Accelerating Decarbonization with District Energy

January 8, 2025

The Association of Energy Engineers - New England Chapter

About Vicinity

Vicinity owns, operates, and maintains the largest portfolio of district energy systems across the U.S.

- **19 district energy systems** poised for decarbonization nationwide
- **250 million square feet** of buildings served
- **400+ MW of CHP** owned and operated
- Potential to **avoid 2 million metric tons of carbon annually**

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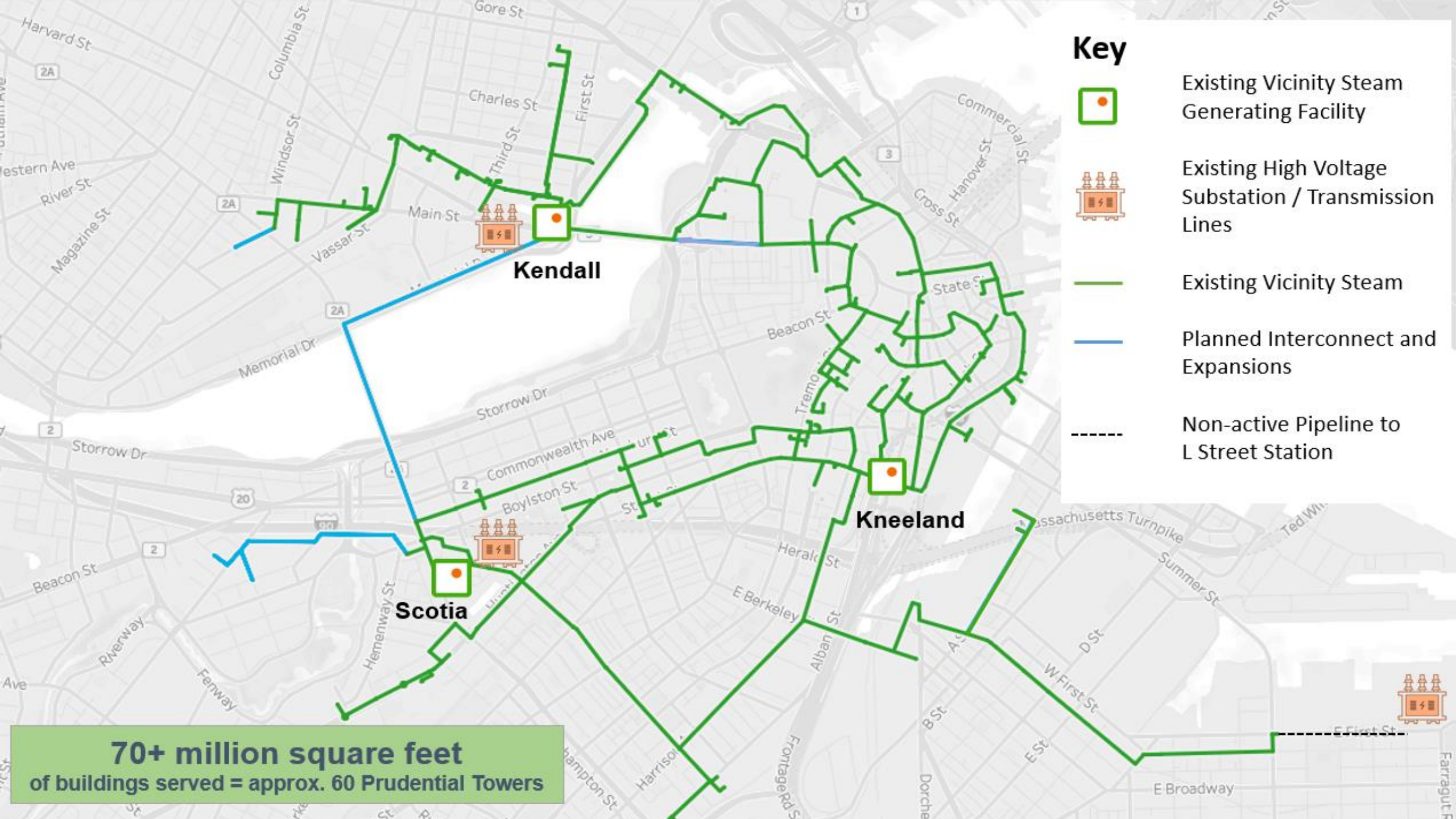
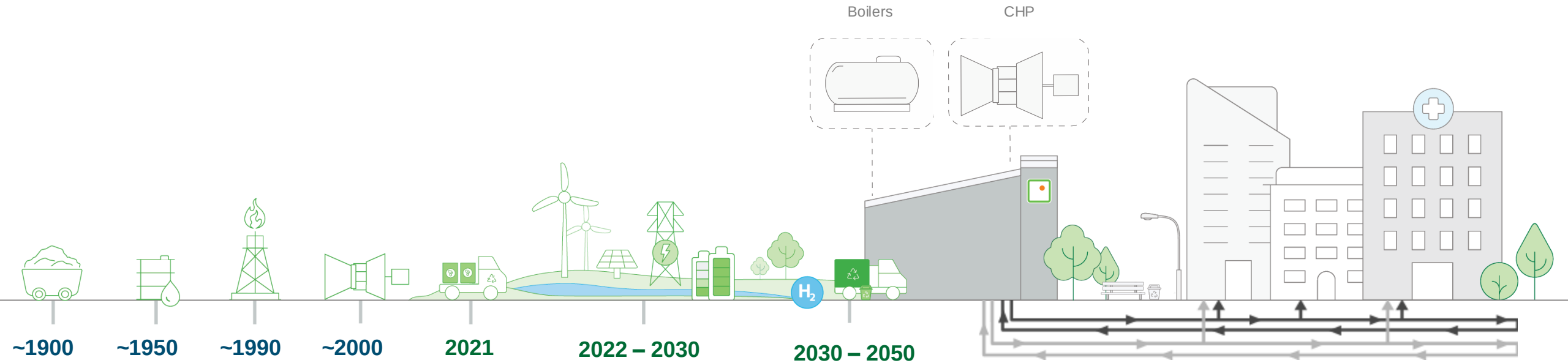

