



Northwest HVAC Market Snapshot 2022



Report Overview

This report presents results from Bonneville Power Administration's (BPA) analysis of Northwest heating, ventilation, and air conditioning (HVAC) supplier sales data in 2022. In the report, BPA and Cadeo (the research team) describe the sales data's coverage of the Northwest HVAC market and regional technology mix and efficiency information for major residential heating and cooling equipment.

This report augments the sales data summary with highlights from the research team's interviews with 22 manufacturers at the 2023 Air Conditioning Heating and Refrigeration (AHR) Expo in Atlanta. To understand residential HVAC sales as comprehensively as possible, the research team also analyzed room air conditioner sales data obtained from the Northwest Energy Efficiency Alliance's (NEEA) Retail Product Portfolio (RPP) program.

NEEA and its vendor D+R collect the sales data, leveraging existing relationships with regional HVAC suppliers. The sales data represent submittals from more than half of the known suppliers in the Northwest and include key residential technologies such as air-source heat pumps (ASHP), variable speed heat pumps (VSHP), mini-split heat pumps (MSHP), gas furnaces, and central air-conditioners (CAC). NEEA and D+R augment the data by matching equipment model numbers to equipment efficiency attributes from the Air-Conditioning, Heating, and Refrigeration Institute certification database.

Quick Hits

- **VSHPs** now make up **35%** of ducted heat pump sales
- **Gas furnace and CAC market share declined in 2022**
- Combined **heat pump sales** surpassed gas furnace sales

The resulting analyses help the region understand trends in residential HVAC sales and inform standard practice baselines. BPA uses the analysis results to inform market modeling efforts, specifically updates to BPA's Residential HVAC Market Model for the 2021 Northwest Power Plan Action Plan Period (2022–2027).

BPA and NEEA have collected and reported HVAC sales data for 6 years. While this report focuses on data from 2022, historical data is available for 2016–2021.¹ With new federal standards, metrics, and other factors impacting the market in the coming years, continued data collection with the same group of suppliers will be especially important over the next few years.

¹ <https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2016-2021-hvac-sales-data-summary.pdf>

Description of Collected Data

The data collected are from suppliers who sell products in Oregon, Washington, Idaho, and/or Montana. Most suppliers have participated consistently for the last several years. Nearly all are traditional HVAC distributors, while some are manufacturers or manufacturer representatives.

The collected sales data for residential-sized products are mainly distributed among the key technologies listed in **Table 1**: air-source heat pumps (ASHPs), variable speed heat pumps (VSHPs), mini-split heat pumps (MSHPs), gas furnaces, central air conditioners (CAC), and mini variable refrigerant flow (mini VRF) systems.



An MSHP side discharge outdoor unit

The MSHP category contains side discharge, inverter-driven (variable speed) heat pumps that manufacturers pair with a variety of indoor units. Indoor units can be ductless (wall-mounted, floor-mounted, ceiling-suspended, and/or ceiling cassettes), concealed “short-duct” systems, whole-home ducted AHUs, or a combination of ductless and ducted units. When a manufacturer allows, but doesn’t require, a side-discharge heat pump to be paired with a whole-home AHU, the research team placed it in the MSHP category. The research team opted to classify these units generally as mini-split heat pumps rather than ductless heat pumps because there is no visibility in the sales data into installation configurations. MSHPs may serve single or multiple zones.

A Note on Commercial Sales

While many of the suppliers who provided data sell into both the residential and commercial sectors, none of them distribute solely to commercial buildings. Many commercial sales go through manufacturer representatives, which are not well represented yet in the data. As a result, the collected data include significantly limited information on commercial equipment, as categorized based on capacity and power requirements.² Some commercial buildings use smaller, residential-sized equipment,³ but the sales data do not provide insights into where technologies are eventually installed. Given the limited commercial data availability, this report focuses on residential-sized equipment.

Both ASHPs and VSHPs are centrally ducted systems that provide heating and cooling through an indoor air handling unit (AHU). This report defines ASHPs as units that have single- or two-stage compressors and VSHPs as having variable-speed compressors. VSHPs are now separated into their own category in this report because VSHPs have continually increased their market share. The VSHP category also includes any side discharge, inverter-driven heat pumps when manufacturers require pairing them with ducted indoor AHUs.

² All ASHP, CAC, and MSHP over 60 kBtu/hr, all furnaces over 225 kBtu/hr, and any equipment that requires 3-phase power was classified as commercial.

³ <https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2022-commercial-hvac-permit-database.xlsx>

Description of Collected Data, cont.

Gas furnaces provide heat through an AHU from the combustion of natural gas. These can be high-efficiency condensing furnaces or standard efficiency non-condensing units.

CAC systems provide cooled air to an entire home using the vapor compression refrigeration cycle. These are single- or two-stage outdoor units that provide cooling to a centrally ducted indoor AHU. CACs are often paired with gas furnaces to provide whole-home heating and cooling.

Although mini-VRF systems are a small portion of the collected sales data, the research team is highlighting them as an emerging technology. Definitions of mini VRF vary by manufacturer, but in this report, mini VRF systems refer to larger versions of multi-zone MSHPs. They are also side discharge, inverter-driven heat pumps, but come in capacities of 3–5 tons and can serve as many as 8–10 indoor units. While MSHPs have refrigerant piping from the outdoor unit to each indoor unit, mini VRF connect all of the refrigerant piping for indoor units through a branch box.

