

# Heating reimaged: Industrial-scale heat pumps for building decarbonization

Revolutionizing the way we heat buildings by integrating industrial-scale heat pumps to produce carbon-free eSteam™

Industrial-scale heat pumps are revolutionizing the energy industry. With the ability to produce [temperatures of up to 150C](#), these powerful systems have become a sustainable solution across the globe. As the demand for carbon-free heating increases, the shift away from fossil fuels is finally gaining momentum.

Vicinity is transforming district energy by installing an industrial-scale heat complex. This innovative heat pump complex will draw heat from nearby water sources to generate steam and improve the system's efficiency. Ensuring that the river and its ecosystems remain unharmed, the river intake system lifts heat from the river and brings it into our facilities.

## Key facts



Our Cambridge heat pump will have a steam export capacity of 35MW (thermal)



The heat pump will occupy a space of approximately 25,000 sq ft. +/-



The heat pump will circulate through 24.5 million to 49 million gallons of water from the Charles River daily

## How heat pumps work

- 1 The heat pump compressor, powered by electricity from renewable resources compresses natural refrigerant to pressures upward of 1,000 psig.
- 2 The heated refrigerant is conducted to a heat exchanger for low-pressure steam generation.
- 3 The low-pressure steam is transferred to a multi-stage steam compressor, which increases steam pressure from 5 psig to 220 psig, the required pressure for distribution into the district energy system.
- 4 After generating steam, the refrigerant is routed to a feedwater pre-heating heat exchanger and is condensed.
- 5 The liquified refrigerant is then expanded through an expansion valving arrangement. The expansion reduces the refrigerant pressure, gasifies the refrigerant, and sharply reduces the refrigerant temperature to less than 30 degrees Fahrenheit.
- 6 The cold, gaseous refrigerant is conducted to a river water heat exchanger to collect energy from the river water. The river water heat exchanger heats the gaseous refrigerant several degrees Fahrenheit while cooling the river water several degrees Fahrenheit. The cooled, gaseous refrigerant is conducted back to the heat pump compressor for reuse in the heat pump cycle.



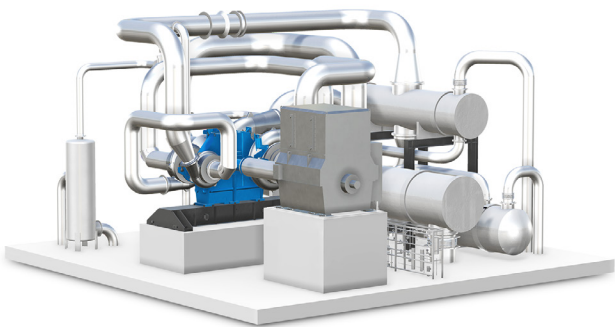
Vicinity announcing its partnership with Augsburg, Germany-based MAN Energy Solutions to collaborate in the development of low-temperature source heat pump systems for steam generation.

### How Vicinity is using heat pumps

Industrial-scale heat pumps will be installed in cities around the country where Vicinity's facilities are located near water sources and already employ water intake systems. These heat pumps will extract heat from adjacent water sources, like the Charles and Schuylkill Rivers, to generate steam and improve the system's overall efficiency.

Across all of our operations, heat pumps will be used with electric boilers and thermal storage technologies to fully decarbonize our operations.

This first heat pump complex in Cambridge will be powered by renewable electricity to efficiently harvest energy from the Charles River and return the water to a lower temperature.



Early design of the industrial-scale heat pump Vicinity Energy is developing in partnership with MAN Energy Solutions.

### Why industrial heat pumps are important for Vicinity, our customers, and the environment

The global energy transition can only succeed with decarbonizing heat. Why? Heating in buildings is responsible for four gigatons (Gt) of CO2 emissions annually—10% of global emissions, according to the International Energy Agency (IEA). The heating sector accounts for 30-40% of CO2 emissions globally.

Water-source heat pumps are a proven solution to fossil-fuel-driven heating because they can efficiently harness the renewable power of water sources.

In 2021, approximately [10% percent](#) of the global demand for space heating was satisfied by heat pumps. In some countries such as Norway, Sweden, and Finland, heat pumps are the most widely used heating source and have already begun integrating with district energy systems. The district system in Glasgow will leverage heat pumps to extract cold water from the adjacent River Clyde. This will cover over 80% of building heat demand and will deliver immediate carbon reductions of 50%.

By installing industrial-scale heat pumps at our central facilities, Vicinity is one step closer to instantly decarbonizing millions of square feet of building space for the good of our customers, communities, and the cities we operate. The impact of this plan is substantial: by 2035, Vicinity's investments at our Kendall, MA facility will reduce the carbon intensity of our steam by 50%, the equivalent of 400,000 tons.

To learn more about Vicinity's plans to decarbonize, visit [www.vicinityenergy.us](http://www.vicinityenergy.us), or email [info@vicinityenergy.us](mailto:info@vicinityenergy.us).