Key
Existing Vicinity Steam Generating Facility
Existing High Voltage Substation / Transmission Lines
Existing Vicinity Steam
Planned Interconnect and Expansions
Non-active Pipeline to L Street Station
Kendall
Kneeland
Scotia
70+ million square feet
of buildings served = approx. 60 Prudential Towers

Leveraging Existing Infrastructure, New Technologies and Renewable Energy Sources to Decarbonize the Building-energy Sector

District Energy has a 100-year history of greening and Vicinity will deploy innovative technologies to achieve ***net zero carbon emissions by 2050... Cutting our emissions in half by 2035***



~1900 Coal

~1950 Oil

~1990 Natural Gas

~2000 Combined Heat and Power (CHP)

2021 **Biogenic Fuel**

2022 – 2030 **Electrified steam generation, industrial scale heat pumps, and long-term energy storage (electric/thermal) for carbon-based dispatch**

2030 – 2050 **Hydrogen, RNG and other fuels/technologies as they become available**

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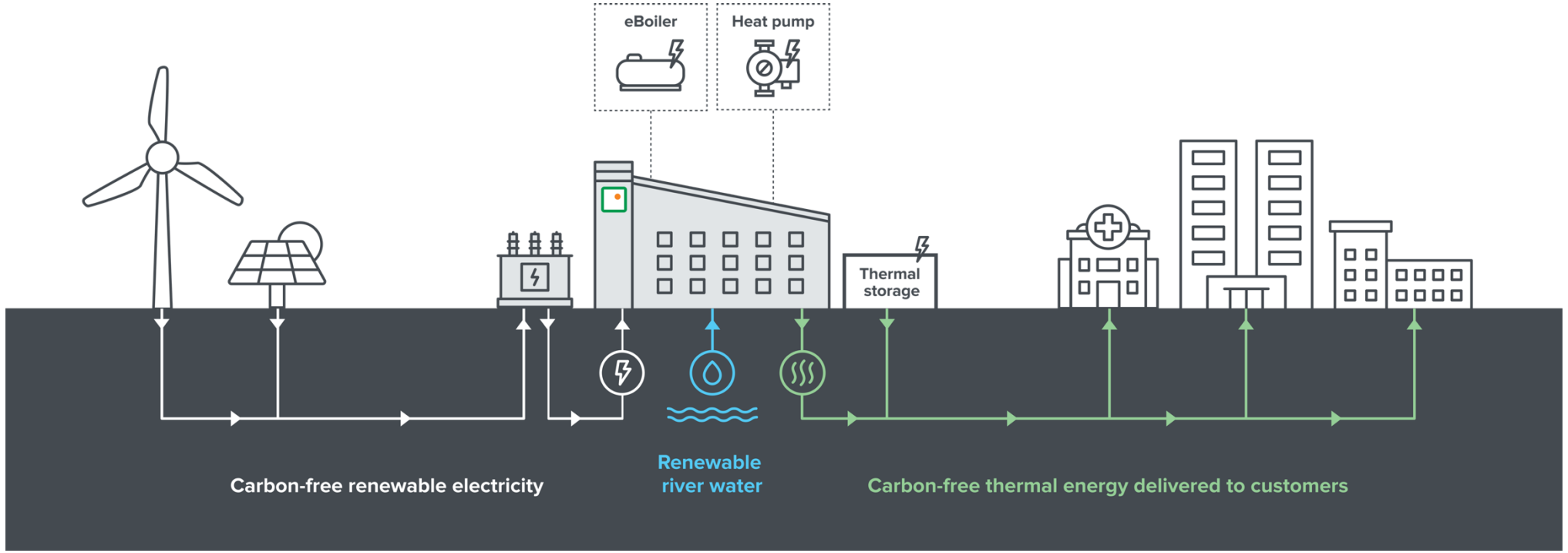
How eSteam™ works

Vicinity will use a combination of heat pumps, electric boilers, and thermal storage technologies to create carbon-free eSteam™.



1 Procure
Vicinity will procure electricity from renewable, carbon-free energy sources and import the power through a co-located electric substation.

2 Produce
Powered by renewable electricity, electric boilers and industrial-scale heat pumps will transform water into eSteam™.

3 Optimize
Provides on-demand eSteam™ production from stored, off-peak renewable electricity.

3 Distribute
Carbon-free eSteam™ will be distributed to customers through existing underground piping infrastructure.

Decarbonization Strategy: leveraging all three technologies

Suitable for districts with existing river water intake systems and ability to centralize technology

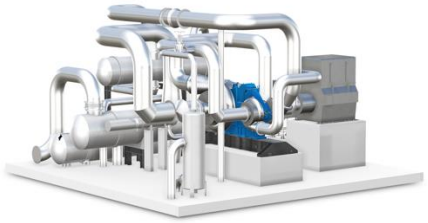
Electric boilers

Online Fall 2024

Existing technology; “easy” to procure and install; drives rapid adoption; ability to locate in existing plants

Progress:

- Entered service November 2024



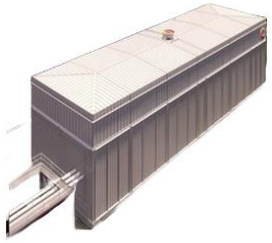
Heat pumps

Online
2028

Harness the 24-7 renewable power of rivers; achieve higher COP and baseload capabilities; need proximity to river and existing water intake

Progress:

- Construction design and bid process underway



Thermal storage

Online 2029/2030

Valley surf for better renewable pricing; appropriate when electrification technology is centralized in large facilities

Progress:

- Technology selection underway. Pacing offshore wind installation.

