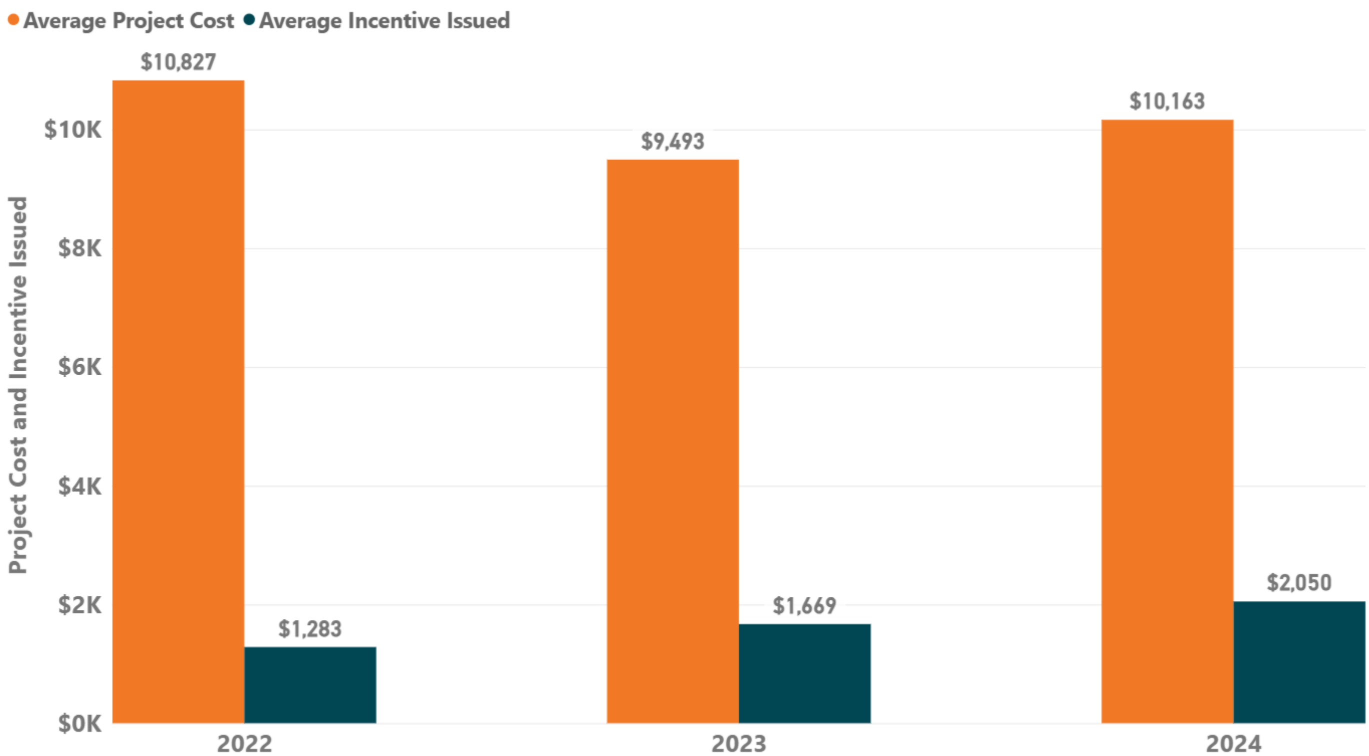
Average cost of installation can vary depending on the project location. Available data on the factors influencing this variation is limited; however, many factors can affect pricing such as contractor availably and skill, difficulty of installation, additional retrofitting, equipment lead times, etc. In Figure 16, cost of installation is higher on average for projects completed in the north central, metro, and mid valley regions.

Figure 17: Single Family Residential Heat Pump Projects Completed by County



Distribution of installations from Energy Trust of Oregon incentives shows higher numbers of projects completed within the valley and central regions, as well as work along the coast. Incentives are not available in many parts of Oregon as Energy Trust's service area is limited to PGE and Pacific Power customers. Lane county, for example, has limited Energy Trust coverage despite being one of Oregon's largest counties by population.

Figure 18: Average Project Cost and Incentive Issued by Energy Trust per Year



According to Energy Trust program data, an installation completed between 2022 and 2024 would, on average, cost consumers between $9,500 and $10,800 with an incentive of $1,300 to $2,000. The incentive would reduce total cost by about 14 to 21 percent. When compared with the higher installation costs associated with heat pumps of about 58 percent, after receiving their incentive, residents can expect to pay between 37 and 44 percent more than if they had purchased a traditional HVAC system.

