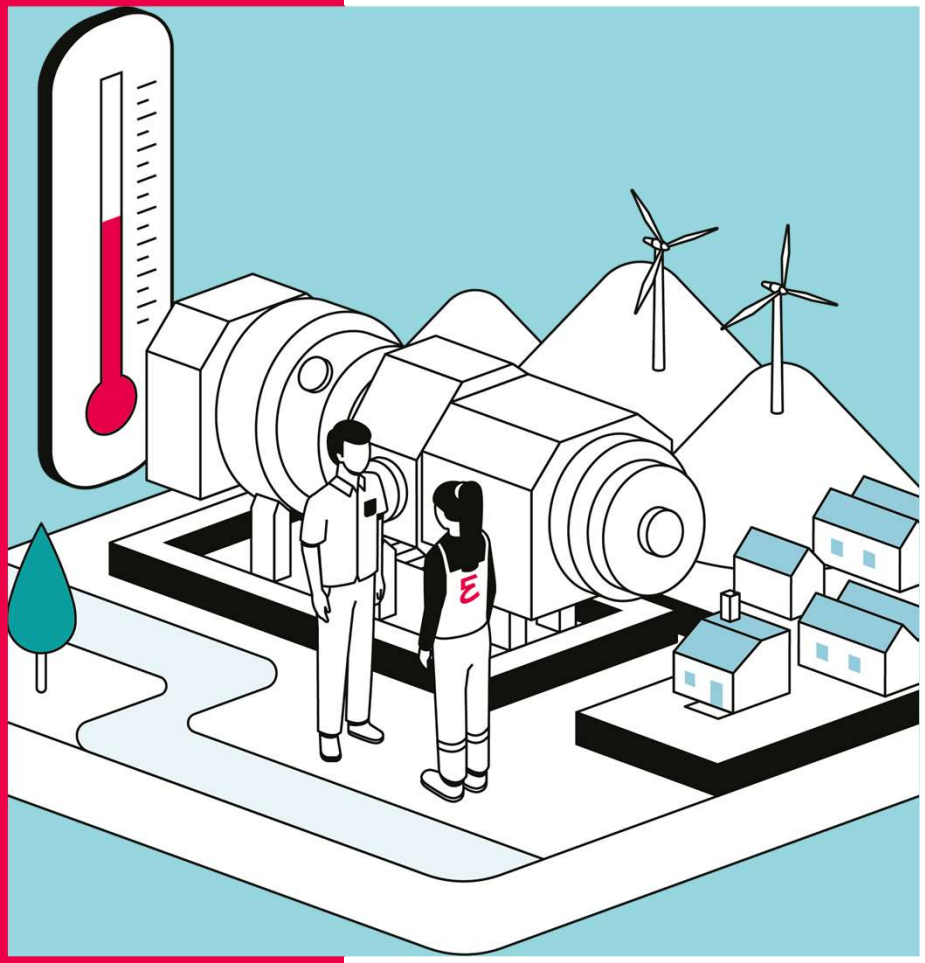
Everllence

# Integrating Geothermal Heat Sources into Industrial Heat Pump Systems



Mobola Dosumu | National Sales Manager – Heat Pumps

November 19, 2025

# Everllence in numbers

**2025** MAN Energy Solutions becomes Everllence

**2023** We sum up our strategy in our new purpose – ‘Moving big things to zero’

**2018** Our new strategy is launched, making decarbonization central to our business success

**15,000** employees

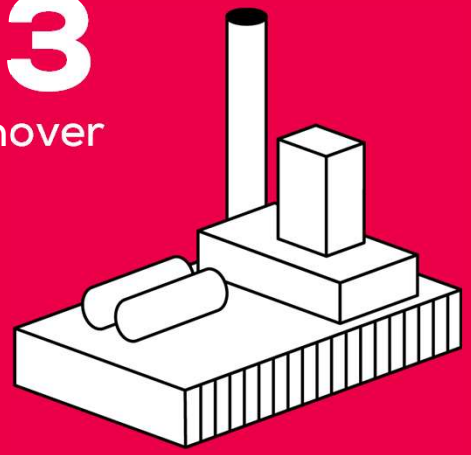
present in **50** countries

**140** sites

**260+** years of experience

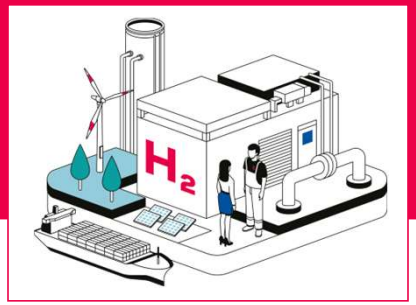
**€4.3** bn turnover

**50%** reduction in $CO_2$ emissions in our production sites by 2030



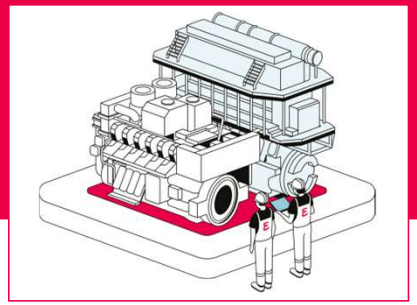
# Our key technologies

These are the technologies we rely on to help our clients achieving the target of ‘net zero’



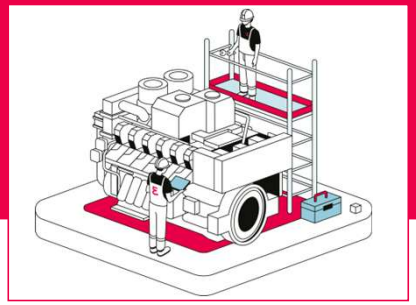

## PEM electrolysis and Power-to-X

We offer expertise in PEM electrolyzers for producing green hydrogen and in reactors for Power-to-X processes (eco-friendly e-fuels).



