Innovative Heat Storage for Carbon-Neutral Heating

QHeat Borehole Thermal Energy Storage Concept

Geothermal 2026 - Accelerating Geothermal Energy

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Chief Technical Officer & Founder at QHeat

Founded QHeat in 2018 based on previous projects, experiences and studies in deep geothermal.

Innovator of renewable energy and geothermal solutions with years of experience as a research scientist in topics related to energy networks, electric power systems, fibre optics and geothermal solutions.

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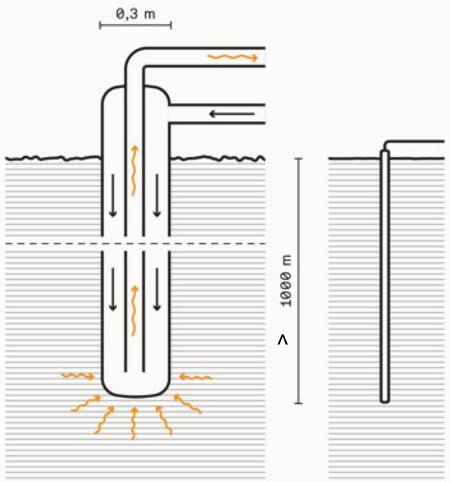
Applications of our technology

Deep coaxial heat well

1500 meters of depth creates a capacity equivalent of almost 40 traditional wells (300 meters deep) – with 97% less land usage. Provides 1GWh annual heating / cooling (~3 blocks of apartments) for real estate. Making it energy efficient and a large-scale solution with clean, combustion-free heating energy.

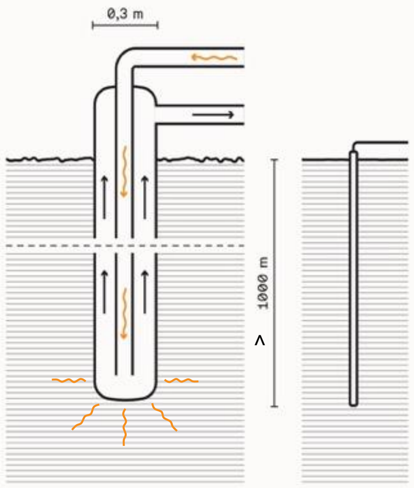
Protected innovation includes the coaxial reversable current and insulated inner pipe.



Deep coaxial cooling and borehole thermal energy storage

Utilising the same medium deep wells with reversed current enables using the wells for **efficient cooling with heat pump** and for **heat storage.**

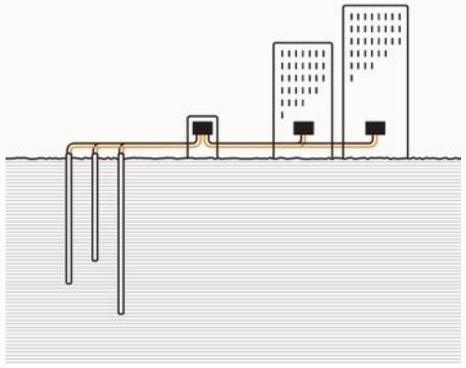
Utilising the heat storage capability, the geothermal system can be built to capture waste heat in the summers and utilise it in the winters (seasonal storage).