Energy Trust heat pump incentive programs have supported many single family and multi-family heat pump installations, demonstrating a strong demand among Oregon residents and a desire to transition to energy efficient systems despite higher installation costs.

Key Energy Trust program highlights:

- **High Incentive Volume:** Energy Trust offers multiple incentive options to Oregon residents within the organization's service area. These incentives cover a wide range of income levels and types of housing, allowing for a greater volume of applicants.
- **Specified Coverage:** Energy Trust provides heat pump incentives in PGE and PacifiCorp service areas and has seen significant interest in heat pumps in the metro and central valley regions. Energy Trust programs are not available in all counties; for example, Energy Trust's service area doesn't cover southeastern Oregon.
- **Incentive Amounts:** Energy Trust's programs offer modest financial incentives, which means homeowners need to cover the remainder of upfront costs. This may discourage low-income residents from accessing program funding.

HEAT PUMP ADOPTION IN OREGON

Heat Pump Market Share

Understanding the current heat pump adoption rate presents a unique challenge due to the limited availability of relevant data. To understand the adoption rate of a product, a deep understanding of market conditions, sales, and accurate distribution is required. For example, a shipment of 200 heat pumps to Oregon does not necessarily translate to 200 units installed. Secondary distributors and contractors often hold surplus inventory, especially when order lead times are long. Additionally, it is not unusual for installers and secondary distributors to sell off excess inventory, or undertake work out of state, leading to issues with data accuracy. These factors, combined with the high level of difficulty in collecting comprehensive sales data, limit the reliability of using distributor-provided sales data.

Due to these limitations, ODOE built a prediction model that analyzes the current market share annual growth rate of heat pumps currently installed in Oregon buildings. This process uses existing data from studies performed by consulting partners at NEEA and the U.S. Energy Information Administration. This model considers previous market share increases reported in these studies and calculates a statewide annual increase in heat pump installations based on expected market growth. This approach allows ODOE to calculate a reasonably accurate estimate of current and future heat pump installations until more robust data becomes available.

Product Adoption Rate Analysis

The Oregon heat pump adoption model presents two scenarios for consideration. With the uncertainty of recent adoption trends due to lack of data, ODOE has chosen to use the Static Growth Scenario as the primary model for this study.

Static Growth Scenario. In this scenario, the predicted adoption rate of heat pumps is maintained at the last observed level of growth and does not assume additional growth beyond the current observed rates. This model uses a continual year-over-year increase of 3 percent total heat pump market share, which is approximately 50,700 installations per year. As of December 31, 2025, this model calculates Oregon's total heat pump market share will be 25 percent, totaling approximately 458,500 residences, multifamily, and commercial buildings using heat pumps. Of that total, approximately 121,700 heat pumps have been installed in line with the state goal set out in HB 3409, marking a 7 percent increase in total market share since the passage of the bill. If future market trends hold steady at observed levels, this model shows Oregon achieving its goal of 500,000 additional heat pump installations by mid-2033.

If future market trends hold steady at observed levels, this model shows Oregon achieving its goal of 500,000 additional heat pump installations by mid-2033.

The model is a very conservative approach to calculating heat pump adoption and does not account for potential growth rate increase beyond the most recent dataset's release in 2022. Additional data beyond 2022 will not be available until 2026.

Optimal Growth Scenario. In this scenario, observed trends in market share growth rates are forecasted to maintain their established growth rates beyond the level observed in the current datasets. This model assumes an extended, year-over-year increase of 4 percent total heat pump market share growth. This translates to a yearly increase of approximately 78,050 added heat pump installations throughout the state. As of December 31, 2025, this model puts Oregon's total heat pump market share at 30 percent, totaling approximately 540,600 residences, multifamily, and commercial buildings using heat pumps. Of that total, approximately 187,330 heat pumps would be installed in line with the state goal set out in HB 3409, marking a 10 percent increase in total market share since the passage of the bill. Assuming a steady increase in market growth, this model shows Oregon achieving its goal of 500,000 additional heat pump installations by mid-2030 barring any deviations from the current model.

It is important to note, however, that this model assumes a consistent level of uninterrupted, accelerated growth in current market trends and does not consider current market conditions due to data limitations. It is possible that additional factors such as increased inflation, costs of materials, greater costs of labor, and supply chain disruptions may have a detrimental effect on overall market growth.

2050 State Goal Progress

Heat pump adoption in Oregon, while growing, still requires additional effort to achieve the ambitious goal set out in HB 3409 of 500,000 new heat pump installations by 2030. According to the analysis presented in this report, Oregon will reach 121,700 installations by December 31, 2025, and will achieve its goal of 500,000 heat pump installations in June 2033. While there is the possibility that current trends are more optimistic than the presented scenario, ODOE lacks sufficient data to support using a higher rate of growth with any certainty.

