E360 Outlook JULY 2025

Retrofit residential boilers with hydronic heat pumps

How contractors can electrify hydronic home heating by retrofitting gas-powered boiler systems

COPELAND
Engineered for Sustainability

Our rigorous testing capabilities, research labs and field trials help ensure maximum quality and value for the hydronic heat pump equipment supply chain.

The global transition from gas to electric home heating systems continues to gain momentum in the United States. For several years, heat pump adoption rates have been rising, driven by federal efficiency standards, state mandates to phase down fossil fuels, and homeowner desires to reduce their electricity costs and carbon footprints.

From standard air-to-air, air-to-water (i.e., hydronic) and dual-fuel (i.e., hybrid) options, heat pump system technologies are emerging and advancing to meet diverse consumer and climate requirements.

When the topic of heat pump retrofits arises, we often think of the more common air-to-air heat pumps. But what about the nearly five million U.S. single-family homes heated with hot water from gas-powered boilers, distributed through radiators, baseboards or underfloor piping systems?

These boiler-based hot water distribution systems are widespread in older homes throughout the Northeast, Pacific Northwest and large Midwestern metropolitan areas. They're often also located in progressive states that are more likely to prioritize decarbonization and electrification efforts.

Enter hydronic heat pump technologies for residential applications.

Contractors can retrofit an older home with a hydronic heat pump, utilizing its existing radiators, baseboards and distribution systems. In some regions, this could replace the gas-powered boiler without sacrificing comfort. In colder areas, homeowners could keep their gas boiler as a backup to their heat pump during cold winter months—essentially, in a dual-fuel configuration.

Unlike traditional boilers, which provide only hydronic heating and domestic hot water (DHW) production, retrofitting with a hydronic heat pump also delivers cooling in the summer, resulting in an all-in-one solution for comfort cooling, heating and hot water.

Hydronic heat pump retrofits —decarbonization potential and comfort comparison

Unlike boilers powered by fossil fuels, air-to-water hydronic heat pumps are electric and designed to utilize water as both a heat transfer medium and delivery system. An outdoor unit extracts heat from the ambient air—even in cold temperatures—and a heat exchanger transfers the heat to a water-based refrigerant loop. A pump distributes hot water evenly through a network of pipes connected to a home's hydronic infrastructure, such as radiant floor heating systems, baseboards, or fan coil units.

In cooling mode, the process reverses: heat from inside a home is absorbed by the water and released outside through the outdoor unit.

From a decarbonization perspective, hydronic heat pumps offer a one-two punch of energy efficiency and decarbonization. They're inherently more efficient because they harness renewable energy from the air to move heat rather than generate it, producing more heating/cooling units than they consume. Because hydronic heat pumps are electric, they eliminate the direct carbon emissions from using traditional gas-powered boiler systems.

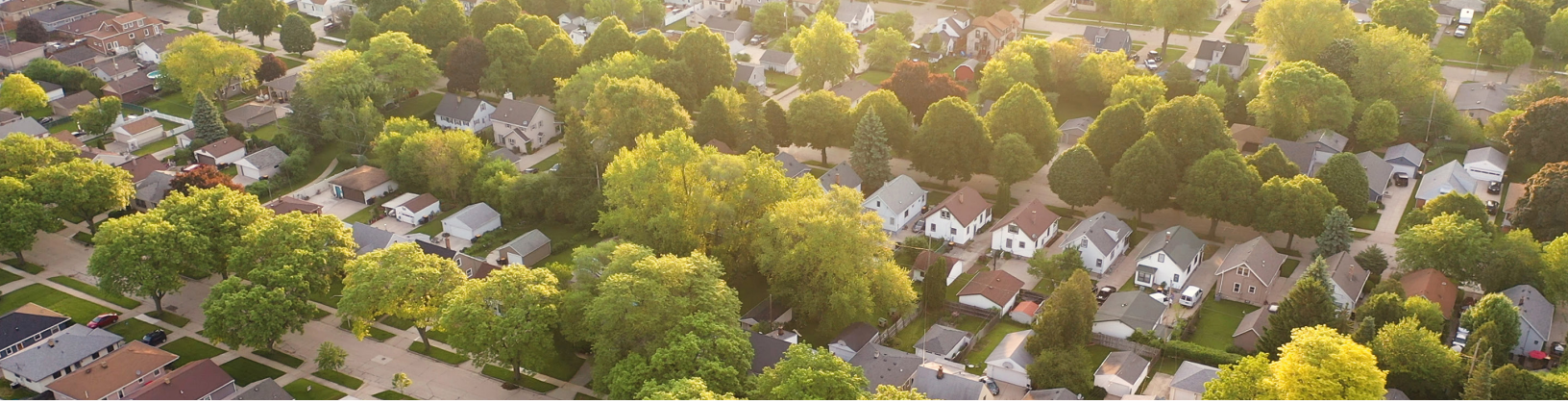
In terms of heating capacity, a typical residential hydronic heat pump produces a maximum of 140 °F hot water compared to up to 180 °F of fuel-based systems. Thus, in cold climates, many contractors advise homeowners to keep their existing boiler systems or an electric heating (e.g., strip heat) as a backup. In this dual-fuel configuration, the hydronic heat pump runs year-round and only relies on the backup source to bridge the comfort gap in cold conditions.