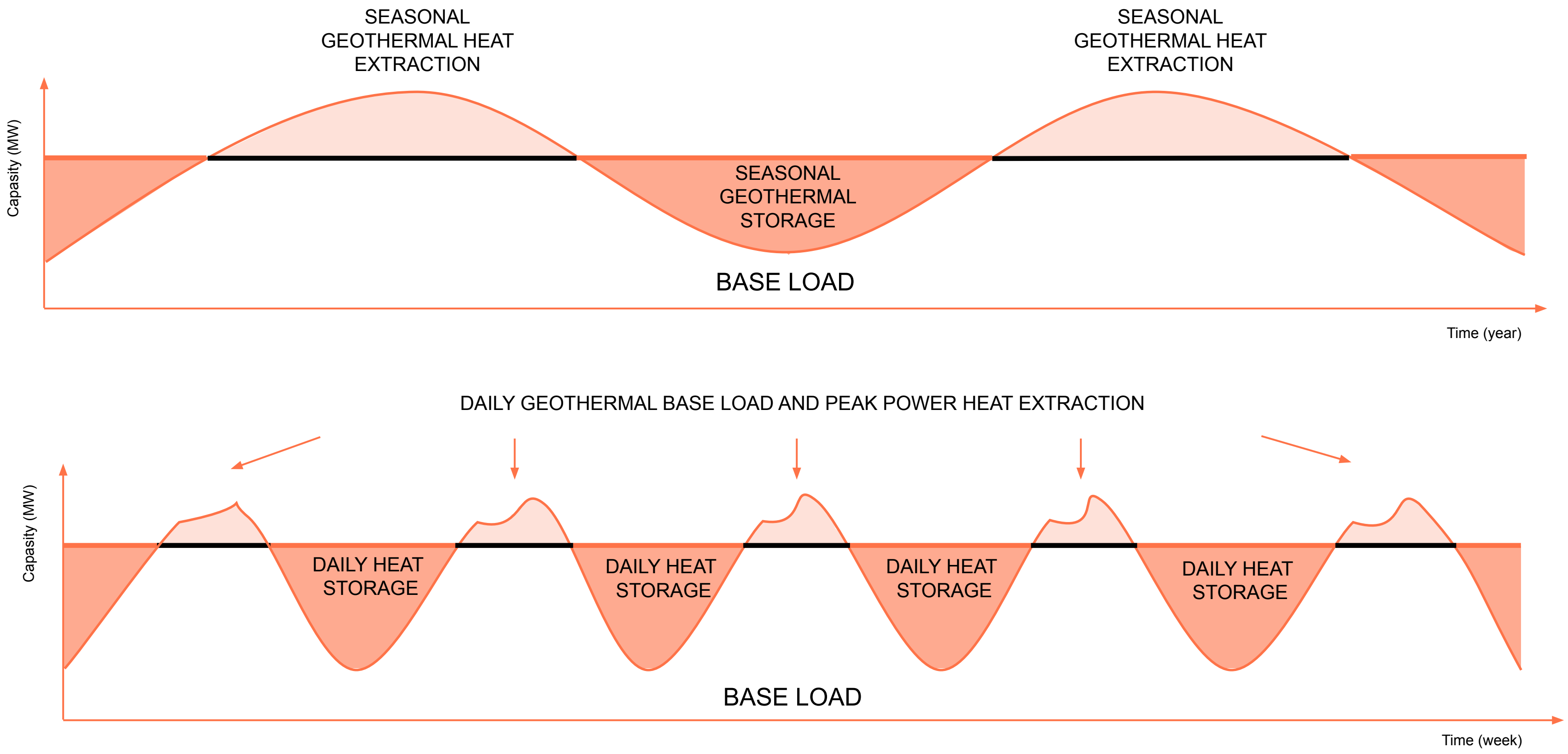
5th generation district heating network

Several buildings can be connected to a local low temperature heating and cooling network where the medium deep geothermal wells even out the fluctuation in demand and supply.

The same network can be utilized simultaneously by those who demand heating and/or cooling.