TABLE 1 Residential Technology Description

Name	Abbreviation	Description
Air Source Heat Pump	ASHP	A single- or two-stage compressor that provides electric heating and cooling to a centrally ducted indoor air handling unit (AHU).
Variable Speed Heat Pump	VSHP	A variable-speed outdoor unit that provides heating and cooling to a centrally ducted indoor AHU. VSHP includes any ducted mini-split HPs that manufacturers always pair with an indoor AHU.
Mini-split Heat Pump	MSH	A variable-speed outdoor unit with a side discharge fan that serves one or more indoor units. The indoor units served by mini-splits can be ducted and/or non-ducted.
Gas Furnace	N/A	An indoor AHU that provides heat from the combustion of natural gas. These can be condensing or non-condensing.
Central Air Conditioner	CAC	A single- or two-stage outdoor unit that provides cooling to a centrally ducted indoor AHU. CACs are typically paired with gas furnaces to provide both heating and cooling.
Mini Variable Refrigerant Flow	Mini VRF	A variable-speed outdoor unit with a side discharge fan that serves one or more indoor units. Mini VRF systems are larger (3–5 ton) versions of MSHPs.



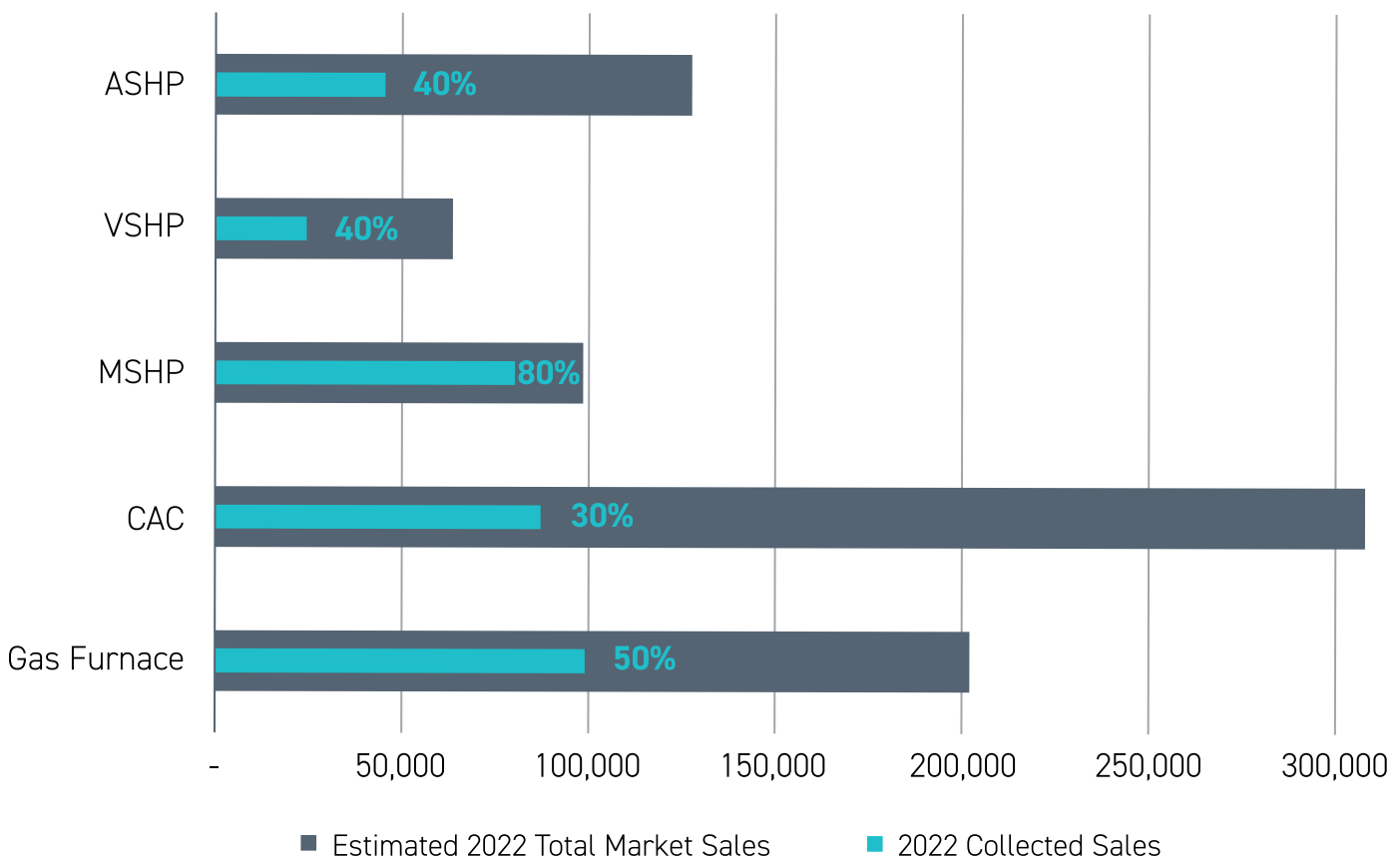
Examples of indoor ductless units that can be paired with an MSHP: a ceiling cassette (left) and a high wall-mounted unit (right)

Description of Collected Data, cont.