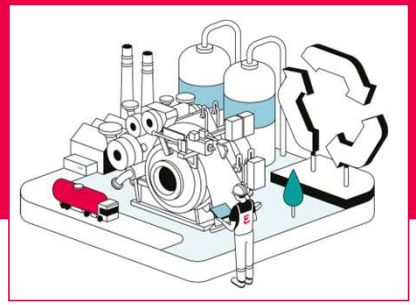
## Future fuel engines

Our engines can run on a variety of climate-neutral fuels, including synthetic natural gas, methanol and ammonia.



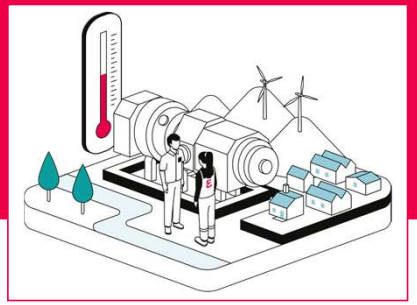
## Retrofits

Ocean-going vessels and power plants are long-term investments. Through our retrofit programs, we convert engines to make them future-proof – so they can run on low-emission fuels.



## Carbon Capture, Utilization & Storage

We offers technologies for processing $CO_2$ from industrial processes safely. Once it has been captured, $CO_2$ can be stored or reused, creating a circular carbon economy.



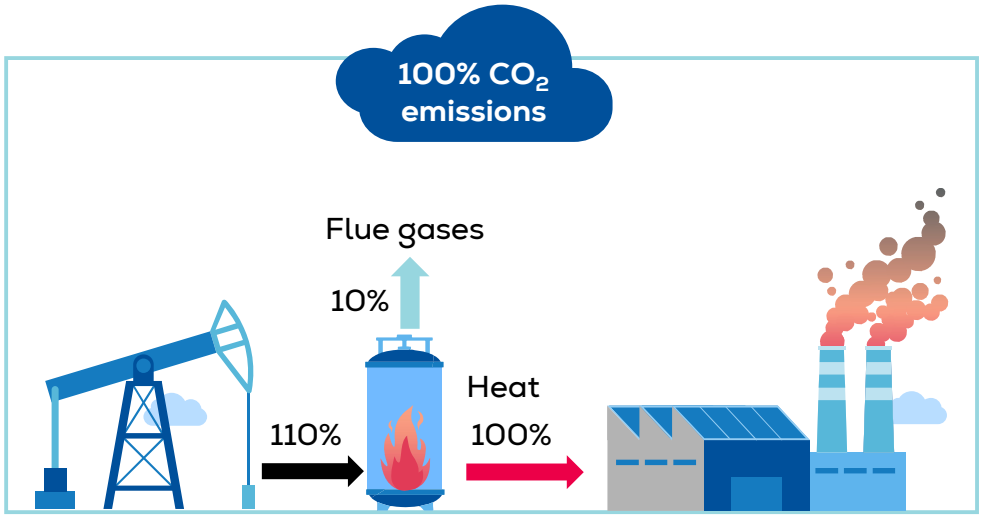
## Large-scale heat pumps

Our large-scale heat pumps use heat sources such as rivers, oceans, industrial waste heat or ambient air to decarbonize industry and households.

