A clean future, simply below your feet

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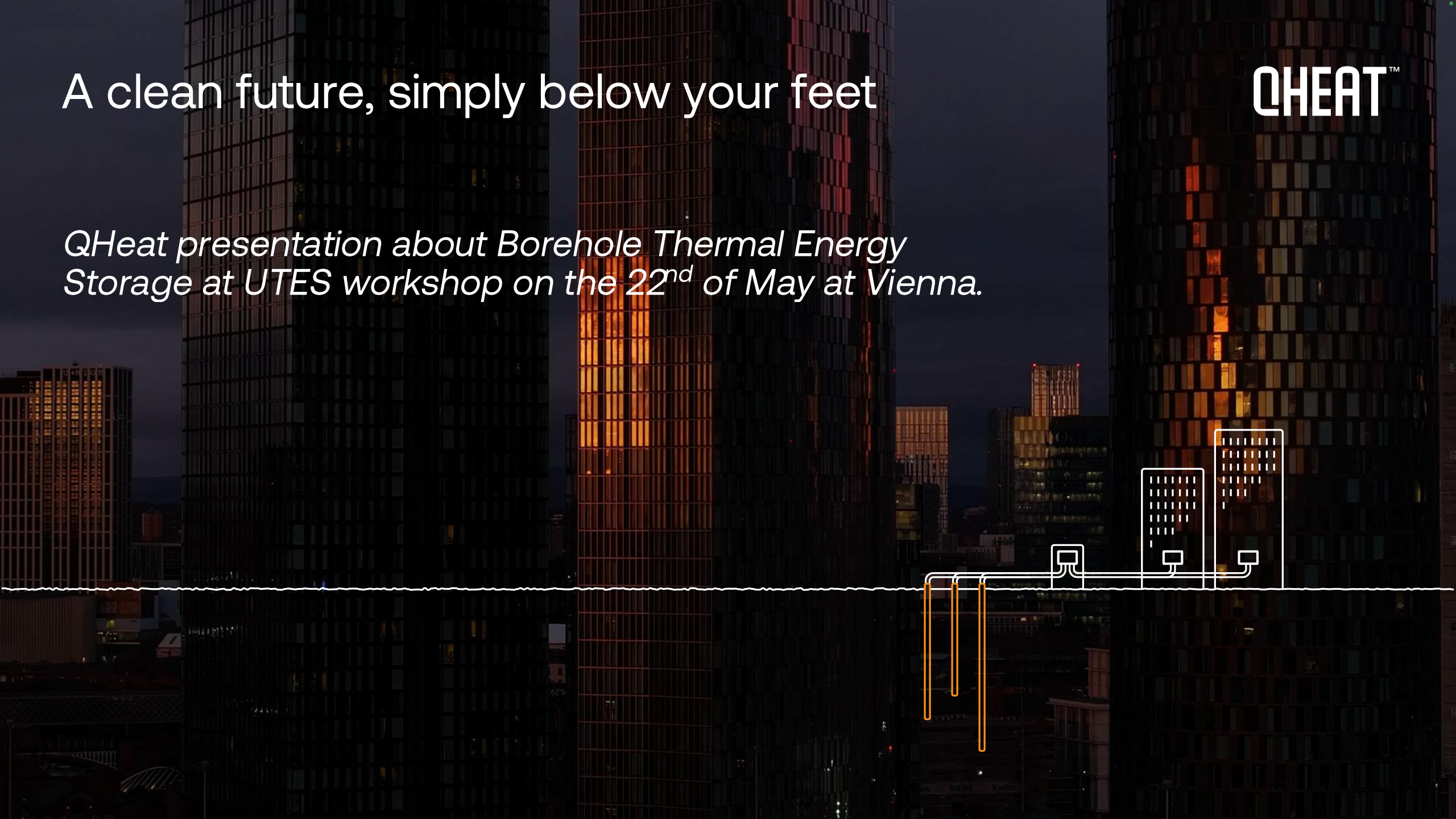
QHeat presentation about Borehole Thermal Energy Storage at UTES workshop on the 22nd of May at Vienna.



Presentation highlights

- QHeat history and technology
- QHeat BTES concept
- Lounavoima waste-to-energy BTES refence case
- How can we help?

Rami Niemi
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.

Master of Science (Theoretical physics) from University of Helsinki

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Combustion-free & efficient solution for sustainable environments

EMISSION REDUCTION

95%

Reduces real estate heating emissions by up to 95% in comparison to fossil-fuel-based heating

7k×

One 1,500-meter-deep well reduces emissions as effectively as 7,000 solar panels.