BARRIERS TO ADOPTION

ODOE was directed by HB 3409 to "Identify financial and nonfinancial barriers that prevent adoption of heat pump technologies by residents of this state."[7] In pursuit of that directive, ODOE consulted with entities currently engaged in the promotion and installation of heat pumps in Oregon. ODOE has included industry feedback in this report to provide a deeper understanding of the most significant challenges and barriers facing the industry.

Financial Barriers

Cost of Installation

The foremost barrier discussed by ODOE's consulting partners was the cost associated with a heat pump installation. Installation of a heat pump can cost significantly more than a standard HVAC system, and this factor places severe limitations on heat pump adoption, especially among low-income residents. One consulting partner highlights this challenge:

> *"The cost of HVAC systems in general have increased a lot in the last five years. As a result, we see people limp along on failing systems, resulting in higher bills, until the system completely fails. When faced with the upfront cost of a new system some simply cannot*

afford it. Some resort to using other forms of heating, that are also expensive, making it hard to adopt heat pump technology."

- *Umatilla Electric Cooperative*

Additionally, envelope improvements were also discussed as a financial barrier. The insulation level of the building envelope will have a direct effect on the heat pump's ability to perform efficiently.[25(p. 7)] Homes with insufficient levels of insulation, poor air tightness, poorly insulated windows, and poor weatherization will require additional improvements to achieve expected efficiency levels. This effort and cost may limit those residents' capacity and ability to install heat pumps.[26(p. 3)] Additional consulting partners address this issue further:

"There are many financial barriers to heat pump adoption: incentive programs often cover only a portion of total costs, and often times significant work is needed before a structure can become heat pump ready. Often times this work goes beyond weatherization — roof replacement, for example, or standing water removal — and isn't covered by most assistance programs."