# Heat Pumps - solution for zero emissions heat

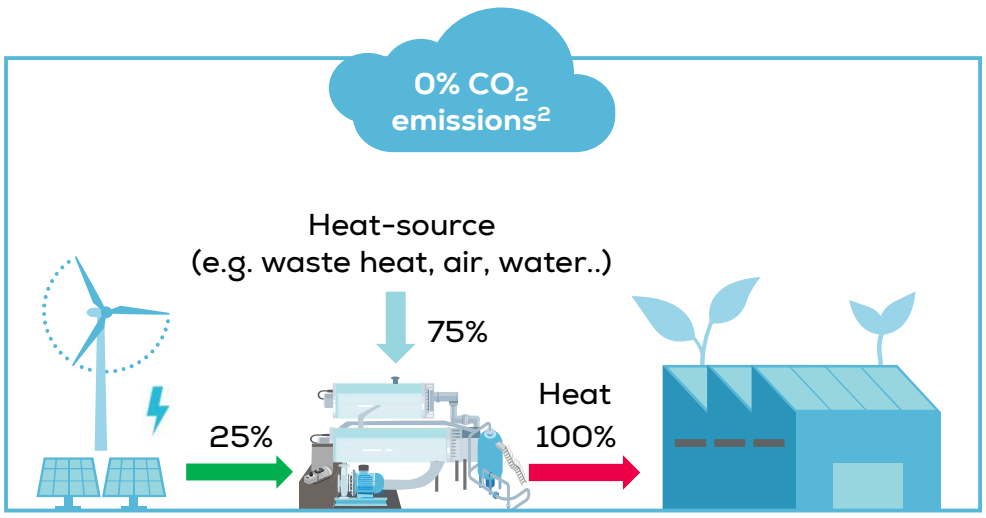
Eco-friendly heat generation

## Fossil fuel driven heat generation




Fossil fuel → Steam boiler[1] → Industrial consumer or district heating network

## Heat pump driven heat generation

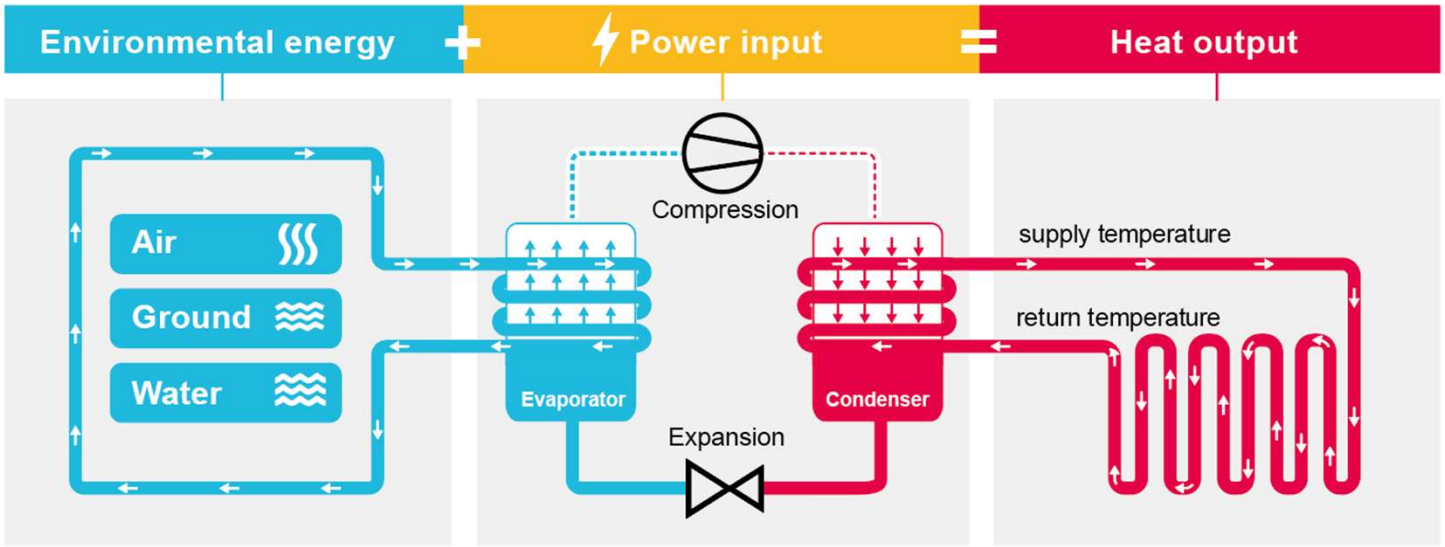



Electric power → Heat pump → Industrial consumer or district heating network

1.Efficiency of about 90%
2.Using renewable electricity, ~30% CO2 emissions based on current electricity mix

# Functional principle of Heat Pump

Transfer energy from low to high temperature level by using power from the grid




$$\text{COP} = \frac{\text{Heat output}}{\text{Power input}}$$

**Heat Pump** = electrification of heat

**COP** = coefficient of performance

Source: www.waermepumpe.de/waermepumpe/funktion-waermequellen/
https://www.iea.org/reports/the-future-of-heat-pumps/how-a-heat-pump-works