EFFICIENCY

20-50%

Uses 20-50% less electricity than other heat pump solutions out there

AREAL DENSITY

97%

Uses 97% less land area than traditional 300m deep ground source heating

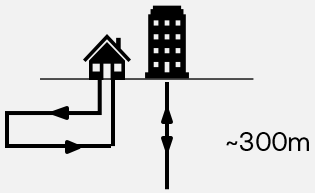
How our solution positions in the market

Heat pump with coaxial geothermal wells provide large-scale heating suitable for densely built areas without a geological risk.

Ground source heat pumps

Traditional ground source heating

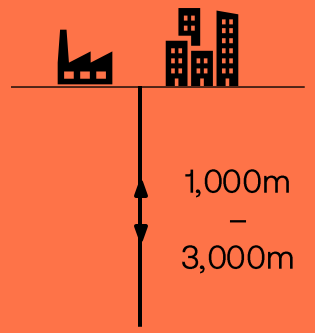
Traditional ground source heating system is a competitive solution if heating need is moderate and there is enough space to build several wells.



Coaxial deep geothermal wells

Deep geothermal

Coaxial reversable heat well design. One well in combination with heat pump produces heating for 15,000 sqm ~ 3 blocks of apartments – optimal for densely built areas.
Relies only on conductive heat transport in rock, which is scalable solution globally.



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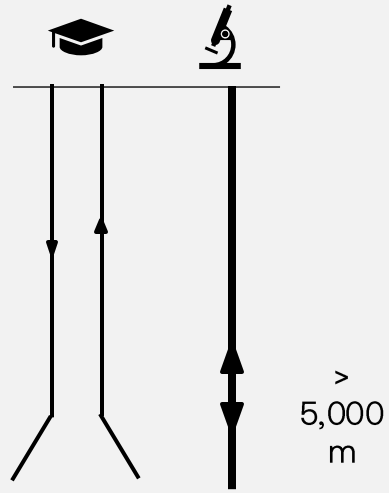
Deep geothermal wells

Deep geothermal

Majority of projects have been terminated or suspended due to technical problems in drilling or geological conditions (e.g. not finding permeability or aquifers).

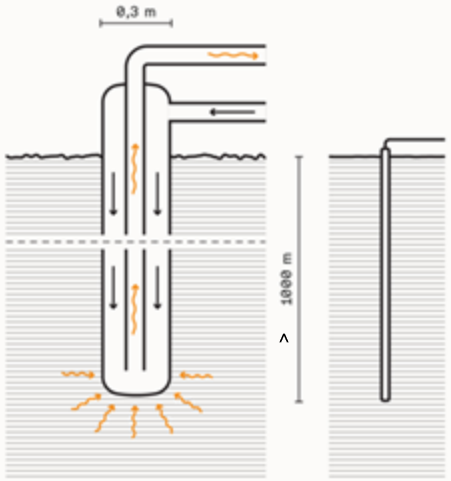


Applications of our technology

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.

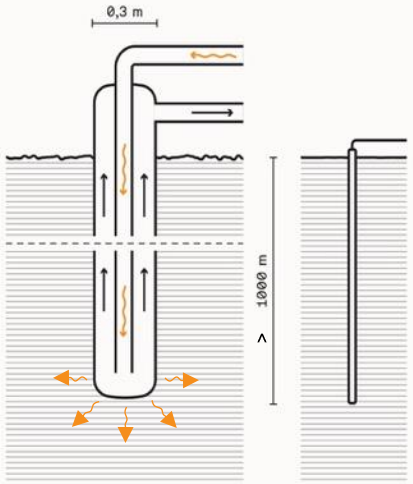
Protected innovation includes the coaxial reversable current and insulated inner pipe.



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.**

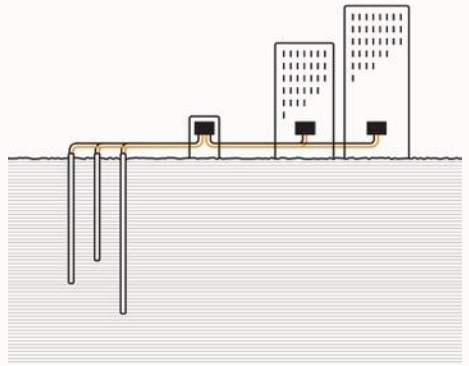
Utilising the heat storage capability, the geothermal system can be built to capture waste heat in the summers and utilise it in the winters (seasonal storage).



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.