Seasonal and intra day energy management



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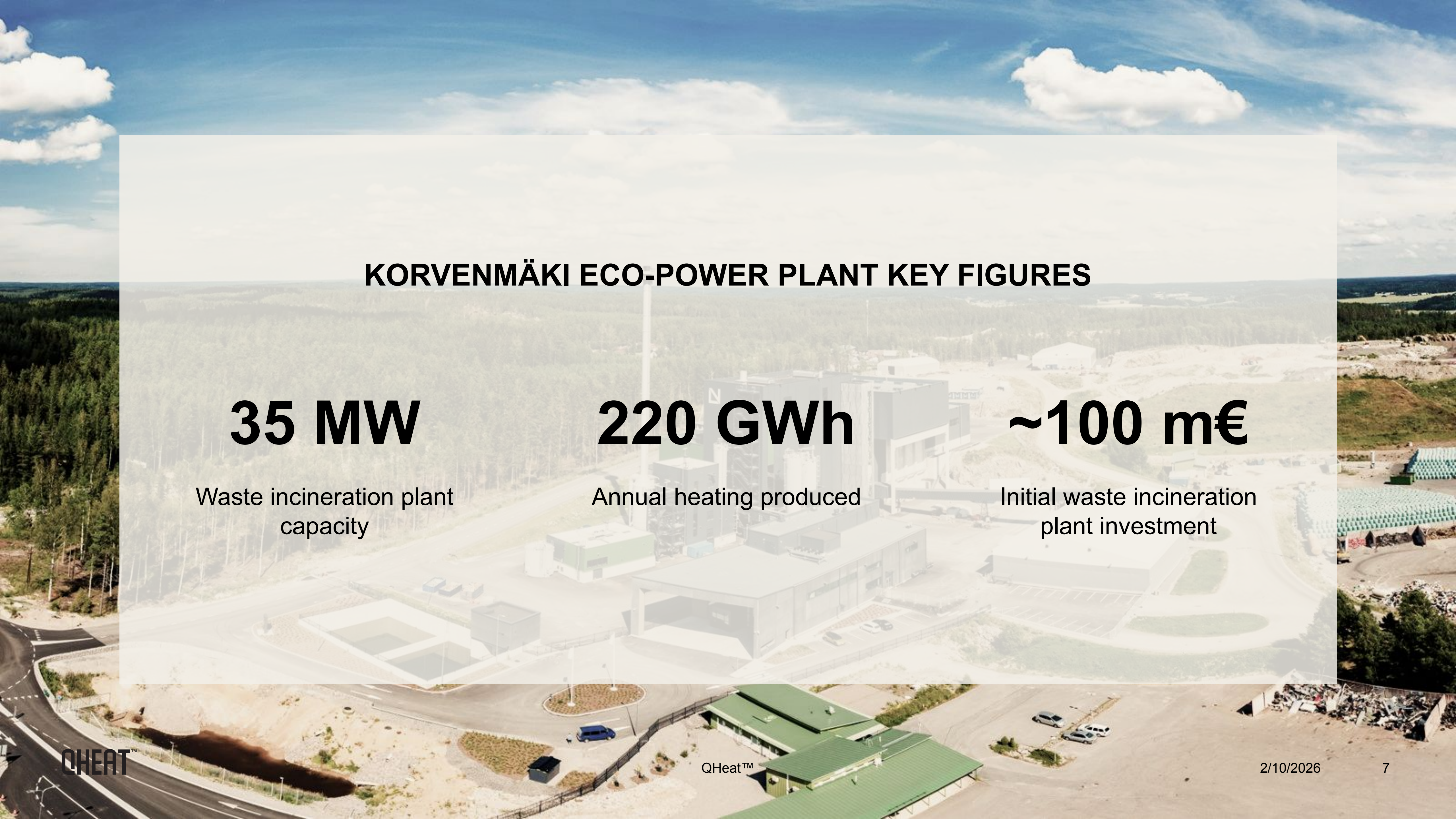
Case Lounavoima, Salo Finland.

Geothermal heat storage to increase heat plant efficiency and prepare for EU emissions trading system.

Read our online case study from the link below

qheat.com



KORVENMÄKI ECO-POWER PLANT KEY FIGURES

35 MW

Waste incineration plant capacity

220 GWh

Annual heating produced

~100 m€

Initial waste incineration plant investment

QHeat Borehole Thermal Energy Storage solution

6

Boreholes with depths varying between **1.6 - 2.0 km.**

14 GWh

Geothermal heat produced annually

6 MW

Peak power capacity

QHeat implemented six 1,6 to 2,0 km geothermal wells at the customer site. This helps Lounavoima store the surplus heat energy generated by the eco-power plant and extract it during the heating season.