# Heat Sources for Mega-Heat Pumps


## Water

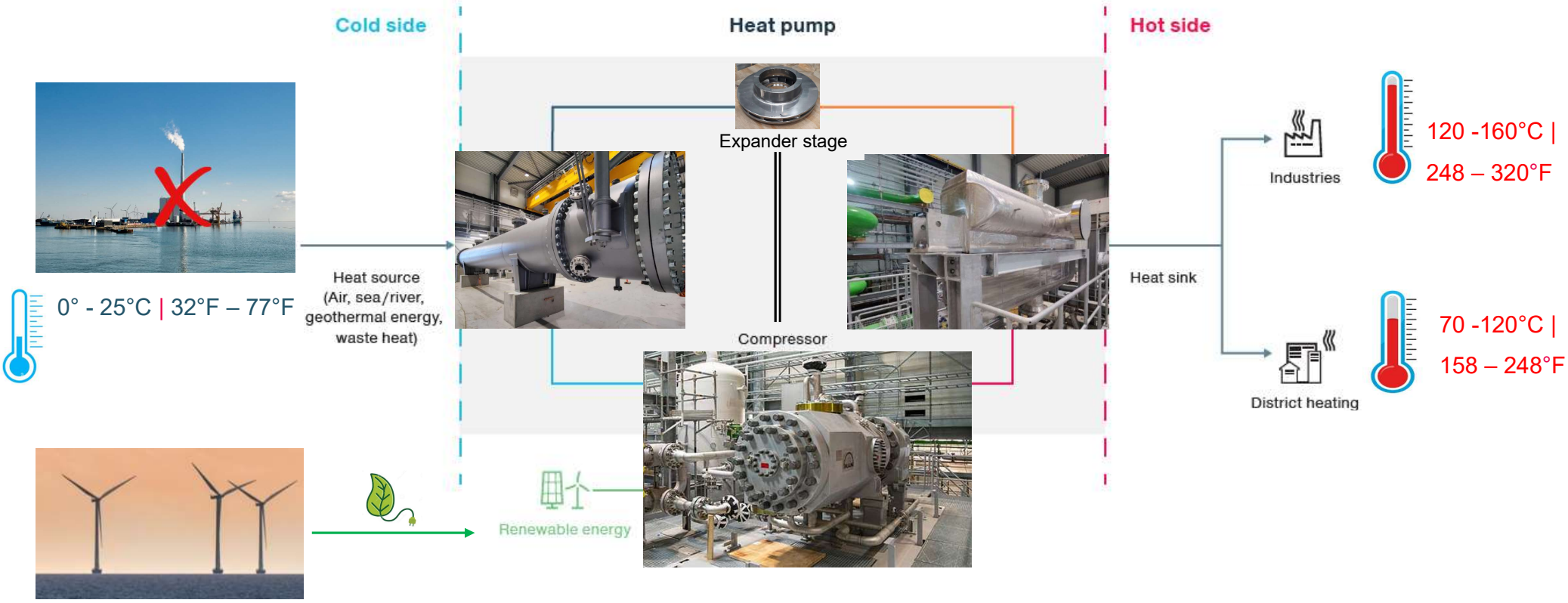
## Ambient Air

## Industrial Waste Heat

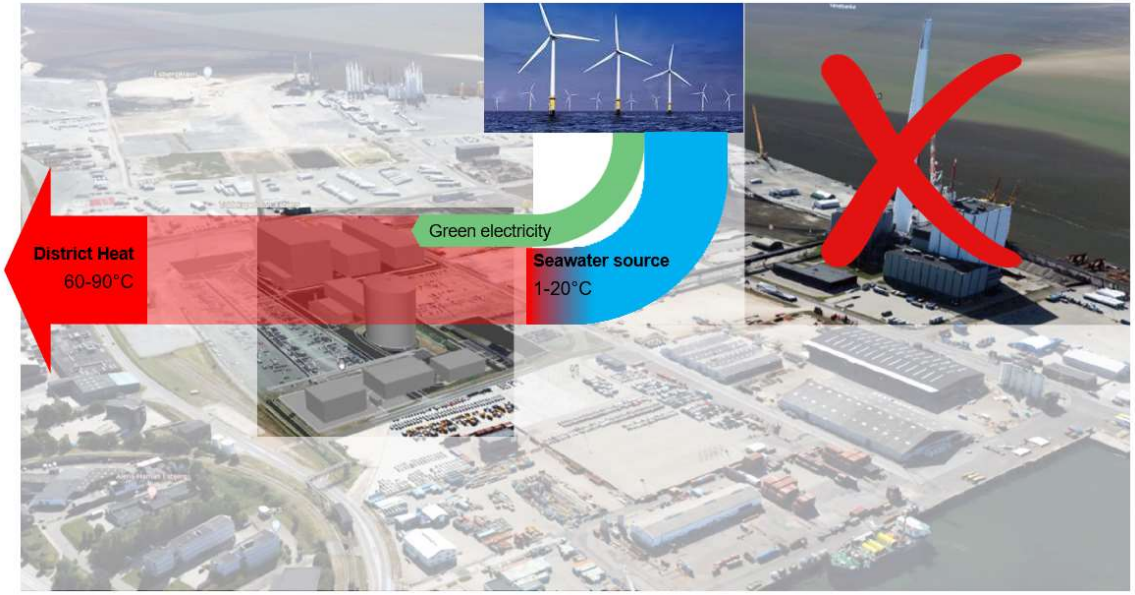
- Data Centers
- Carbon Capture
- Electrolyzer ($H_2$)
- … decarbonized processes