Economic considerations: Understanding first versus total costs

Contractors should also be aware that first costs may be higher than traditional systems, but the potential for consistent energy savings over decades may offer a lower total cost of ownership (TCO). This is especially true for homeowners who live in areas with high electricity rates or those who integrate their energy-intensive DHW heating into the heat pump system.

State and federal incentives, as well as utility rebates, may help offset these costs. Although federal incentives may be at risk under the Trump administration, many states are increasing efforts to electrify and decarbonize.

- The Inflation Reduction Act (2022) introduced its Energy-efficient home improvement credit. This EPA ENERGY STAR program enables homeowners to claim up to 30 percent of the costs of qualifying air-source heat pumps (with a maximum of $2,000).
- The New England Heat Pump Accelerator (NEHPA) is a collaborative initiative among five states—Connecticut, Massachusetts, Maine, New Hampshire, and Rhode Island—aimed at accelerating the adoption of heat pump technologies. Recognizing the prevalence of hydronic (radiator-based) heating systems in New England, NEHPA allocates funding to develop and promote heat pump solutions that are compatible with these systems, thereby facilitating boiler replacements in existing homes. Contractors and homeowners can access rebates through state programs like Efficiency Maine and Mass Save.
- Many local utilities and heat pump manufacturers also offer rebates and incentives.



Selecting best-fit hydronic heat pump technologies

Copeland hydronic heat pump compression platforms and integrated components are engineered to help OEMs provide the water temperatures needed to achieve desired comfort levels while maximizing system efficiencies.

We partner with leading hydronic heat pump and boiler OEMs to help them solve their most difficult technological and engineering challenges. Our heat pump product ecosystem includes monobloc units, compression platforms, control boards, inverters, valves, controls and thermostats.

The Copeland YHW variable-speed scroll compressor with enhanced vapor injection (EVI) technology provides best-fit, optimized operating envelopes for hydronic heat pump applications.

- Enables hydronic heat pumps to achieve 140 °F water temperatures in low-ambient conditions while providing year-round, seasonal efficiency in part-load operation.
- Supports high heating-to-cooling ratios to ensure homeowner comfort in peak summer and low winter temperatures.

Copeland's integrated compression and system technologies are engineered for hydronic heating sustainability. They achieve high energy efficiencies, reducing indirect emissions, while utilizing lower-GWP refrigerants to lower direct emissions (e.g., R-454B). Copeland is also developing low-GWP solutions below 150 GWP using R-454C, which can deliver water temperatures up to 160 °F for a variety of hot water applications.

Conclusion: Explore the advantages of hydronic heat pumps in retrofit applications

Hydronic heat pumps have numerous advantages over fossil-fuel-powered, hydronic and forced-air systems. First, they lower homeowners' carbon footprints, especially in regions with renewable grid sources. Next, they leverage water's high thermal capacity to deliver heat more consistently and efficiently than forced-air systems.

Lastly, hydronic heat pumps can operate at lower water temperatures than traditional boilers. This means they require less energy to maintain the desired temperature, thus reducing energy consumption.

Copeland's legendary scroll compressor reliability and component dependability give contractors the confidence to upgrade homes with existing gas-powered boiler systems. Our products are designed to meet and exceed performance, reliability and efficiency expectations for OEMs, contractors and homeowners alike. Our rigorous testing capabilities, research labs and field trials help ensure maximum quality and value for the hydronic heat pump equipment supply chain.

Please visit our website to learn more about how we're leading the evolution and acceleration of hydronic heat pumps.

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