The current geothermal energy management profile enables the customer to manage peak power requirements from the geothermal wells. This is done by running the majority of the wells on constant energy and extracting peak energy from a one or two wells, based on the needs.

”The increase in fuel prices is one of the factors that accelerates the payback of the well investment.“

Petri Onikki - Managing Director of Lounavoima and Salon Kaukolämpö.

”District heating customers need and demand emission-free energy. This is another reason why climate issues guide Lounavoima's investment decisions.”

Petri Onikki

Managing Director of Lounavoima and Salon Kaukolämpö.

Datacenters and seasonal heat storage

- Our concept
- Case study with BTES

Problem:

How to maximise the value of heat generated by datacenters

Moving away from fossil-based heating

Tighter emission standards and higher costs under schemes like the EU Emissions Trading System (ETS), companies relying on fossil fuels face rising operational costs.

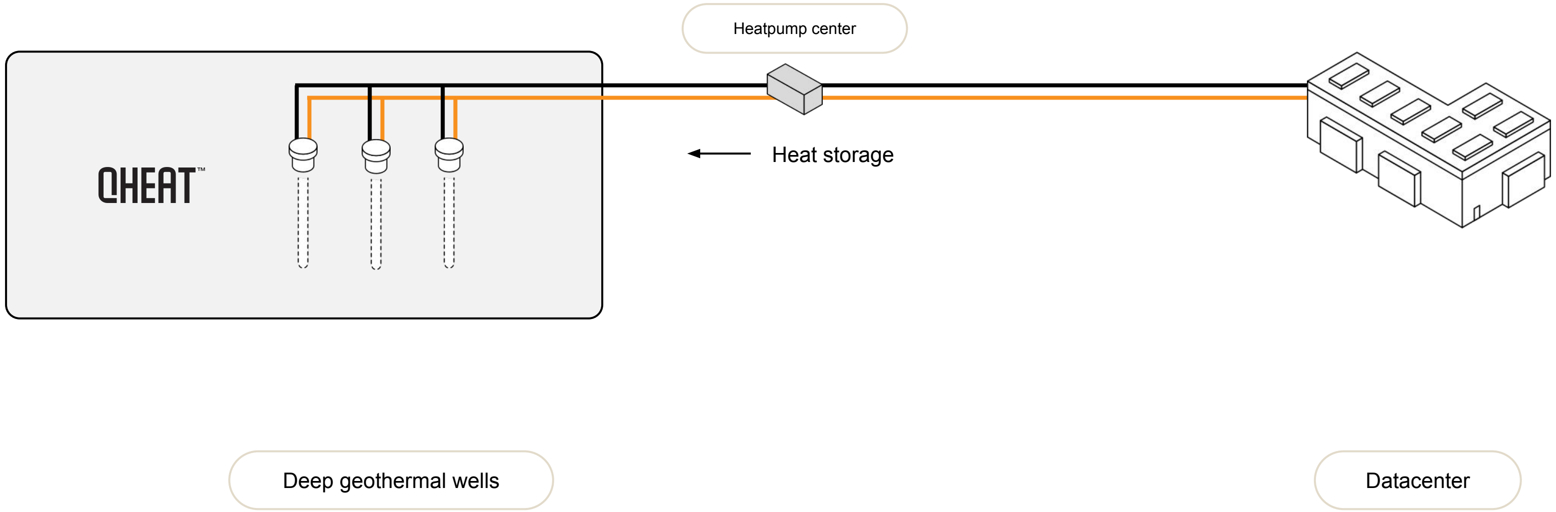
Electricity tax breaks require heat recovery

EU countries are moving towards electricity taxation models where heat recovery creates possibilities for tax breaks.