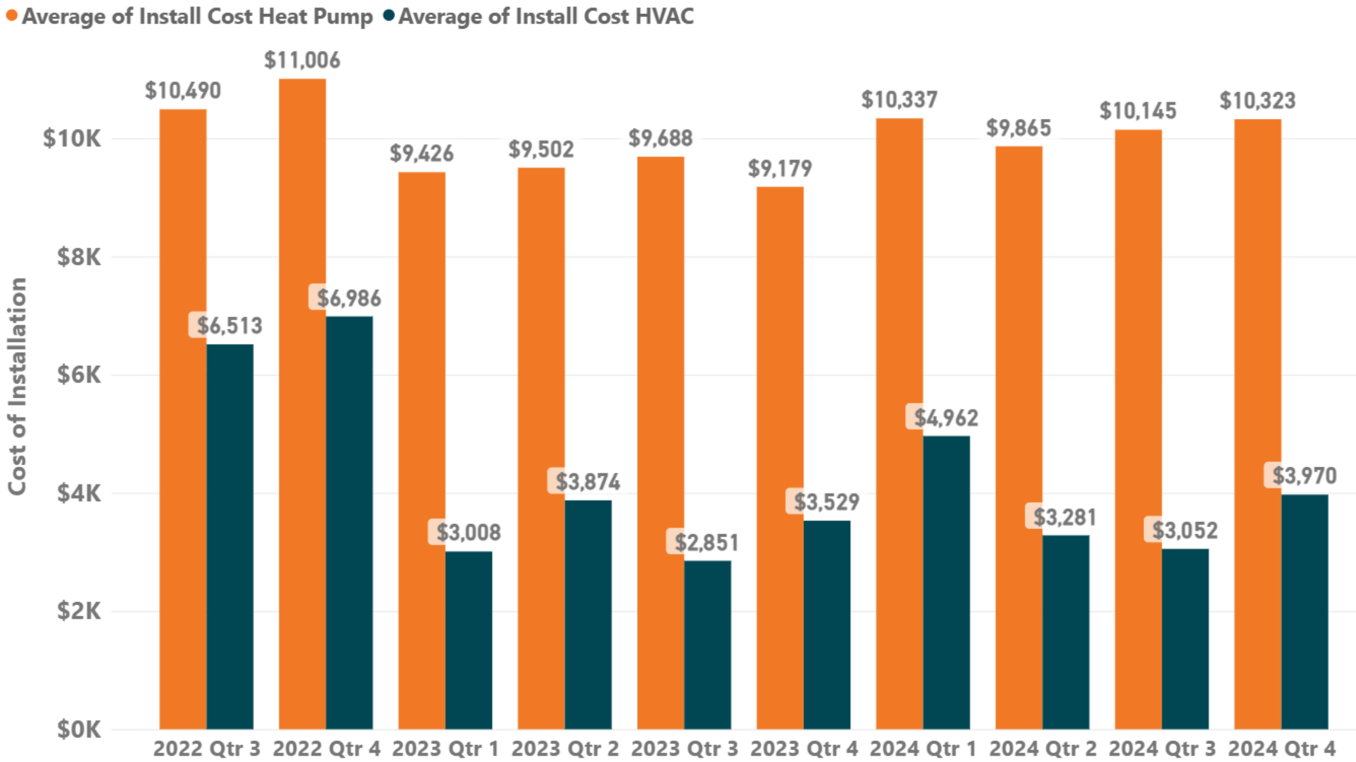
- *Earth Advantage*

"Upfront installation costs are higher than a traditional furnace. Installation of additional weatherization (air sealing and insulation) measures may be also needed to achieve peak functionality of a heat pump."

- *Community Energy Project*

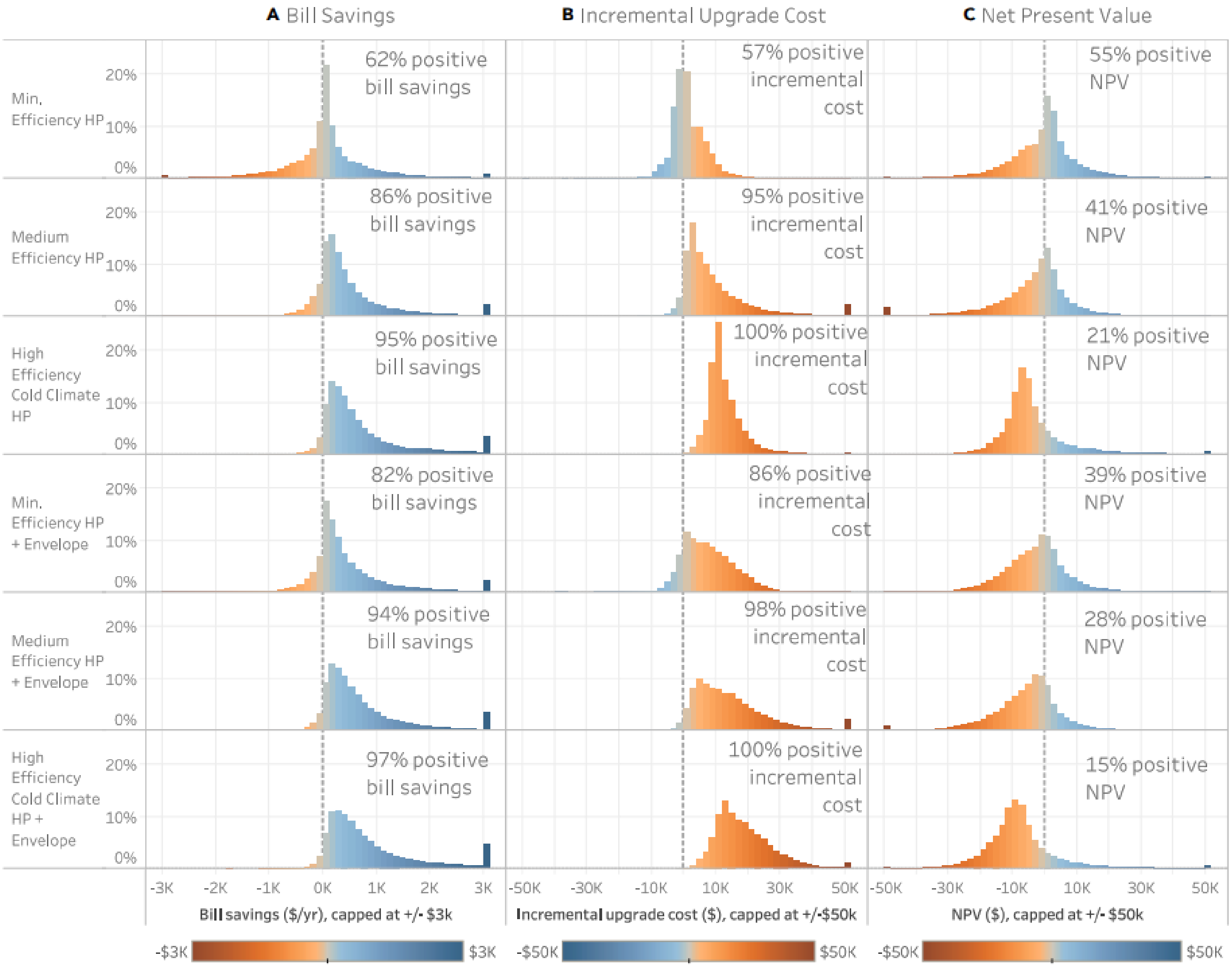
Heat pump installations can increase total project cost by an average of 58 percent when compared to a traditional HVAC system installation, as seen in Figure 19.