The 2022 collected sales data contains over 330,000 units covering the above technologies.⁴ The [Appendix](#) provides the collected sales volume by technology. Since participating suppliers do not constitute all suppliers in the region, the research team estimated the market coverage of the collected sales data by technology. BPA's Residential HVAC Market Model produces technology-specific estimates of total market sales for the main residential technologies (excluding mini VRFs) using a stock turnover model and various data sources.⁵ Figure 1 shows a comparison of sales represented by participating suppliers versus estimated total sales calculated by the Market Model.⁶

MSHPs have the best coverage, with nearly all participating suppliers reporting sales for that technology and the highest number of reporting suppliers for each state. Reported MSHP sales represent approximately 80% of the overall Northwest market, likely the result of NEEA's long-standing engagement with MSHP suppliers. ASHP, VHSP, gas furnace, and CAC sales all represent between 30 and 50% of the overall estimated Northwest market.

FIGURE 1 Market Coverage of 2022 Collected Residential Sales Data



⁴ In addition to these main technologies, collected sales data also included small quantities of commercial equipment and less common residential-sized technologies, such as packaged ASHPs and variable speed mini-split air conditioners. See the Appendix for more information.

⁵ <https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2016-2021-res-hvac-market-model-report.pdf>

⁶ The research team applied growth rates from the collected sales data to the Market Model's 2020 total market sale estimates to obtain the 2022 total market sale estimates.

Residential Insights

This section reviews insights from the 2022 collected sales data for residential applications specific to six technologies: ASHPs, VSHPs, MSHPs, gas furnaces, CACs, and mini VRFs.

Heating Technology Mix

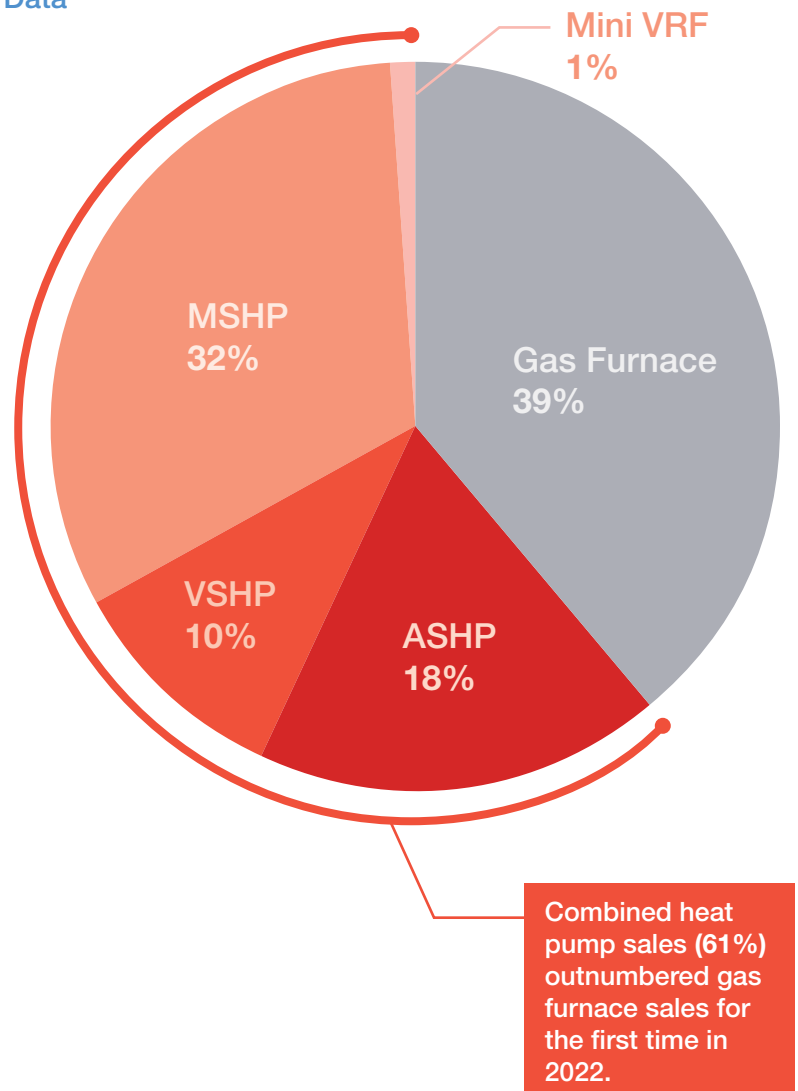
The heating technology mix (Figure 2) shows each heating technology's sales as a percentage of all heating equipment sales in the 2022 collected data. For the first time since 2016, the combined heat pump sales outnumbered the gas furnace sales. In 2022, the combination of ASHP, VSHP, MSHP, and mini VRF sales was 61% of heating equipment sales in the collected sales data. Gas furnace share was 39%.

At the 2023 AHR Expo, at least two manufacturers interviewed for this research said their sales models pointed to gas furnace sales declining by 2025—both nationally and in the Northwest. Similarly, Building Services Research and Information Association (BSRIA) forecasted gas furnace sales to hold steady in the immediate future, then start to decline between 2025 and 2027. The heating technology mix of the collected sales data shows that the slowdown in gas furnace sales may have already begun in the Northwest.

With anticipated code updates in Washington State,⁷ the Inflation Reduction Act (IRA) incentives, and public interest in electrification, heat pump sales of all types are expected to continue growing.