QHeat Borehole Energy Storage Concept

Our thoughts and approach

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Problem:

Combustion-based district heating companies face several significant challenges as climate targets become more stringent

Rising operational costs

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

Meeting climate targets

To meet climate targets, district heating systems need substantial upgrades. This involves integrating renewable energy sources, improving energy efficiency, and potentially switching to technologies like heat pumps

High investment need

The transition requires significant investment. Companies must secure funding for upgrades and new technologies, which can be challenging given the high initial costs and long payback periods.

These challenges necessitate a strategic shift towards more sustainable and efficient heating solutions to align with global climate goals and customer demand.

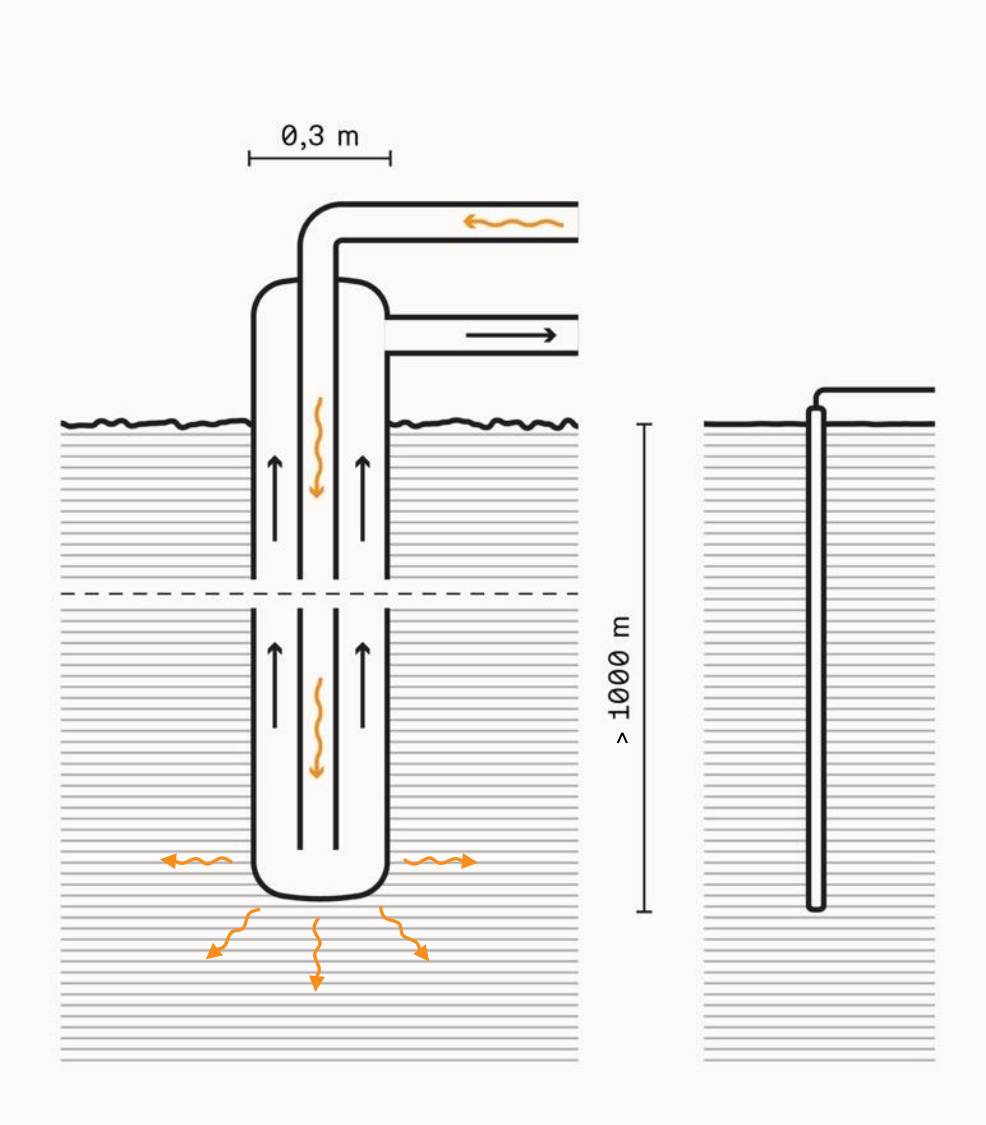
Our approach to BTES

Geothermal heat storage can significantly mitigate the challenges by providing a flexible component to the district heating system. Flexibility is provided as produced excess heat is stored underground in boreholes, which can be charged and discharged to even out differences between production and fluctuating heat demand.