Higher grade excess heat to be recovered

Datacenters are producing higher temperatures for ranging from 40 even up to 80 degrees Celsius with new technologies such as direct liquid cooling.

QHeat deep coaxial geothermal wells provides datacenters the flexible component with seasonal and intra day heat storage.



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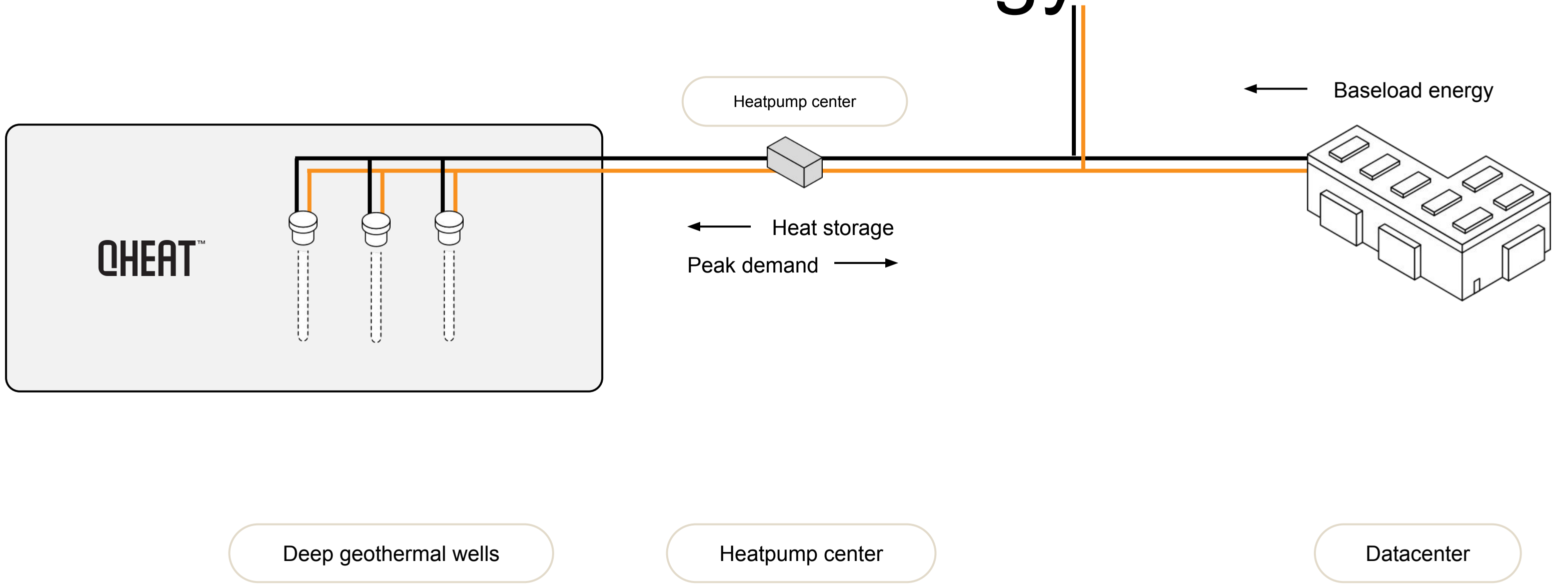
Heat can be distributed either to **high temperature district heating network** or **local low temperature heating & cooling network**. QHeat technology offers the flexible component to the network whilst the datacenter provides baseload energy.