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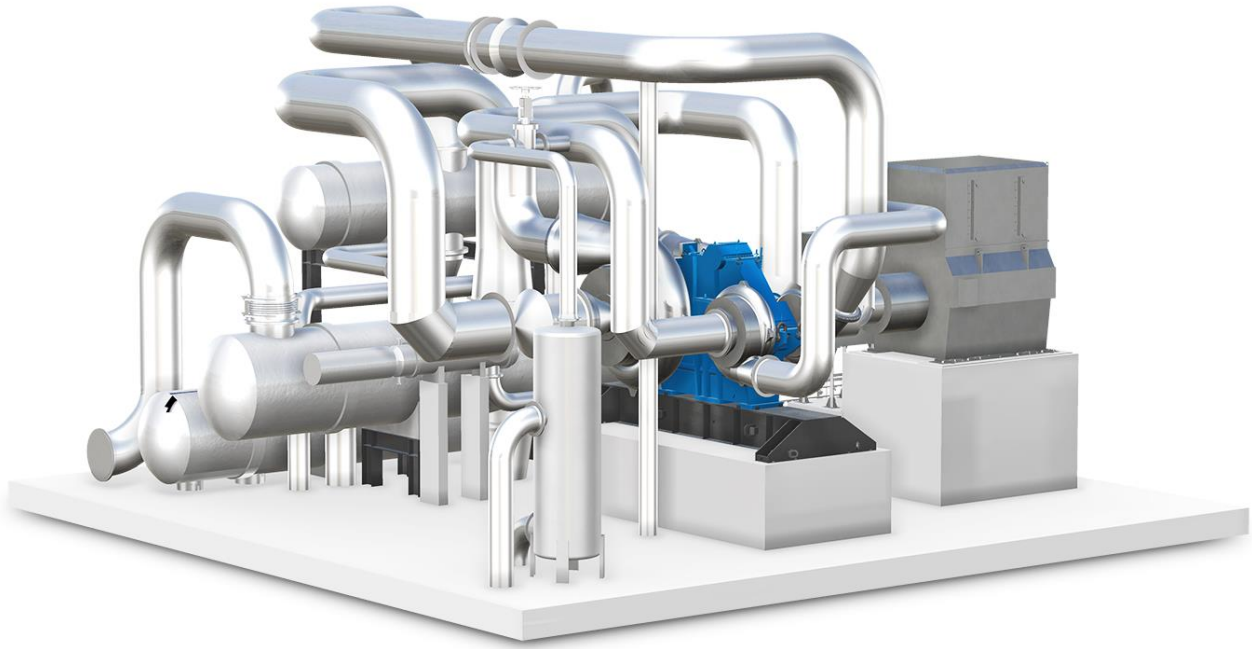
Vicinity Bringing Cutting Edge Green Tech to Boston/Cambridge:
Industrial-scale heat pump complex at Vicinity's Kendall facility

- 35MW in size represents largest heat pump located in North America.
- Generates carbon-free eSteam™, capable of decarbonizing 40% of Vicinity's system.
- New heat pump system occupies approximately 25,000 square feet, completely integrated into existing Kendall Station footprint and building envelope.
- Represents cutting edge heat pump technology, currently being deployed in Europe to decarbonize major cities.
- On schedule and actively expanding users for 2028 deployment.



Early design of the industrial-scale heat pump in development.