By reviewing and comparing national Air Conditioning, Heating & Refrigeration Institute (AHRI) historical data to U.S. Census data, the research team found that heat pump and gas furnace sales generally rise and fall with residential new construction sales.

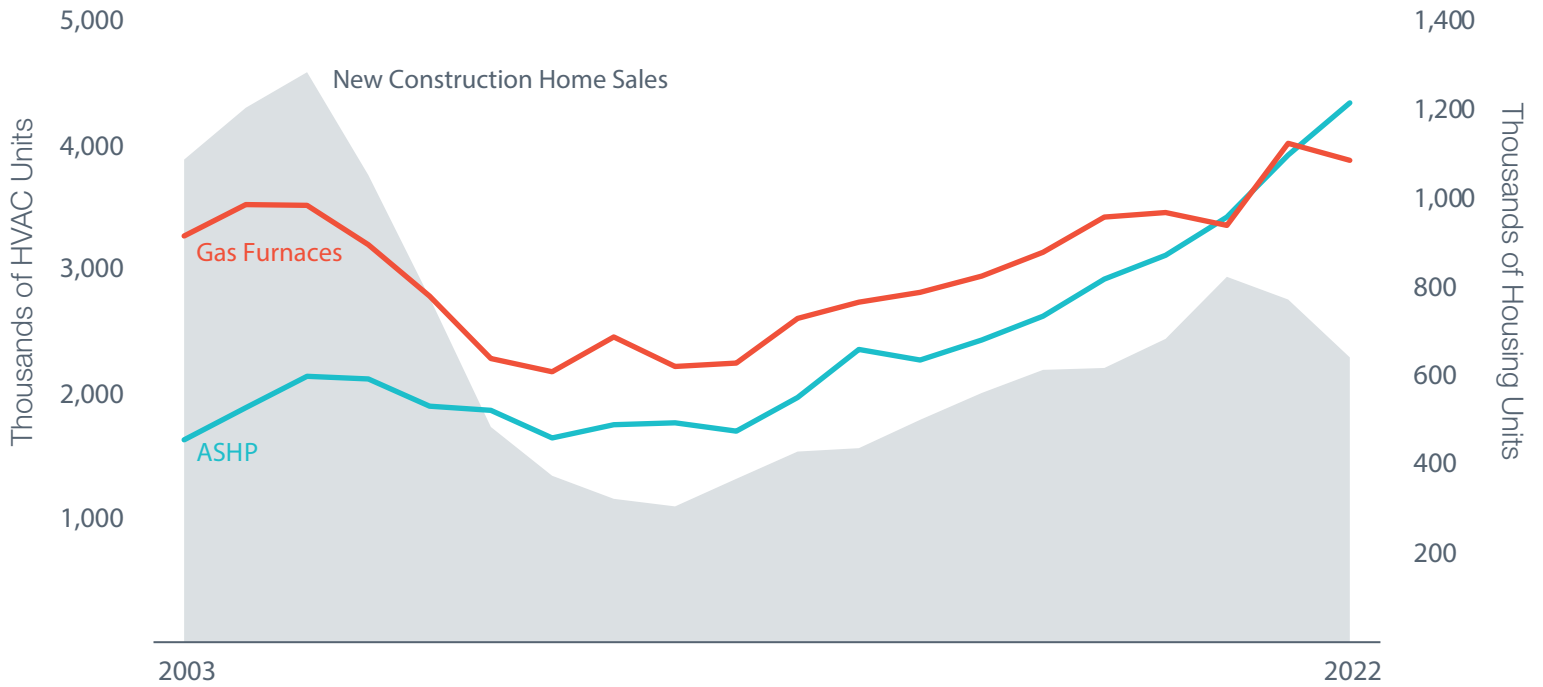
FIGURE 2 2022 Heating Technology Mix of Collected Sales Data



This year, nationwide new construction sales dropped as did sales of gas furnaces. But heat pump sales grew, and for the first time in the 20 years of AHRI data, combined sales of heat pumps (ASHP, VSHP, MSHP, and mini VRF) were higher than gas furnaces, as seen in Figure 3. While the research team is hesitant to declare that this trend will continue based on one year's data, it very well may signal a tide change. Analysis of sales data in 2023 and future years will indicate whether this trend continues in the Northwest.