## Geothermal

# Everllence sCO2 "Mega Heat Pump"



# Esbjerg: $CO_2$-based Large-scale Heat Pump for district heating




**Key Facts:**

**End customer: DIN Forsyning (Denmark)**

**Scope of delivery: 2 heat pump units with HOFIM® compressors with $CO_2$ refrigerant**

**Heat source: seawater at 1 – 20 °C | 34 – 59°F**

**Heat sink: 60 – 90 °C | 140 – 194°F**

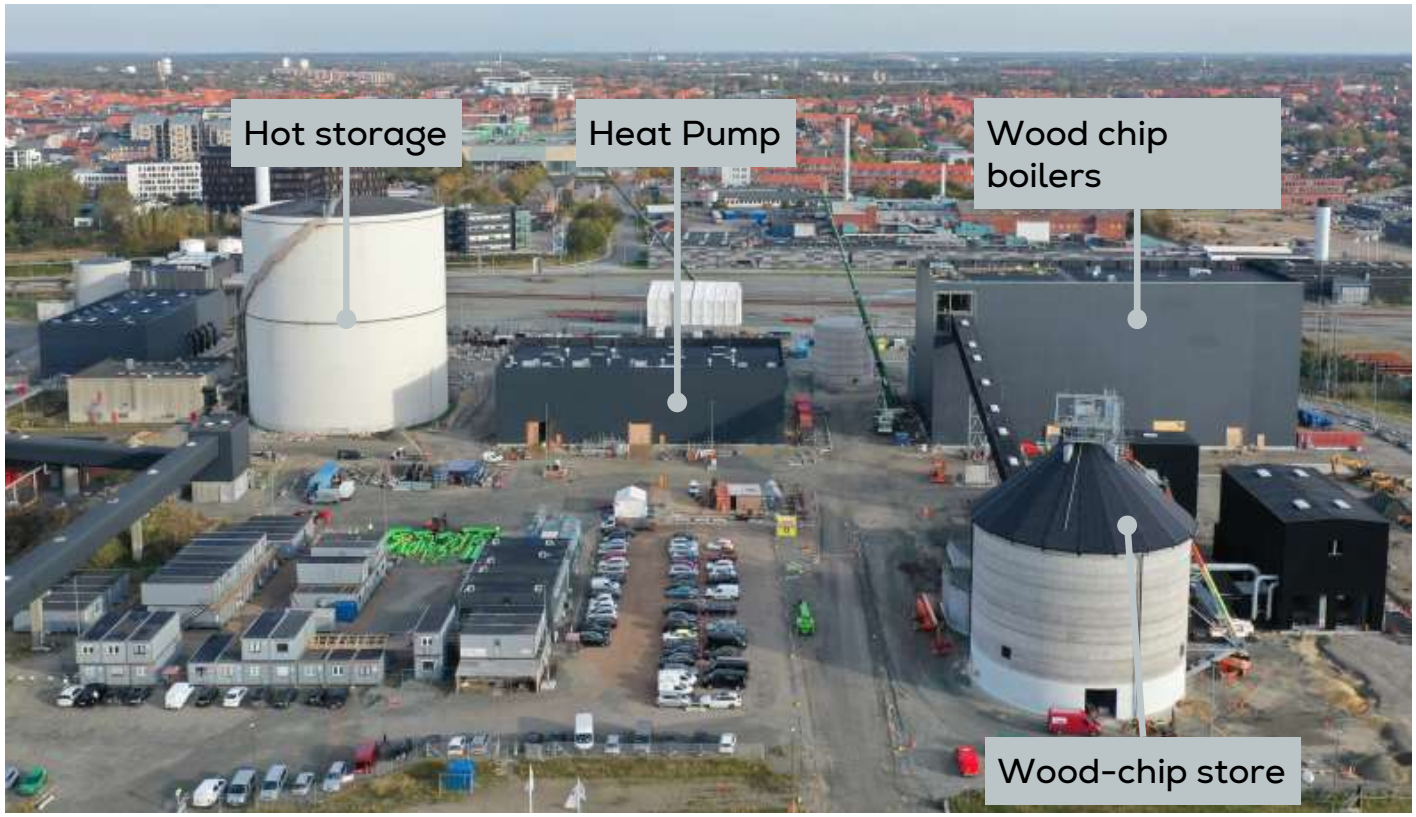
**COP: ~ 3.3 – 4**

| Heat output | Heat for | $CO_2$ savings |
|---|---|---|
| Up to 65 MW | 25‘000 households | 120‘000t p.a. |

**Transfer energy from the seawater to the district heating using renewable energy from the grid**

# Esbjerg SAT (2025)

Site layout




DIN FORSYNING

# Esbjerg SAT (2025)

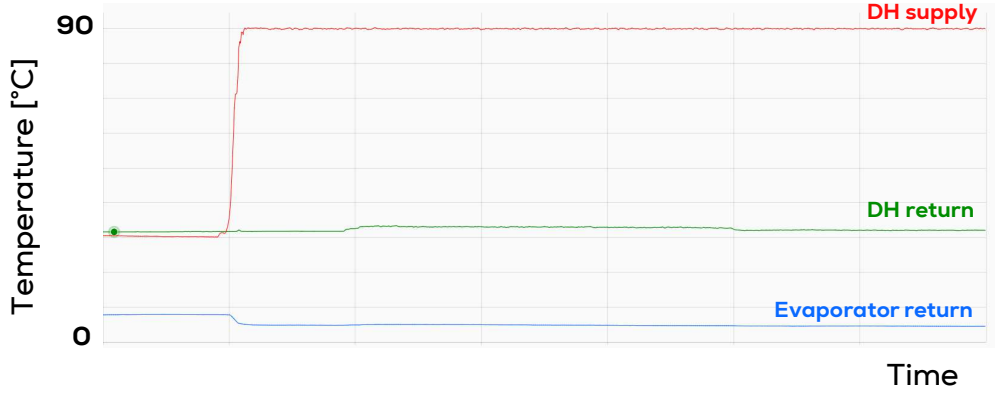
**Status**
First machine rotation in November 2024
Functional, reliability and performance test completed in 2025

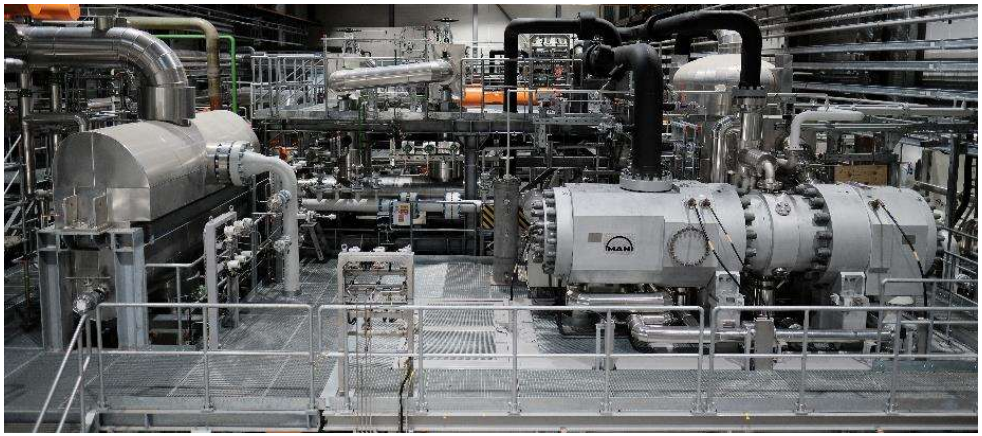
**Conditions**
Minimal seawater temperature at inlet ~ -0.5°C
Heat production ~ 33 MWth (each)
Minimum load ~ 13 MWth
Highest temperature lift achieved ~ 90K