Figure 19: Average Cost of Heat Pump Installations vs. Average Cost of Standard HVAC Installations in Single Family Homes



In a sample study conducted in cold and very cold climate zones, ducted homes that heat with gas, propane, or fuel oil, and have preexisting AC, have an average heat pump upgrade cost of $9,000 to $24,000 depending on the efficiency of the system being installed and envelope improvements needed.[2(p. 9,10)] This increase in installation cost takes place despite the relatively low increase in wholesale equipment price. Wholesale air source heat pumps are, on average, $200 to $500 more than their equivalent air conditioners. Air-source heat pumps are often more expensive to install despite this relatively low equipment cost, even when factoring in the cost of installing an air conditioner plus gas furnace. Factors that can affect the increase in the final cost of installation can include the size of the heat pump required, wiring upgrades, electrical panel upgrades, duct modifications, or service upgrades. Installers who are less familiar with heat pump technologies may also charge higher prices to cover the risk of working with unfamiliar equipment.[2(p. 4)] These increases in total project costs can be difficult to manage without additional support, either through incentives or financing the project through conventional loans.

Figure 20: Distribution of Energy Bill Savings, Upgrade Costs, and Unsubsidized NPV, in a Variable Efficiency Level Scenario, Using Energy Prices From Winter 2021 To 2022[2(p. 7)]



The high cost of installation associated with medium- to high-efficiency heat pumps can negatively influence the Net Present Value (NPV) of the heat pump unit. Heat pumps with greater levels of efficiency are more expensive and can take longer to install than minimally efficient systems, resulting in greater overall costs. In the figure above, a negative NPV indicates that it costs more to operate the ASHP (with the added costs of monthly finance payments) than a standard HVAC system. A negative incremental upgrade cost indicates that the cost of the air source heat pump is less expensive than new equipment (e.g., a new gas furnace and electric air conditioner). A negative unsubsidized NPV indicates that the upgrade scenario would likely not have a positive cash flow if financed through a loan without subsidies. This would result in the homeowner paying more out of pocket with the monthly cost of financing than the bill savings could compensate.

For example, if a homeowner installed a minimally efficient heat pump without envelope improvements and has a monthly loan payment of $100, and their energy bill is reduced by $120, their NPV would show as positive ($20), as their savings outweigh the cost of financing.

The figure shows that minimally efficient heat pumps without envelope improvements are currently the most economical choice for those wishing to reduce energy bills while keeping overall project costs low, but it does not include data from more recent improvements to heat pump technologies. NPV analysis also excludes other benefits such as added cooling, reduced carbon emissions, and health benefits associated with heat pumps, and should be viewed as a tool to understand the effect that unsubsidized heat pump installations can have on overall state climate goals. The higher cost of unsubsidized medium- to high-efficiency heat pump installations may encourage Oregonians to choose low efficiency heat pumps over more efficient systems, reducing the potential positive effect of a heat pump conversion.[2(p. 7)]

Heat pump technology is continuing to improve, and more efficient systems are being developed at a rapid pace. These trends will likely experience significant change as more efficient systems become available at more affordable price points.

Limitations with Incentives

Limitations in available incentive programs can affect heat pump adoption, particularly among low-income residents. ODOE partner Earth Advantage shared the following:

> *"Non-financial barriers include the availability of contractors in an area and the complexity of the incentive/rebate landscape for heat pumps. Another major concern is that often it's the more resourced households who are able to jump on incentive programs first: we've seen many examples of higher-income homeowners grabbing up all available incentive dollars before lower-income households even became aware of the program."*
>
> – *Earth Advantage*

There is high demand for incentives that lower the costs of heating and cooling systems. Many low-income families already have limited capacity to invest in new HVAC systems, and heat pumps remain one of the higher cost options among HVAC systems. While incentives lower the costs, it may still not be reduced enough to ensure equitable access by lower-income households.