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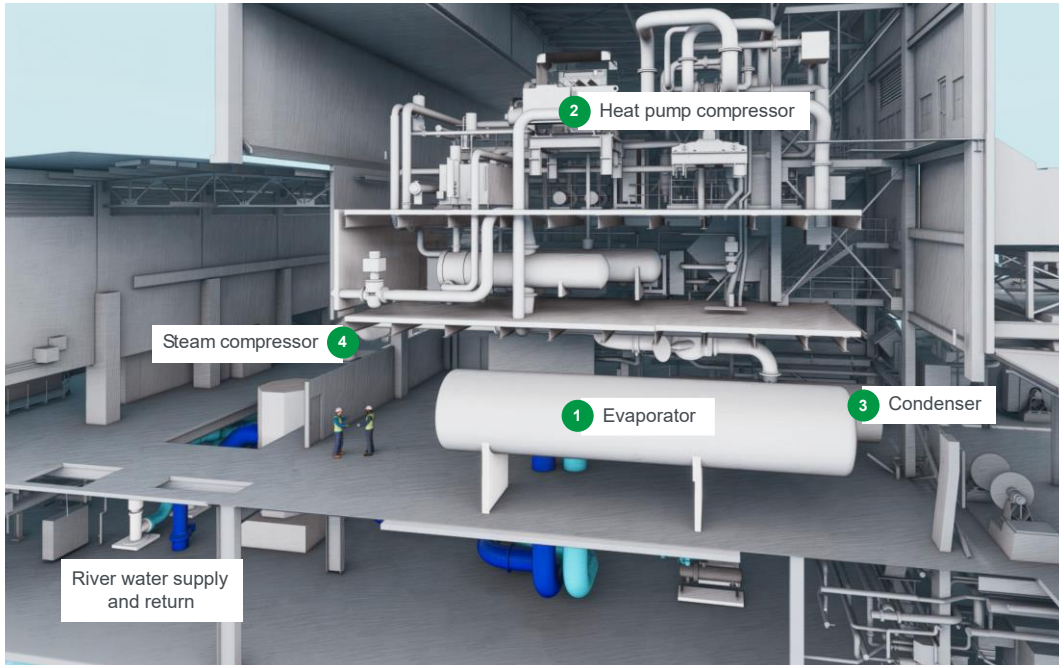
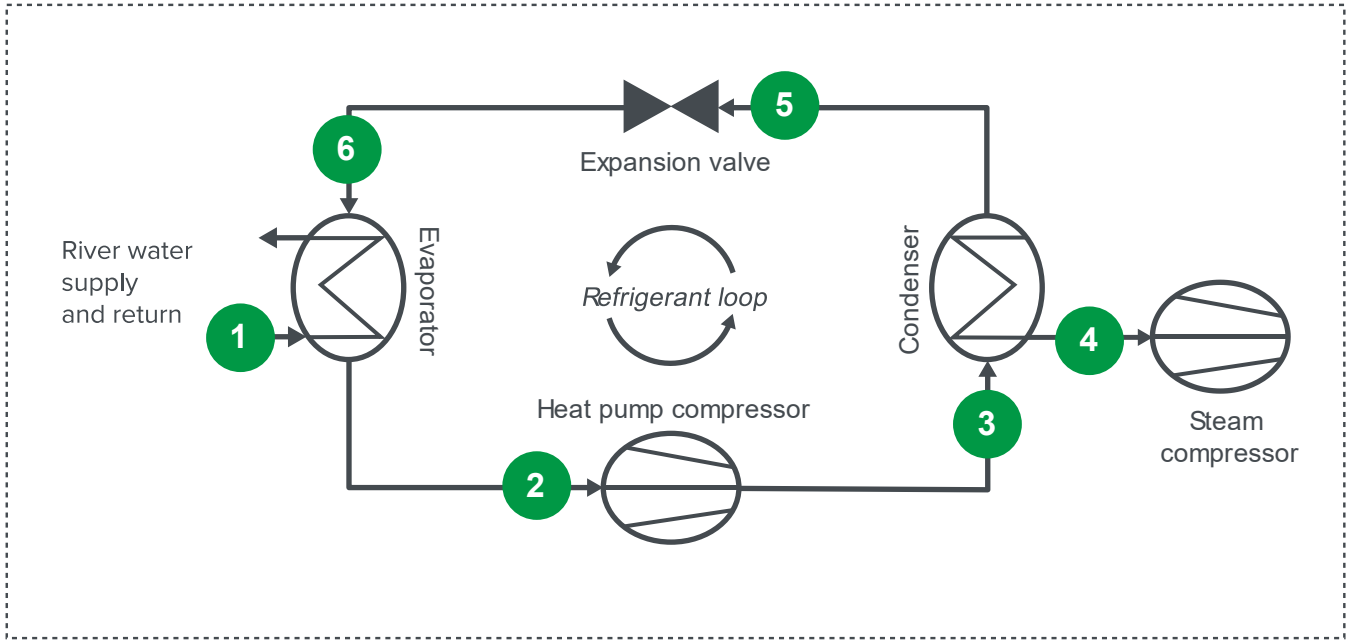
Industrial-scale river-source heat pump complex process





1 **Evaporator:** River water is pumped into the evaporator to warm the cold refrigerant.

2 **Heat pump compressor:** Renewable electricity powers the compressor to pressurize the refrigerant.