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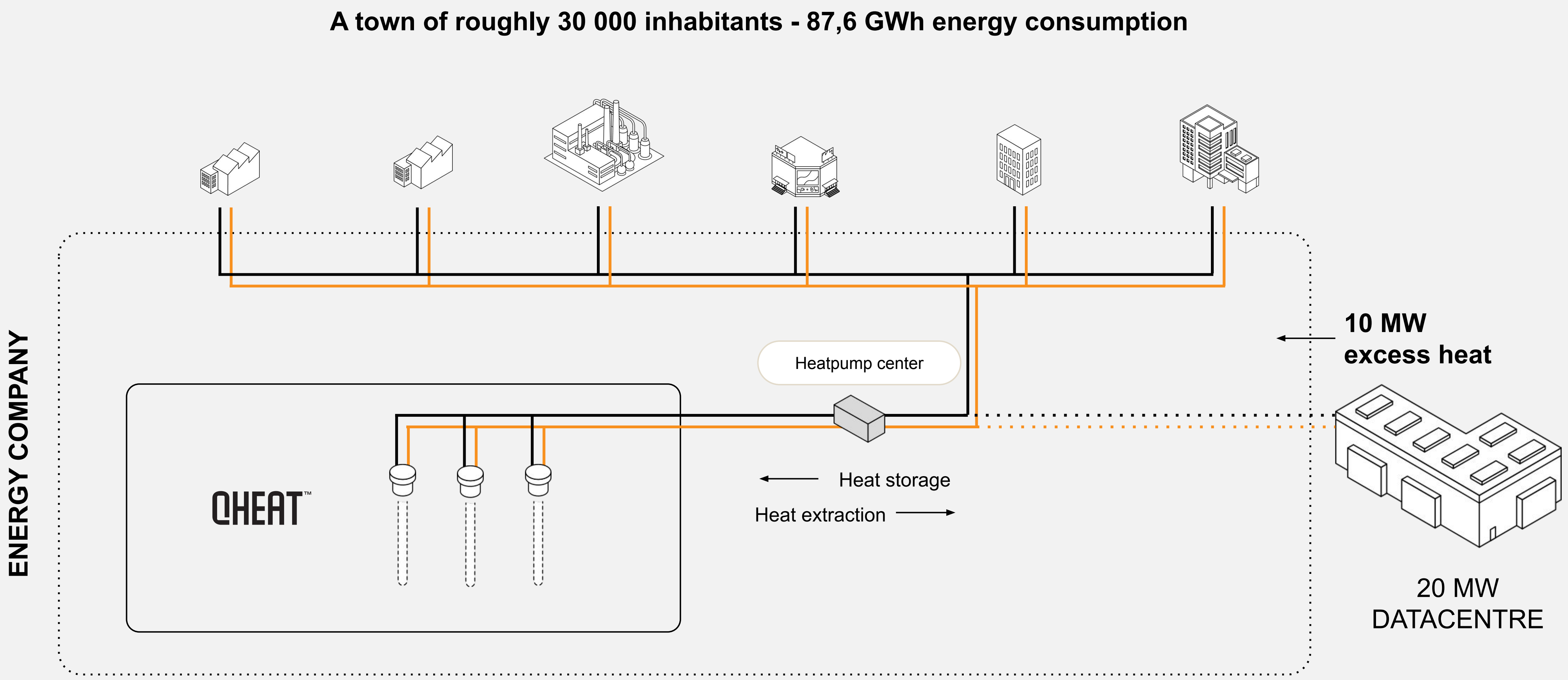
Case study

20 MW datacenter + seasonal storage



Key figures

Network consumption:

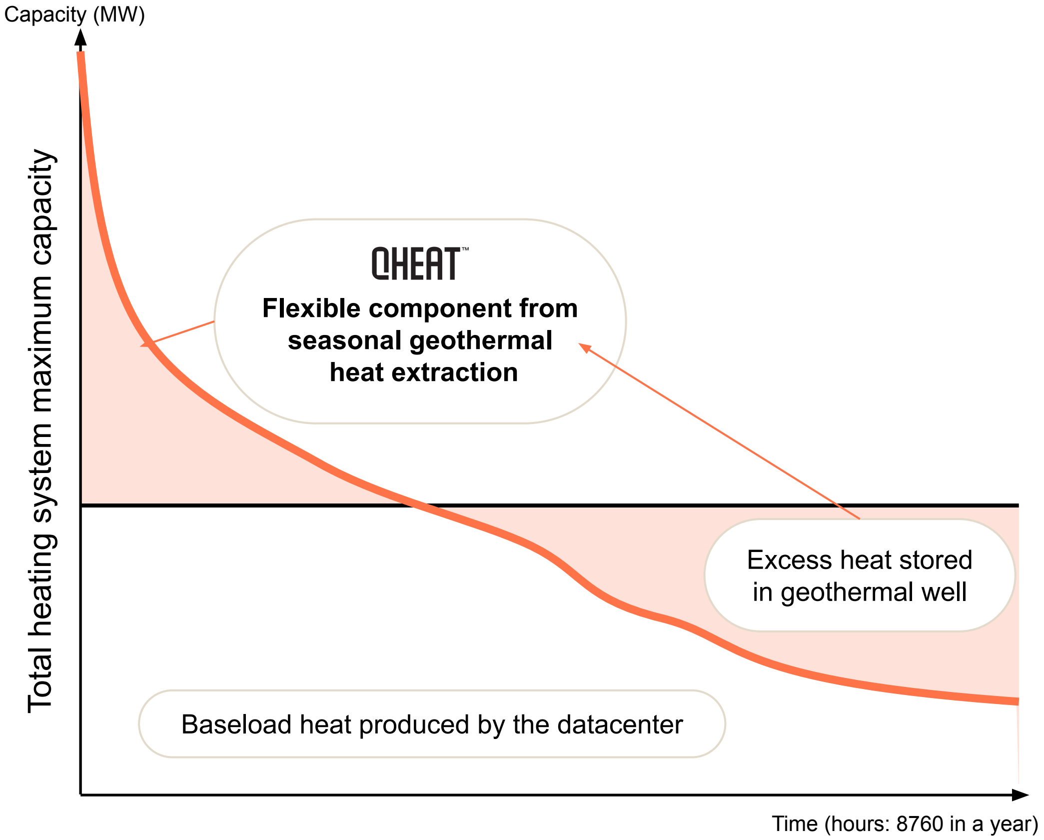
- Yearly network consumption of 87,6 GWh.
- 95% energy coverage requirement from datacenter + well system.

Datacenter:

- 20 MW datacenter which can provide 50 % of its capacity as excess heat, meaning 10 MW excess heat capacity.
- The datacenter is direct liquid cooled providing 45 degrees celsius water.

Energy system design:

- Datacenter provides steady baseload, equaling to 76% energy (or 66,3 GWh).
- QHeat well configuration with heat pump produces 19% (or 17 GWh), with a COP of 3,5 this means 12,1 GWh from the wells.



Results and findings of the simulation.

15 pieces of 1,5 km wells with QHeat technology is needed to provide the remaining 19% capacity. 12 wells provides 92% energy coverage.

Roundtrip efficiency for seasonal kW stored is 55 %.

- Charging capacity per well at 660 kW – 800 kW, based on charging scenario.
- Extraction capacity per well with heat pump 350 – 700 kW, based on the duration of extraction.

Key takeaways from the presentation

Flexible energy storage for district heating

BTES enables underground storage of excess heat, helping district heating systems balance supply and demand, reduce peak loads, and optimise operational costs.