For a significant majority of households (those with income below the 90^{th} percentile), the willingness to adopt heat pumps is insensitive to income; however, the high cost of installation proves a disproportionate barrier for those unable to afford the higher rates. This suggests that incentives targeting the upfront cost of installation could encourage both low income and higher into adopting heat pumps for those willing — but unable or hesitant to act due to cost — albeit at different rates.[26(p. 3)]

Incentive availability and restrictions can also play a role in limiting adoption. Incentives are often provided to specific counties, utility service areas, and/or come with certain income eligibility. These factors can lead to lower levels of adoption in regions with fewer available incentives. Restricting incentives to target a particular fuel source, such as electric resistance heating, can also present a barrier to homeowners with certain fuel sources, including those without any existing heating and cooling system.

Nonfinancial Barriers

Understanding Heat Pump Technology

Understanding heat pump technologies can be a significant barrier to increased adoption rates, both among consumers and HVAC installers, including understanding the importance of proper insulation, weatherization, air tightness, and system controls. Homeowners express difficulties in understanding how a heat pump works, even after an installer has explained the process to them.[27(p. 6)] This can result in homeowners choosing an HVAC system that they are familiar with, even if it is less efficient, rather than investing in a more expensive but efficient system they find confusing.

Knowledge of system operation is also critical as the operation of heat pump systems and controls can affect final efficiency. Heat pumps require annual servicing ($150 - $300) and correct setting and operation of system controls to function at peak capacity. Incorrect operation and lack of maintenance can lead to loss of overall system efficiency and a reduction in energy savings for the homeowner. This trend was also raised by one of our partners:

> *"Client reluctance to adopt different technologies. Lack of familiarity with the technology and how it differs from traditional heating/cooling. Lack of education on how heat pumps work and how the heat delivery is different than furnace or radiant heat."*
>
> – *Community Energy Project*

Workforce and Skill Limitations

Training in relation to heat pump technology is also a factor affecting installers, particularly when relating to new heat pump technologies such as variable speed compressor systems. As new and improved systems are released to the market, many of them require additional training that some installers may not have the time or motivation to pursue.[27(p. 6)] A lack of convenient training opportunities can make it difficult for installers to maintain the knowledge necessary to properly install new systems. This can lead to a wide range of issues including but not limited to: improper sizing of heat pump systems, poor installation quality, incorrect setting of control systems, and minimal education for homeowners about the operation of installed systems. Prior research has also demonstrated that poor installations due to the lack of formal qualification requirements can have a detrimental effect on the heat pump market as a whole.[27(p. 9)] Lack of a recognized standard qualification for installers can leave homeowners unsure about who can offer guidance, and may influence them to rely on traditional HVAC systems.

Many installers maintain a positive attitude toward heat pumps in general and believe in their added value and importance to the future. However, some contractors may encounter barriers in their day-to-day operations that can negatively affect their views of heat pump technologies. Higher up-front cost and incentive complexity, negative customer feedback due to perceived bill increases and comfort issues, unfamiliarity with newer heat pump systems, and longer installation times may influence installer perception of heat pump systems.[6]

ODOE is committed to promoting the adoption of heat pumps through workforce development. HB 3409 (2023) created an Energy Efficiency Technologies Information and Training Fund for programs that provide training for technicians and contractors. ODOE awarded $2 million in grants to six organizations to provide training for HVAC technicians, energy auditors, and contractor development. Those programs are ongoing.

Additionally, ODOE applied and received conditional awards for the Training for Residential Energy Contractors (TREC) formula and the Energy Auditor Training (EAT) Residential grant programs through the U.S. Department of Energy. ODOE was awarded $2,028,480 to fund programs that provide training for new and existing HVAC contractors, energy auditors, or contractor business development through TREC. An additional $1,664,600 was awarded to ODOE to train home energy auditors, which are needed to provide incentives through the forthcoming Home Energy Rebate Programs.

ODOE is also currently developing the Oregon Energy Strategy, due November 1, 2025, which will outline potential pathways and policies to meet Oregon’s future energy needs and policy objectives. As part of this study, ODOE will identify gaps in current and estimated occupation-level employment to meet Oregon’s future energy needs, and support and expand workforce development efforts.

Several workforce programs are also available through the Oregon Housing and Community Services’ Home Weatherization Assistance Program, the Oregon Department of Education’s Career and Technical Education (CTE) program, and the Bureau of Labor and Industries’ Pre-apprenticeship and Apprenticeship Programs.

RECOMMENDATIONS

Heat pumps have significant potential to reduce energy consumption and carbon emissions in the heating and cooling of residential and commercial buildings in Oregon. To achieve state adoption goals, additional support is needed. The following recommendations may further support heat pump adoption in the state.