⁷ <https://app.leg.wa.gov/WAC/default.aspx?cite=51-11R-40392>

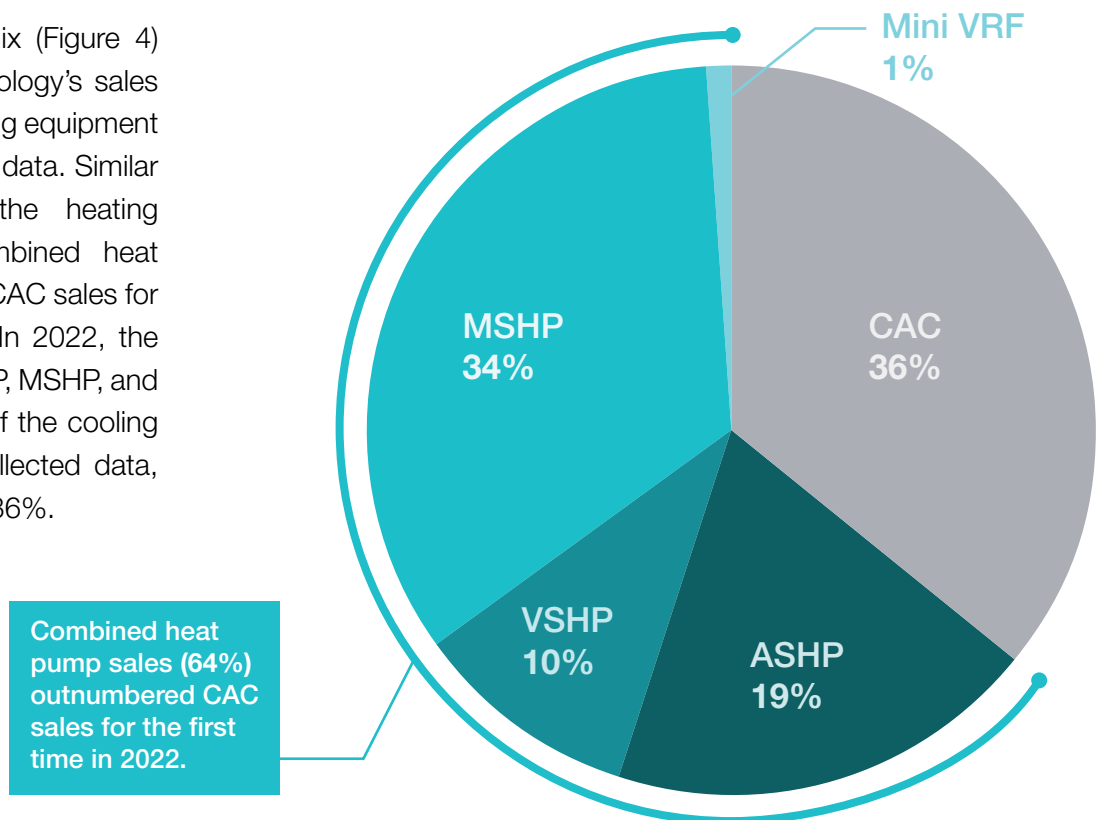
FIGURE 3 National AHRI Sales vs. U.S. Census New Construction Home Sales



Cooling Technology Mix

The cooling technology mix (Figure 4) shows each cooling technology’s sales as a percentage of all cooling equipment sales in the 2022 collected data. Similar to the observation in the heating technology mix, the combined heat pump sales outnumbered CAC sales for the first time since 2016. In 2022, the combination of ASHP, VSHP, MSHP, and mini VRF sales was 64% of the cooling equipment sales in the collected data, while CAC sales made up 36%.

FIGURE 4 2022 Cooling Technology Mix of Collected Sales Data



ASHPs and VSHPs

All centrally ducted heat pumps, both ASHPs and VSHPs, have continued to grow in market share. They now represent over a quarter of heating equipment sales (with similar representation in cooling equipment sales). As a reminder, ASHPs are defined in this report as including only single- and two-stage ducted split system units, whereas VSHPs are defined as ducted split-system units with variable-speed compressors. VSHPs have seen enormous growth over the past few years and now account for 35% of all ducted heat pump units.

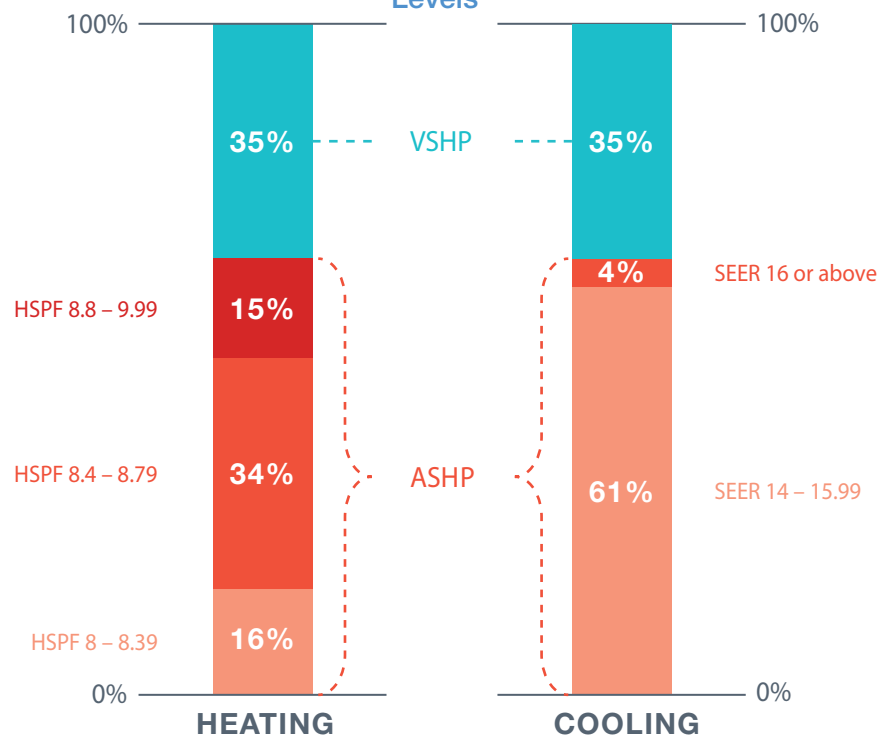
At the 2023 AHR Expo, one manufacturer commented that the biggest change they've seen in the Northwest is that now 35–40% of heat pump sales are inverter-driven, matching the collected sales data. The same representative said they forecast this percentage to rise in the next 5 years.