Advancing circular economy & emissions reduction

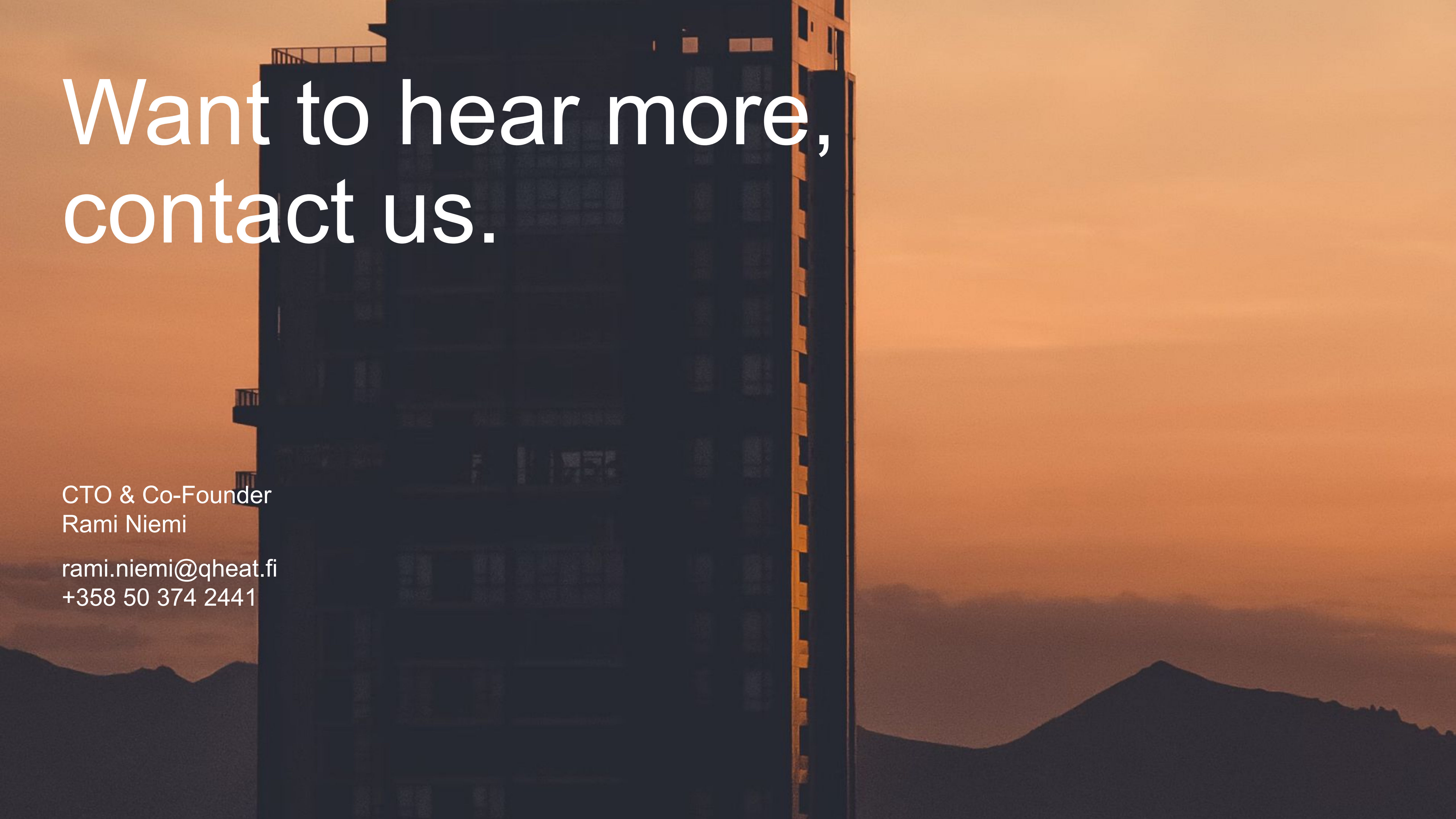
By capturing and reusing waste heat from sources like waste-to-energy plants and datacentres, BTES reduces fossil fuel dependency and lowers greenhouse gas emissions.

Scalable solutions for industry and datacentres

BTES integrates with both high-temperature and low-temperature heating networks, allowing datacentres to monetise excess heat and communities to benefit from affordable, resilient energy.

Proven BTES technology

BTES is not just a future concept—it has already delivered reliable results in multiple production environments, demonstrating its effectiveness and value.



Want to hear more, contact us.

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