Real time monitoring of performance (lots of data) Everllence CEON

**Validation**
Overall cycle performance
Vibrations
HEX and turbomachinery performance

**On-going**
Validation of steady-state and transient modelling



# Vicinity Energy district energy transformation to eSteam™

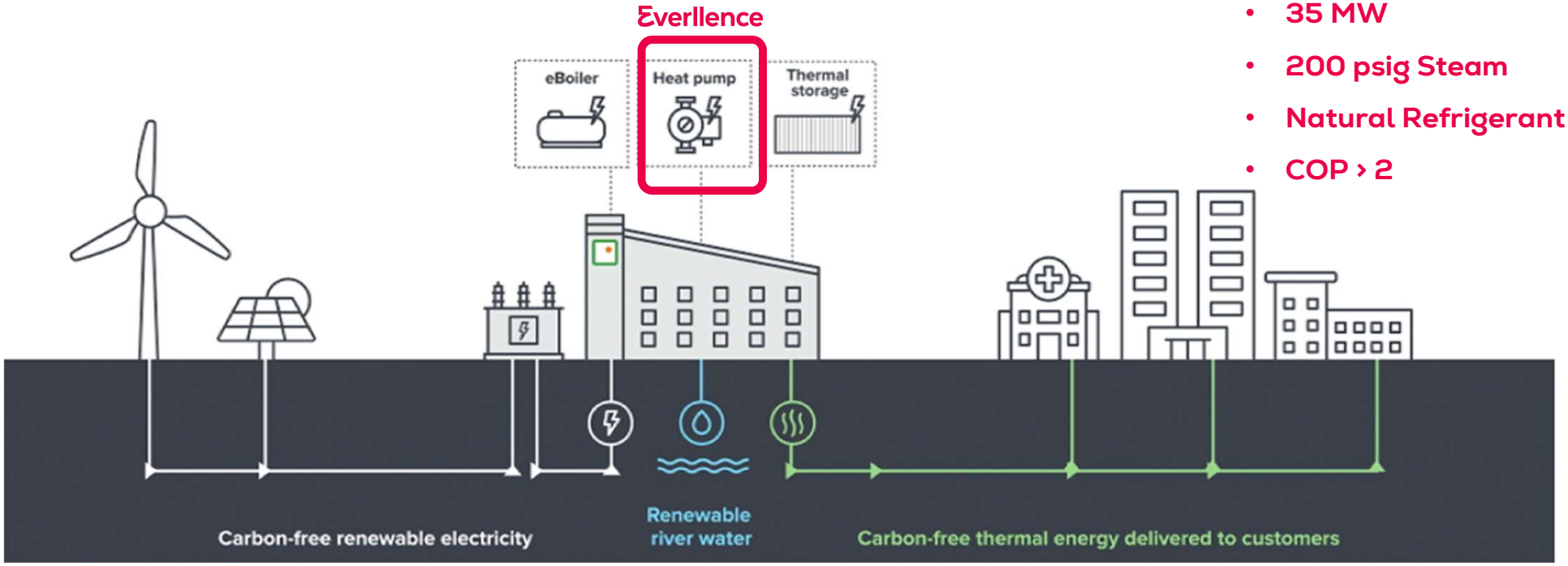



Image courtesy of Vicinity Energy

**Key Facts:**

- 35 MW
- 200 psig Steam
- Natural Refrigerant
- COP › 2

# Kendall Station Heat Pump

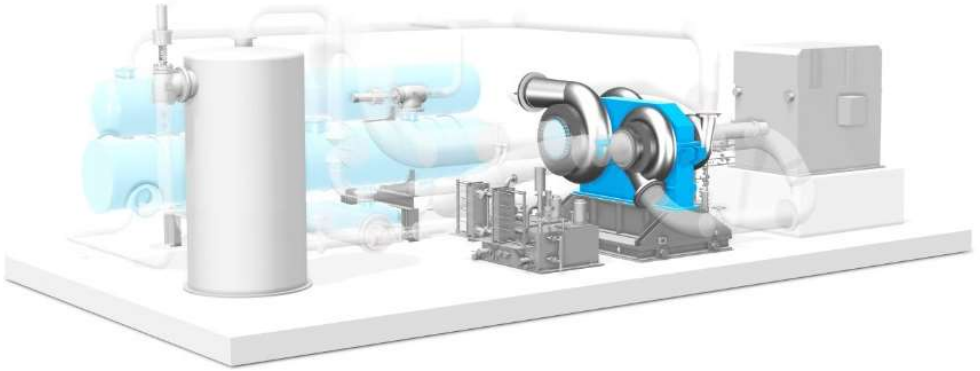
**Project targets:**
- Produce baseload carbon-free eSteam™
- Supplement electric boiler installed in Phase 1

**Heat pump size:**
- Heating capacity: 35 $MW_{th}$
- Steam production: › 100,000 lbs./hr. @ P › 200 psig

**Location:**
- Kendall Station in Cambridge, Massachusetts

**System boundaries:**
- Natural Refrigerant; sustainable & future-proof
- Multi-stage compressor for compact design & optimized footprint
- Electrical Drivers
- Baseload operation





Conceptual drawing only. Not representative of Kendall Station.