In 2022, VSHPs made up 35% of ducted heat pump sales

In 2022, federal regulations required split-system heat pumps to have a minimum heating efficiency of HSPF 8.2 and a minimum cooling efficiency of SEER 14.⁸ The majority of ducted heat pumps sold in 2022 were more efficient than the existing mandatory requirements.

As seen in Figure 5, only 16% were in the lowest efficiency tier that just met the federal minimum. Nearly half (49%) were a mid-tier ASHP with an HSPF between 8.4 and 9.99, and 35% were VSHP. Within the VSHP category are ranges of efficiency ratings—a majority of VSHP have HSPF values between 8.8 and 9.99 while some units have HSPF above 10. On the cooling side, 61% of ducted heat pumps were in the lowest tier, 4% of ducted heat pumps have a SEER rating of 16 or above, and 35% were VSHP. While there are many factors that affect energy use,⁹ modeling shows that an average VSHP consumes less energy than the highest HSPF tier of ASHPs (which are single- and two-stage).¹⁰

FIGURE 5 Ducted Heat Pump Heating and Cooling Efficiency Levels



⁸ HSPF stands for heating seasonal performance factor and SEER stands for seasonal energy efficiency ratio.

⁹ For example, the sizing of the heat pump, duct sizing, duct insulation, and controls.

¹⁰ <https://www.bpa.gov/-/media/Aep/energy-efficiency/momentum-savings/2016-2021-res-hvac-market-model-report.pdf>

ASHPs and VSHPs, cont.

HSPF and SEER are not the only important efficiency metrics—other factors impact how much energy a heat pump uses, especially on VSHP units. NEEA research has shown that low load efficiency (LLE) is an important factor in determining energy consumption for VSHPs.¹¹ LLE can make a significant difference in energy use because there are many hours in the year when a heat pump does not operate at the most extreme outdoor conditions. Currently, NEEA defines LLE as ducted units having a coefficient of performance (COP) of 4.5 or higher at 47°F.

In addition to LLE, several other features may be important to consumers and to utility programs. Some VSHPs might be designated as cold climate if they perform well at very low temperatures (e.g., 5°F). Others may be sold with advanced diagnostics that help commission and monitor equipment or demand response capabilities that allow utilities to lower power draw at peak demand times.

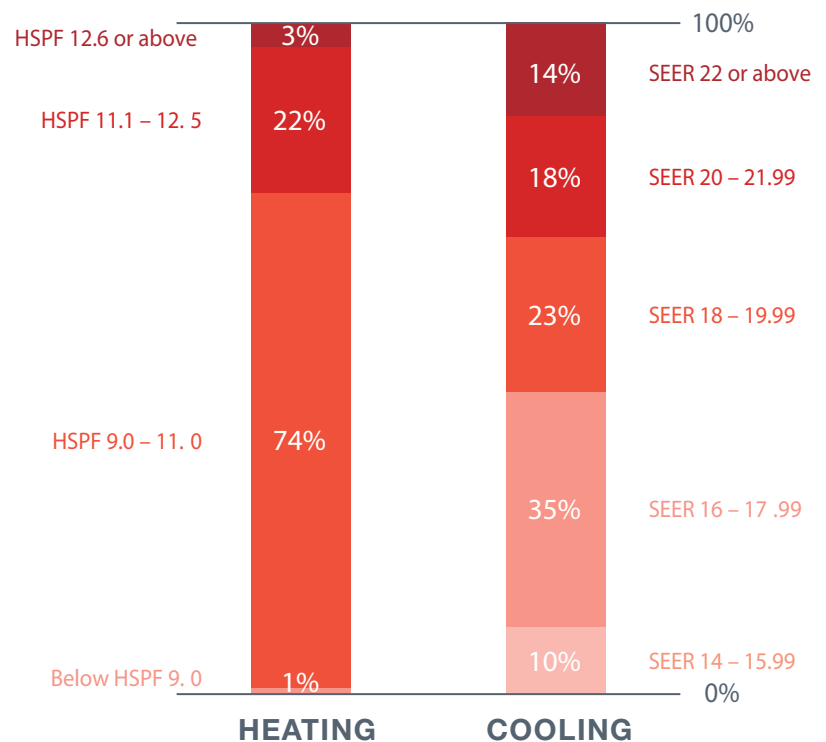
Starting January 1, 2023, suppliers of residential CACs and ASHPs had to meet new standards using the metrics of SEER2 for cooling and HSPF2 for heating. The new rating procedure requires manufacturers to test units using a higher external static pressure than the previous test, which tends to make SEER2/HSPF2 values lower than previous SEER/HSPF values. Equipment sales with the new metrics are not included in 2022 but will appear in next year's data.

Mini-split Heat Pumps

Mini-split heat pumps represent a third of heating equipment sales in 2022. MSHPs use the same variable-speed compressor technology for their outdoor unit as VSHPs but are typically used in smaller applications. Distributors can sell MSHPs with one or more indoor units: ductless fan coil units, concealed duct (aka “short duct”) systems, or combinations of these to create a multi-zone system. Some MSHPs may also get paired with whole-home air handling units. While MSHPs are increasingly used in some form of ducted and/or hybrid configurations, the majority are paired only with ductless indoor head(s) and often referred to as ductless heat pumps.