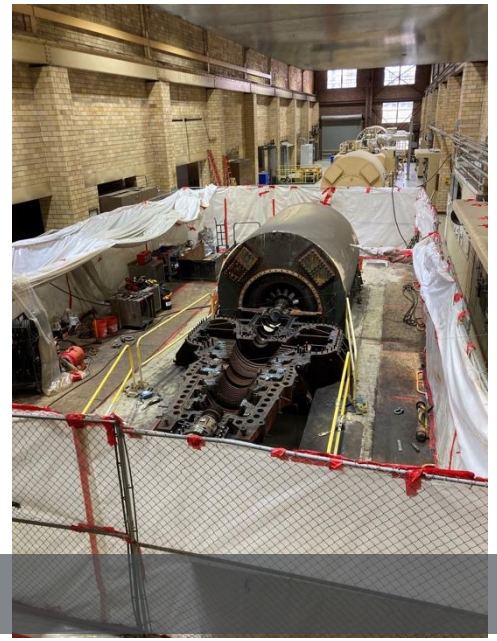
3 **Condenser:** Hot, pressurized refrigerant creates low-pressure carbon-free eSteam™ from feed water.

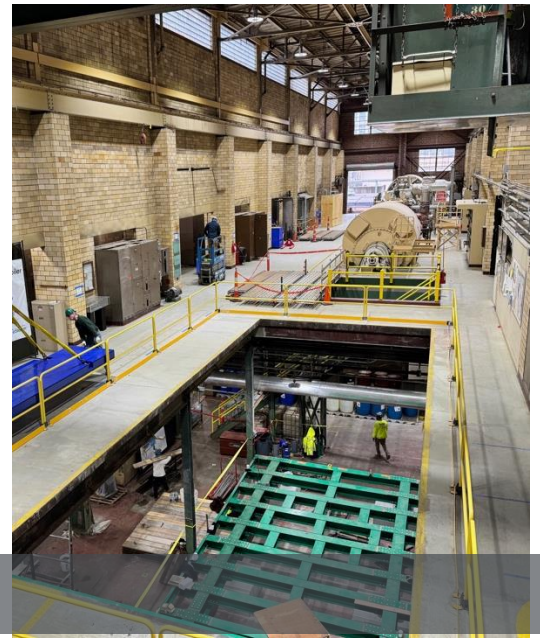
4 **Steam compressor:** A multi-stage compressor increases the eSteam™ pressure for distribution.

5 **Expansion valve:** The refrigerant is cooled and depressurized for the next cycle.

6 **Evaporator:** Cooled water is returned to the river, and the process repeats.

Kendall Facility Transformation – 42MW Electric Boiler



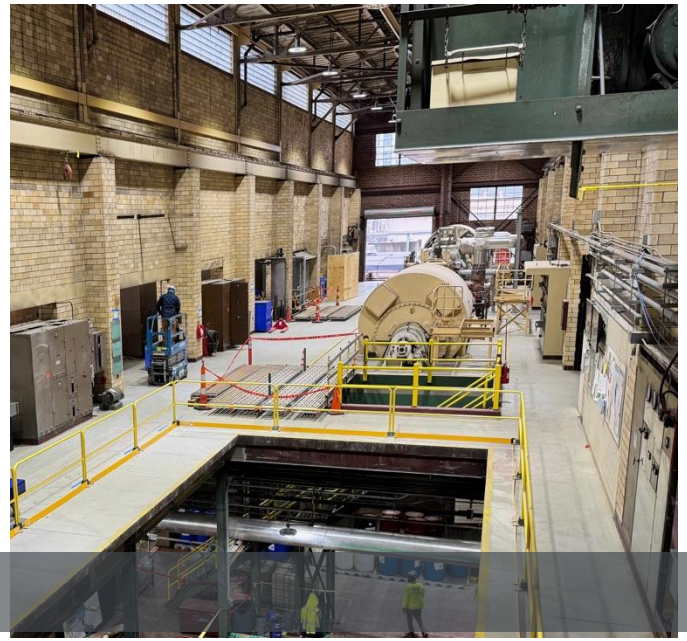


Starting our electrification journey alongside Mayor Wu in 2022 to delivering eSteam™ with our first 42MW electric boiler on November 19, 2024.

1,400+ mlbs of eSteam delivered to date.

Kendall Facility Transformation – 35MW Heat Pump Complex

2022



2024

Building on this momentum, we continue advancing our electrification efforts to prepare for our heat pump complex, which will enter service in 2028.

To learn more, please visit

https://www.vicinityenergy.us/

-or contact-

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THANK YOU!