# The heart of the heat pump

Radially Geared compressor for VCC* heat pumps

**Scaleable**

Up to 60 MW

**Reliable**

API 617 Compliant

› 1,300 RGs were sold since 1970

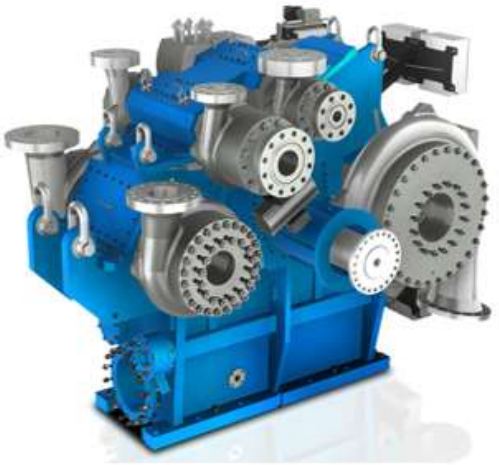
More than 98,500,000 operating hours

**Highest Efficiency & Lowest OPEX Costs**

Lower power consumption than conventional solutions

**Compact Footprint**

High thermal output per $m^2$



*VCC – Vapor Compression Cycle

# Location of Heat Pump

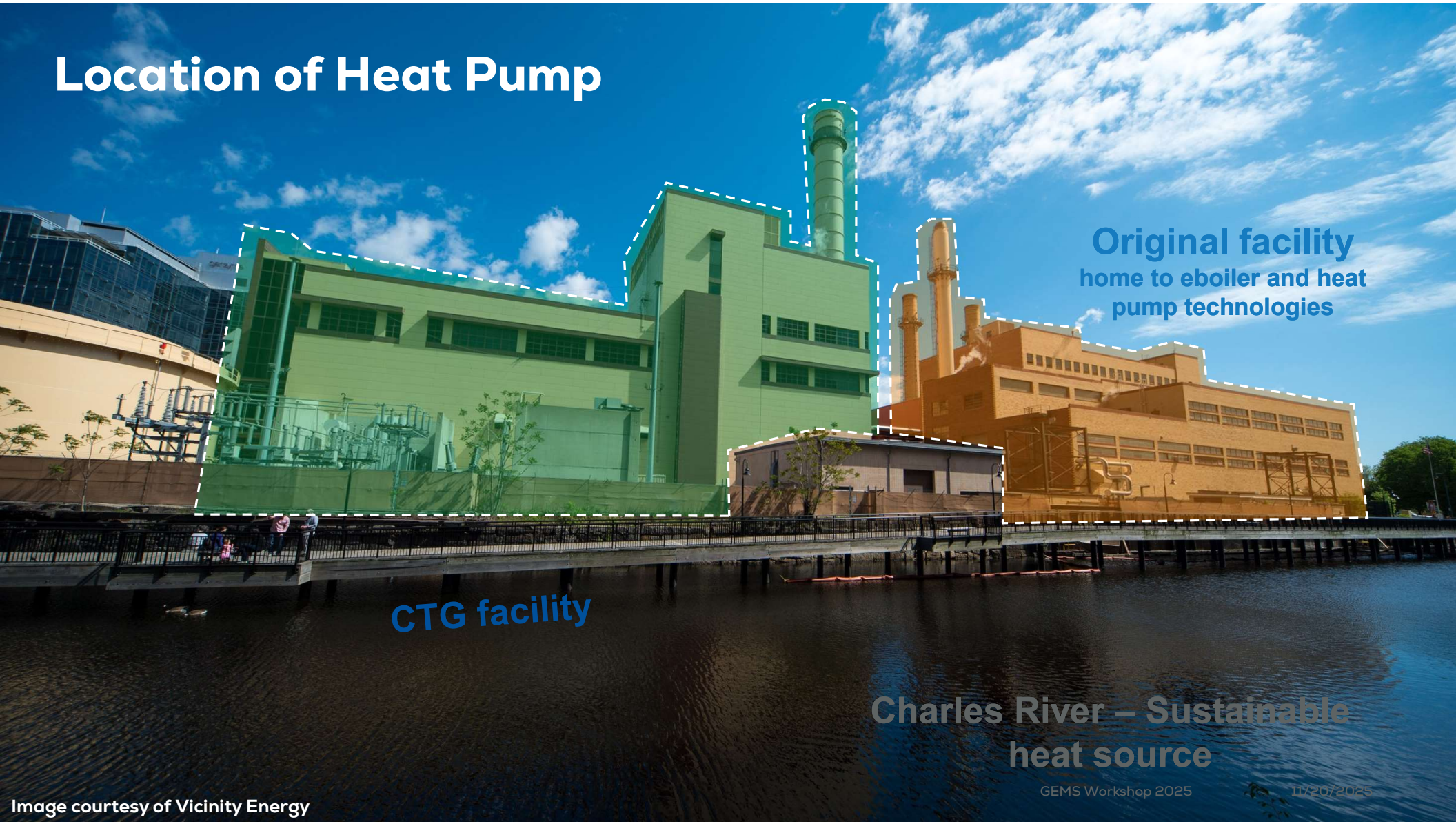
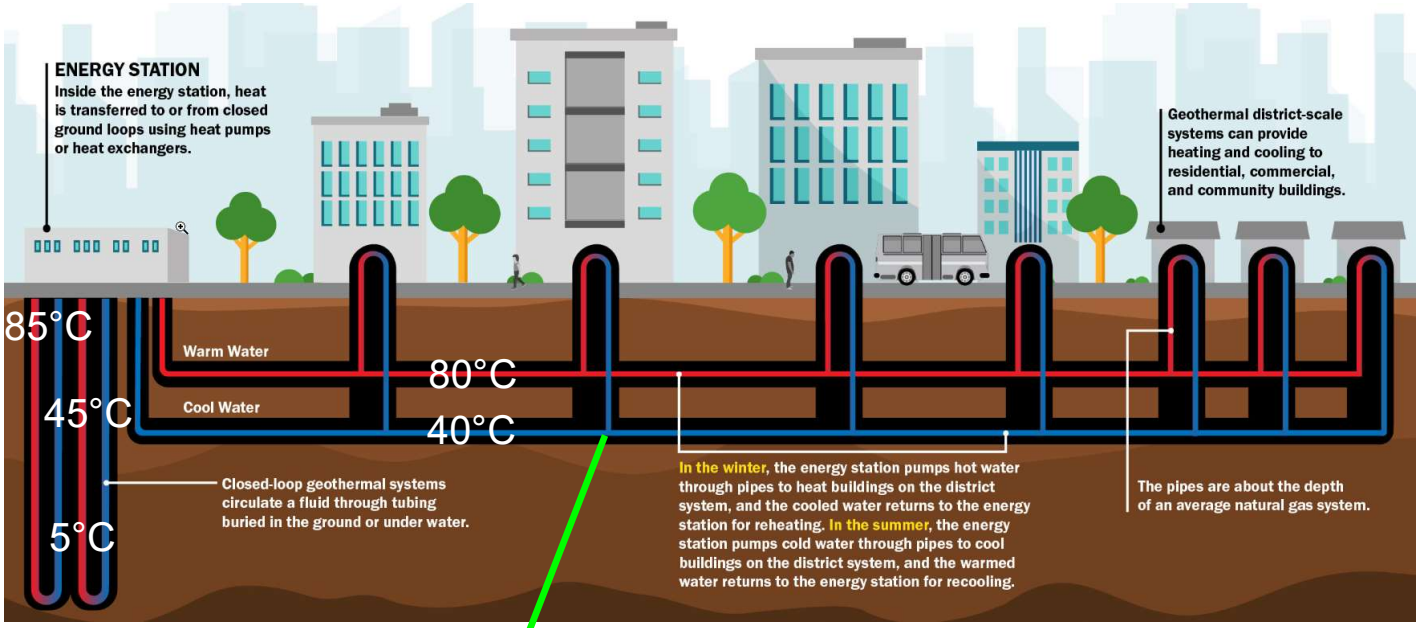