MSHPs must meet the same federal standards as ASHPs. However, MSHPs are inherently variable speed, and only 1% of sales are in the lowest heating efficiency tier, as seen in Figure 6. Nearly three quarters of the MSHP sales in 2022 were in the mid-tier of HSPF 9 to 11, and 25% of consumers installed units with HSPF above 11. On the cooling side, only 10% of MSHPs were in the lowest tier that just met federal standards.

FIGURE 6 Mini-split Heat Pump Heating and Cooling Efficiency Levels

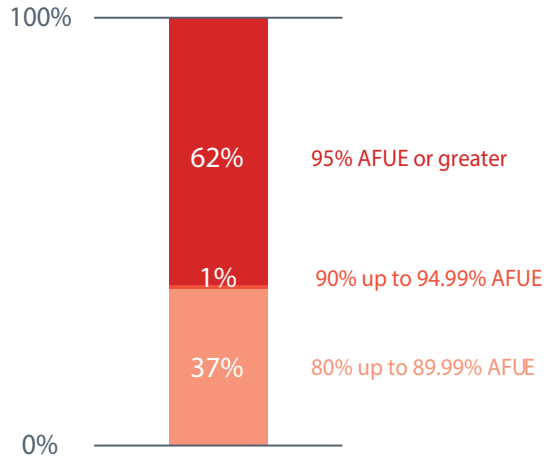


¹¹ <https://neea.org/resources/variable-speed-heat-pump-product-assessment-and-analysis>

Gas Furnaces

For the first time since 2016, gas furnace sales dipped below the combined heat pump sales. While the share of gas furnace sales dropped in 2022, they still represent 39% of heating technologies. Gas furnace efficiency (Figure 7) continues to be bifurcated, with 37% of consumers installing code-minimum units and 62% choosing highly efficient condensing burners with AFUE of 95% or higher.

FIGURE 7 Gas Furnace 2022 Efficiency Levels

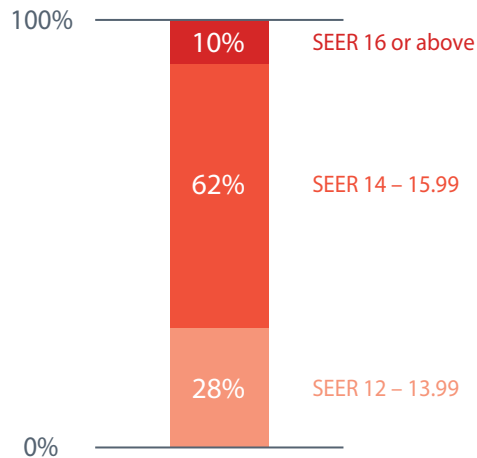


Central Air Conditioners

CAC sales represented 36% of all cooling equipment sales, their lowest share since data collection started in 2016.

CAC efficiency, as seen in Figure 8, shows that consumers generally purchase mid-tier units, with 62% of sales at slightly higher than minimum standards. Most other sales, 28%, are in the lowest tier, while 10% are in the highest efficiency levels.

FIGURE 8 Central Air Conditioner 2022 Efficiency Levels



A mini VRF unit

Mini VRF

In the 2022 collected sales data, a very small portion—approximately 2000 units—were identified as mini VRFs. While mini VRF equipment is still uncommon compared to other heat pump technologies, sales nearly quadrupled in 2022.

At the 2023 AHR Expo, three different manufacturers specifically mentioned mini VRFs, indicating the interest in growing this as another offering in their heat pump catalog.