Low-Income Incentive Programs

Ongoing support for low-income heat pump incentive programs should be prioritized. As shown in this report, heat pump installations have a higher total project cost and can require additional maintenance or repair work needed for homes in poor condition, making a purchase more difficult for many low-income households. Additional income-based heat pump incentives will help drive potentially life-saving heating and cooling improvements for low-income Oregonians. Without those income-qualifying incentives, it will be difficult for low-income households to access heat pumps, and they will have to turn to less expensive but less efficient alternatives that likely have higher operating costs in the long run, without the added benefit of cooling.

Cost Reduction Incentives

The high upfront cost of heat pump installation results in an average 58 percent increase in total project cost when compared to traditional HVAC installations. This increased expense represents a “gap” in affordability that may discourage some residents from opting in to a heat pump installation, even though it may cost less to operate in long run. When coupled with a lack of knowledge about how heat pumps work, and uncertainties of their long-term benefits to a household, the added cost can act as a barrier to many who may otherwise consider conversion to a heat pump. Continued ongoing support to programs focused on reducing the affordability gap to allow heat pumps to compete with traditional HVAC systems could potentially reduce this barrier, encouraging uncertain residents from all income levels into investing in the technology.

Non-Permanent Heat Pump Solutions

Residents unable to afford a permanent heat pump installation may consider traditional AC cooling if no other alternative is available, which increases energy consumption and home energy bills. Feedback provided by ODOE consulting partners demonstrates the growing need for inexpensive cooling solutions among low-income residents. Programs already being run by partners have shown an increasing demand in portable systems that can deliver home cooling while mitigating the effect of higher energy consumption. Oregon should consider either direct incentivization of portable heat pump systems or provide additional support to agencies and non-profits already engaged in PHP incentives. Providing energy efficient alternatives to traditional portable AC systems would not only support the intent of HB 3409 in reducing energy burden, but also allow for energy efficient cooling in situations where permanent heat pump installations are not possible.

Workforce Incentives

For heat pumps to perform at a level that will provide energy efficiency benefits, they must be installed in homes with sufficient weatherization. Installers must also be knowledgeable in proper sizing of equipment, weatherization, and ducts. Traditional HVAC installers may need additional training to complete quality installations of heat pumps. The Oregon Employment Department predicts that 82 percent of open HVAC positions in 2033 will be replacement openings. Programs to train existing technicians and provide outreach and training to new workers will be necessary to ensure there are enough qualified installers to meet the goals outlined by the legislature. Funding for pre-apprenticeship and apprenticeship programs will need to be expanded to additional workforce streams to fill the gaps. These additional workers may come through high school career and technical education programs, re-entry programs, and other non-traditional sources. Investments in marketing to increase awareness of career paths and potential pay can also drive interest in trade careers.

More Data About Heat Pumps in Oregon

As discussed in the report, collecting comprehensive data relating to heat pumps and their adoption in Oregon is extremely challenging. There is currently no centralized repository of heat pump data, neither within state government nor the private sector. Many of the agencies and commercial entities involved in the distribution and installation of heat pump data hold a wide array of information in varied formats. Much of the data collected is specific to their internal goals and is not necessarily ideal for the purpose of calculating overall state adoption rates. This can lead to a narrowed and inaccurate view of heat pump trends and reduce the ability to support known trends among consulting partners with supporting data. Additionally, relying on external data collection efforts removes ODOE's ability to generate data in line with reporting needs. For example, several datasets used in this study are published on a four-year schedule, while this report is issued on a biennial schedule.

The varied sources of available data can also carry a risk of duplicates or additional errors as some entities can overlap in their area of focus. There is also the problem of relevant sample size, as one comprehensive study may only contain a few hundred surveys — and while representative of a particular region, may not present a large enough sample size to accurately calculate a statewide adoption model.

The USDOE Home Energy Scoring (HES) program, already mandatory in four Oregon cities, is an existing low-cost effort that could be geographically expanded to provide needed data and inform Oregonians about residential energy efficiency opportunities. ODOE suggests that by strengthening the existing HES program, the agency can provide comprehensive home energy data, including data on installed heat pumps in Oregon.