Image courtesy of Vicinity Energy

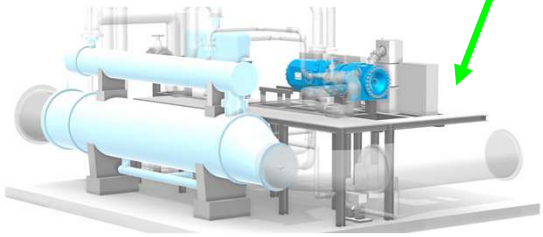
# Kendall Station HP Parameters & Performance

| | |
|---|---|
| Thermal Duty ($MW_{th}$) | › 35 |
| $COP_{total}$ | › 2 |
| Heat Sink | |
| Supply Temperature (°F) | › 380 |
| Supply Pressure (psig) | 200 |
| Steam Mass Flow (lbs./hr.) | › 100,000 |
| Heat Source – River Water | |
| Source Inlet Temperature (°F) | 38 - 85 |
| Source Flow (gpm) | › 17,000 |
| Electric Motor Rating for Heat Pump (hp) | 16,000 |
| Commercial Operation Date | Scheduled for early 2028 |

# Synergies of Heat-Pumps and HT Geothermal for DH




Ca. 20MWth per borehole

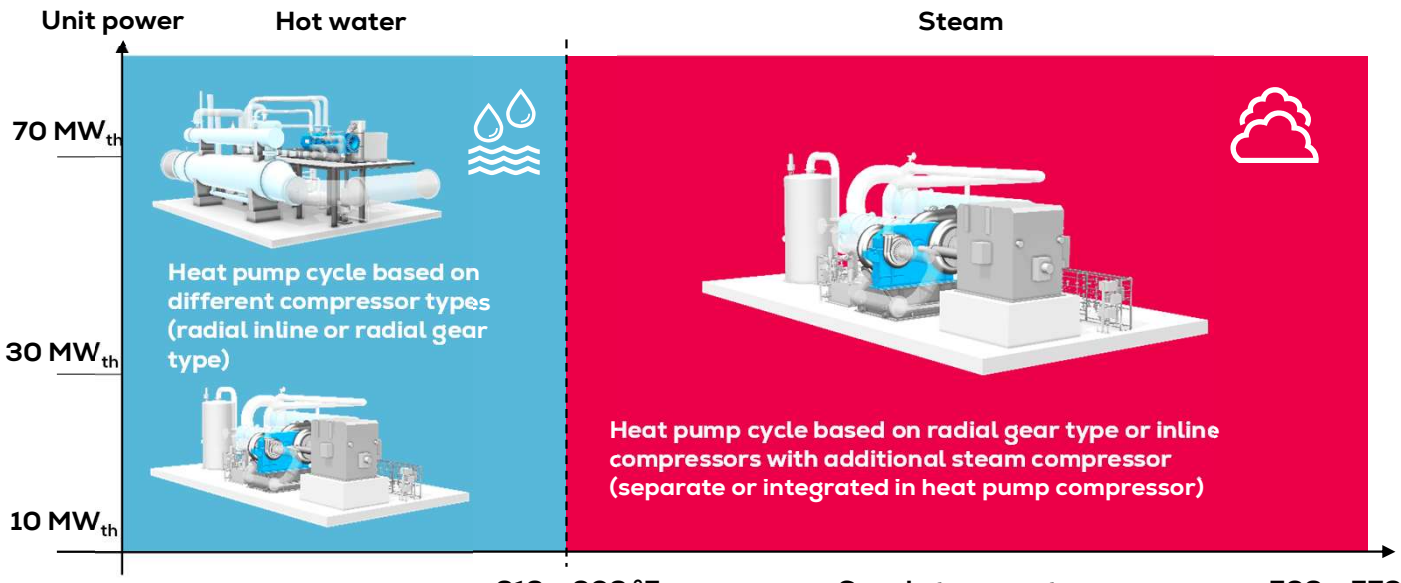


- Recovering return water from DHN (becomes heat source for the heat-pump)
- Generation of 30+MWth by adding a mega Heat-Pump
- **TOTAL 50MWth output** (20MWth from GT + 30 MWth from Heat-Pump)

# Hot water and steam production >10 MWth

We deliver heat pump solutions for various power and temperature ranges

**Technology distribution according to existing Everllence compressor portfolio**




**Everllence heat pump cycle design based on different:**

- **Well proven compressors**
- **Conventional refrigerants ($CO_2$, hydrocarbons, synthetic )**
- **Working principles (VCC[1] or TCC[2])**

1 VCC: Vapour compression cycle;
2 TCC: Transcritical cycle

# Thank You!

Everllence


## Mobola Dosumu

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# Disclaimer

All data provided in this document is non-binding.
This data serves informational purposes only and is especially not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project.

This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.