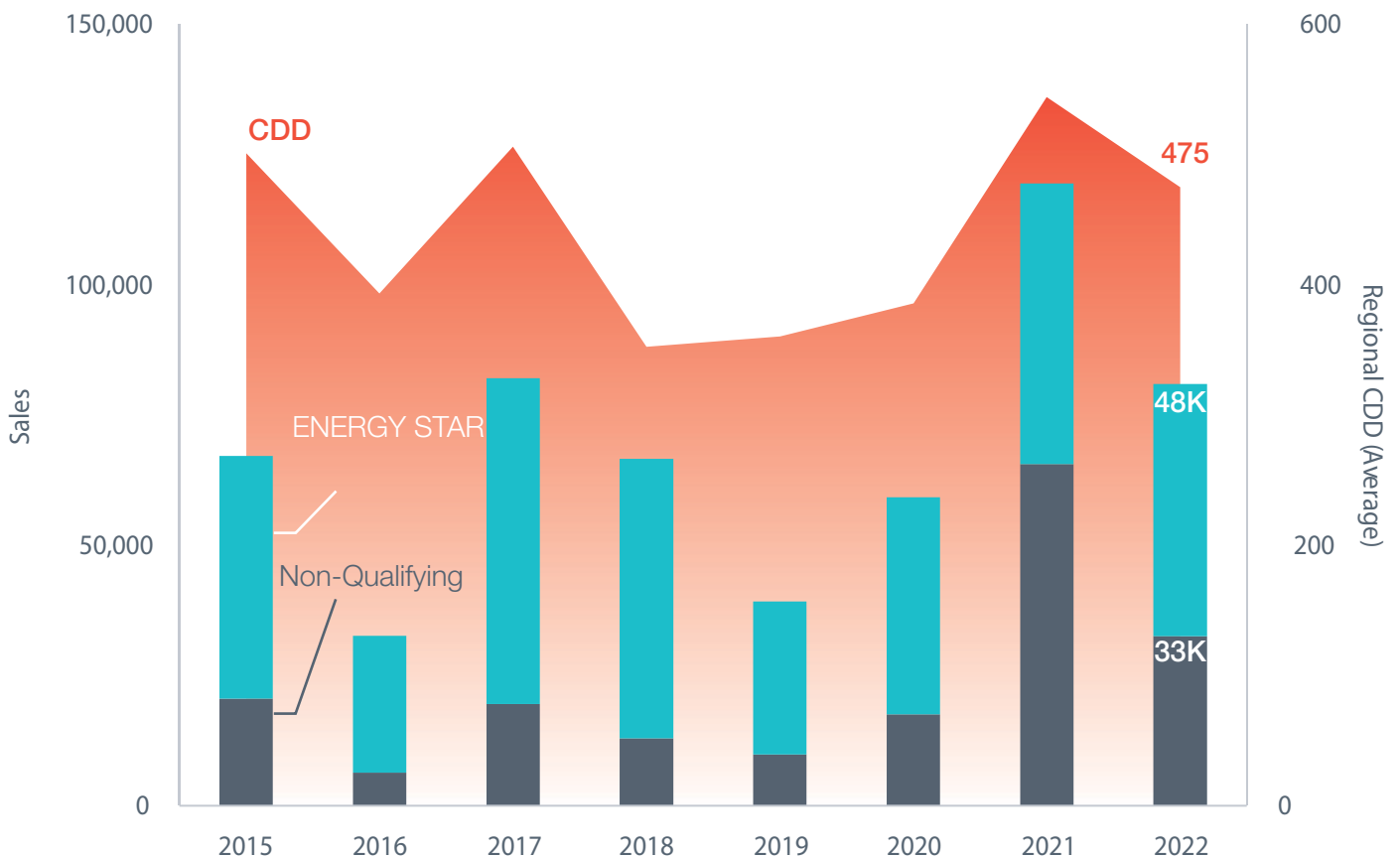
Supplemental Data on Room Air Conditioners

The sales data collected from HVAC suppliers do not include sales of room air conditioners. However, to provide a comprehensive report on the residential cooling market, this report includes a summary of room AC sales that NEEA obtains separately from retailers.

NEEA's RPP platform works directly with corporate-level national retailers to provide mid-stream incentives on qualified energy-efficient products. One of the key products is room air conditioners, meaning units that consumers can mount in a window seasonally and plug into a standard 120V electrical outlet.

Room AC sales can vary significantly year over year. Figure 9 indicates that room AC sales typically correspond with the number of cooling degree days (CDD), a metric that shows how "hot" a particular year was. In 2021, the number of non-qualifying (lower efficiency) units surpassed the ENERGY STAR-qualified units for the only time since data collection started in 2015. The research team theorizes that supply chain issues may have impacted the availability of higher efficiency units in 2021. In 2022, room AC sales dropped along with CDD, and the efficiency rebounded.

FIGURE 9 ENERGY STAR vs. Non-ENERGY STAR Room AC Sales Compared to Cooling Degree Days (CDD)



Appendix: Table of 2022 Collected Sales by Sector and Technology

The sales volumes of 2022 collected data are presented in this section. In addition to filling in temporal and geographic data gaps, the research team made minor adjustments to the data to reflect the specific categorization necessary to align with BPA's Residential HVAC Market Model, including a sector categorization for residential and commercial equipment using the following criteria:

Air Source Heat Pumps, Ductless Heat Pumps, and Central Air Conditioners	
RESIDENTIAL	COMMERCIAL
capacity of less than or equal to 5 tons (60 kBtu/hr)	capacity of greater than 5 tons (60 kBtu/hr)
Gas Furnaces	
RESIDENTIAL	COMMERCIAL
capacity of less than 225 kBtu/hr	capacity of greater than or equal to 225 kBtu/hr
All HVAC Equipment	
COMMERCIAL	
all HVAC equipment listed with three-phase power	

	Technology	2022 Collected Sales Quantity
RESIDENTIAL	Gas Furnace	99,099
	Central Air Conditioning	87,147
	Mini-Split Heat Pump	80,287
	Air-Source Heat Pump	45,373
	Variable Speed Heat Pump	24,436
	Variable Speed Mini-Split and Multi-Split Air Conditioning	2,304
	Mini VRF	1,950
	Direct Heating Equipment ¹²	869
	Single Packaged Heat Pump	725
	Gas Packaged Unit	3,415
COMMERCIAL	Unitary Large Equipment	2,390
	Packaged Terminal Heat Pump (PTHP)	1,626
	Single Packaged Central Air Conditioner	728
	Air-Source Heat Pump	677
	Central Air Conditioning	640
	Single Packaged Heat Pump	530
	Variable Refrigerant Flow	155
	Packaged Terminal Air Conditioner (PTAC)	135

¹² Direct heating equipment uses gas and is installed in the room that it is intended to heat; the equipment heats air and distributes the warmed air directly to the room. Common names for this equipment include space heaters, wall heaters, floor heaters, hearth heaters, and room heaters.