REFERENCES

1. News Release: Benefits of Heat Pumps Detailed in New NREL Report. (2024, February 12). *NREL*. https://www.nrel.gov/manufacturing/news/press/2024/benefits-of-heat-pumps-detailed-in-new-nrel-report
2. Wilson, E. J. H., Munankarmi, B. D., Less, J. L. R., & Rothgeb, S. (2024). *Heat pumps for all? Distributions of the costs and benefits of residential air-source heat pumps in the United States* (p. 37). Lawrence Berkeley National Laboratory and National Renewable Energy Laboratory (NREL). https://doi.org/10.1016/j.joule.2024.01.022
3. Hutchinson, D. (2025). *ODOE Internal, Heat Pump tC02e reduction model* [Dataset].
4. US EPA, O. (2016, January 12). *Greenhouse Gas Emissions from a Typical Passenger Vehicle* [Overviews and Factsheets]. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
5. Hutchinson, D. (2025). *ODOE Internal, Heat Pump Affordability Model* [Dataset].
6. Slanger, D. (2024, November 20). Electrify Your Community. *RMI*. https://rmi.org/electrify-your-community/
7. House Bill 3409, 3409 (HB 3409-C), 2023 Regular Session (2023).
8. *Air-Source Heat Pumps*. (n.d.). Energy.Gov. Retrieved May 12, 2025, from https://www.energy.gov/energysaver/air-source-heat-pumps
9. *2022 Residential Building Stock Assessment* (p. 99). (2024). Northwest Energy Efficiency Alliance.
10. Lane, S. (2024, October 4). Market Transformation in a Maturing Heat Pump Market. *Northwest Energy Efficiency Alliance (NEEA)*. https://neea.org/market-transformation-in-a-maturing-heat-pump-market/
11. Reports, G. M. (n.d.). *Packaged Terminal Heat Pump Market Research Report 2033*. Retrieved September 10, 2025, from https://growthmarketreports.com/report/packaged-terminal-heat-pump-market
12. *Geothermal Heat Pumps*. (n.d.). Energy.Gov. Retrieved May 12, 2025, from https://www.energy.gov/energysaver/geothermal-heat-pumps
13. Thermal Energy Networks. (n.d.). *BDC*. Retrieved September 9, 2025, from https://buildingdecarb.org/resource-library/tens
14. *Heat Pump Water Heaters*. (n.d.). Energy.Gov. Retrieved May 13, 2025, from https://www.energy.gov/energysaver/heat-pump-water-heaters
15. Larson, B., & Larson, S. (2025). *The Amazing Shrinking Room* (p. 48). Larson Energy Research. https://www.energytrust.org/wp-content/uploads/2025/02/AmazingShrinkingRoom_ETO-BESF.pdf
16. *How Much Does a Water Heater Cost? (2025) | ConsumerAffairs®*. (2024, April 10). https://www.consumeraffairs.com/homeowners/how-much-does-it-cost-to-replace-a-water-heater.html
17. Francis, J., Amman, T., Dunn, A., & Maass, A. (n.d.). *Pricing Research for Efficient Water Heaters*.
18. Teja, A. (n.d.). *Heat Pump Water Heater Market Progress Evaluation Report #7*.
19. Bopp, D. (n.d.). *Air Source Heat Pump Measures*. RTF Meeting.
20. US EPA, O. (2016, January 12). *Greenhouse Gas Emissions from a Typical Passenger Vehicle* [Overviews and Factsheets]. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
21. *Guide to Home Heating and Cooling*. (n.d.).
22. *Ductless Minisplit Heat Pumps*. (n.d.). Energy.Gov. Retrieved May 12, 2025, from https://www.energy.gov/energysaver/ductless-minisplit-heat-pumps
23. Dymond, C. (n.d.). *Heat Pump and Air Conditioner Efficiency Ratings—Why Metrics Matter*.
24. Webb, A., Lee, H., Hardman, T., Wang, J., Stevens, C., & Horkitz, K. (n.d.). *Northwest Ductless Heat Pump Initiative: Market Progress Evaluation #8*.

25. Junghans, L. (2014). Evaluation of the economic and environmental feasibility of heat pump systems in residential buildings, with varying qualities of the building envelope. *Elsevier*, 7. http://dx.doi.org/10.1016/j.renene.2014.11.037

26. Poblete-Cazenave, M., & Rao, N. D. (2023). Social and contextual determinants of heat pump adoption in the US: Implications for subsidy policy design. *Elsevier*, 8. https://doi.org/10.1016/j.erss.2023.103255

27. Decuypere, R., Robaeyst, B., Hudders, L., Baccarne, B., & Van de Sompel, D. (2021). Transitioning to energy efficient housing: Drivers and barriers of intermediaries in heat pump technology. *Elsevier*, 10. https://doi.org/10.1016/j.enpol.2021.112709

FOR MORE INFORMATION

The Oregon Department of Energy
550 NE Capitol Street NE
Salem, OR 97301
503-378-4040 | 800-221-8035
askenergy@oregon.gov
www.oregon.gov/energy