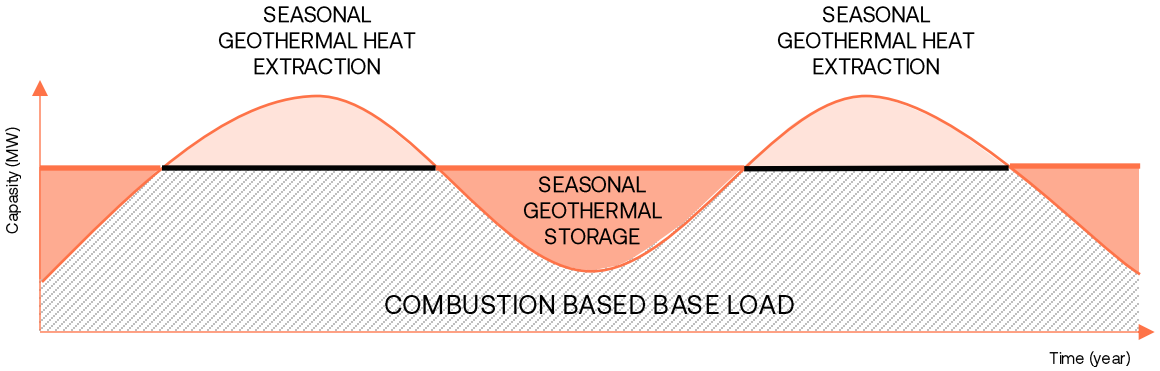
By reducing the need for peak load production, these storage solutions can **lower operational costs** and **extend the lifespan of heating infrastructure**.

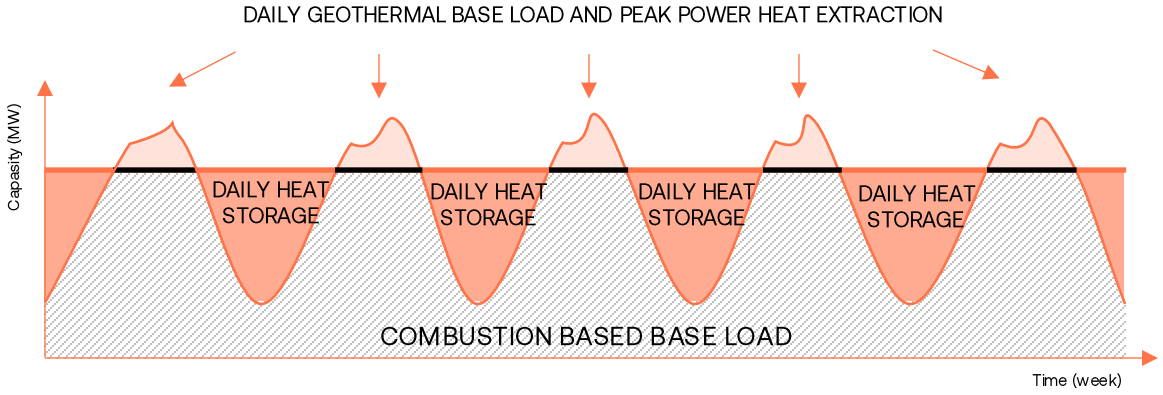
Storing and utilizing excess energy reduces reliance on fossil fuels and lowers greenhouse gas emissions.

For the optimal performance of the system excess energy is managed both on a **seasonal** and **daily basis**.



Seasonal and intra day energy management





Seasonal storage and extraction

With seasonal heat storage we charge the boreholes during the summer months utilising the excess heat generated by the combustion-based facility.

This stored heat is extracted during the winter months to enhance the capacity and longevity of the boreholes.

Intra day storage and extraction

The baseload required by the district heating system is provided by the combustion-based heating solution.

The additional constant heat and peak capacity are provided by the geothermal boreholes. Based on the heating profile, most of the boreholes in the system provide constant heat and a few provide peak capacity.

Once the highest demand drops the boreholes switch to storage mode, storing the excess heat generated by the energy plant.

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

Lounavoima waste-to-energy plant

Lounavoima is owned by waste management services provider Lounais-Suomen Jätehuolto Oy and district heating company Salon Kaukolämpö Oy. Founded in 2017, Lounavoima's main task is to produce district heating and electricity from municipal waste that cannot be recycled by Lounais-Suomen Jätehuolto.

The Korvenmäki eco-power plant produces around 220 GWh of heating energy from municipal waste every year. However, the plant's efficiency has been seasonal: during the warmer months, the plant produces significant surplus heat. On an annual basis, about a quarter of this is lost as waste heat.

"In line with our strategy, we want to be at the forefront of the circular economy and an active player in reducing CO_2 emissions and improving waste recovery. In achieving these goals, the importance of partners is highlighted. Waste energy recovery and storage makes waste recovery even more efficient." says Petri Onikki, Managing Director of Lounavoima and Salon Kaukolämpö.

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.

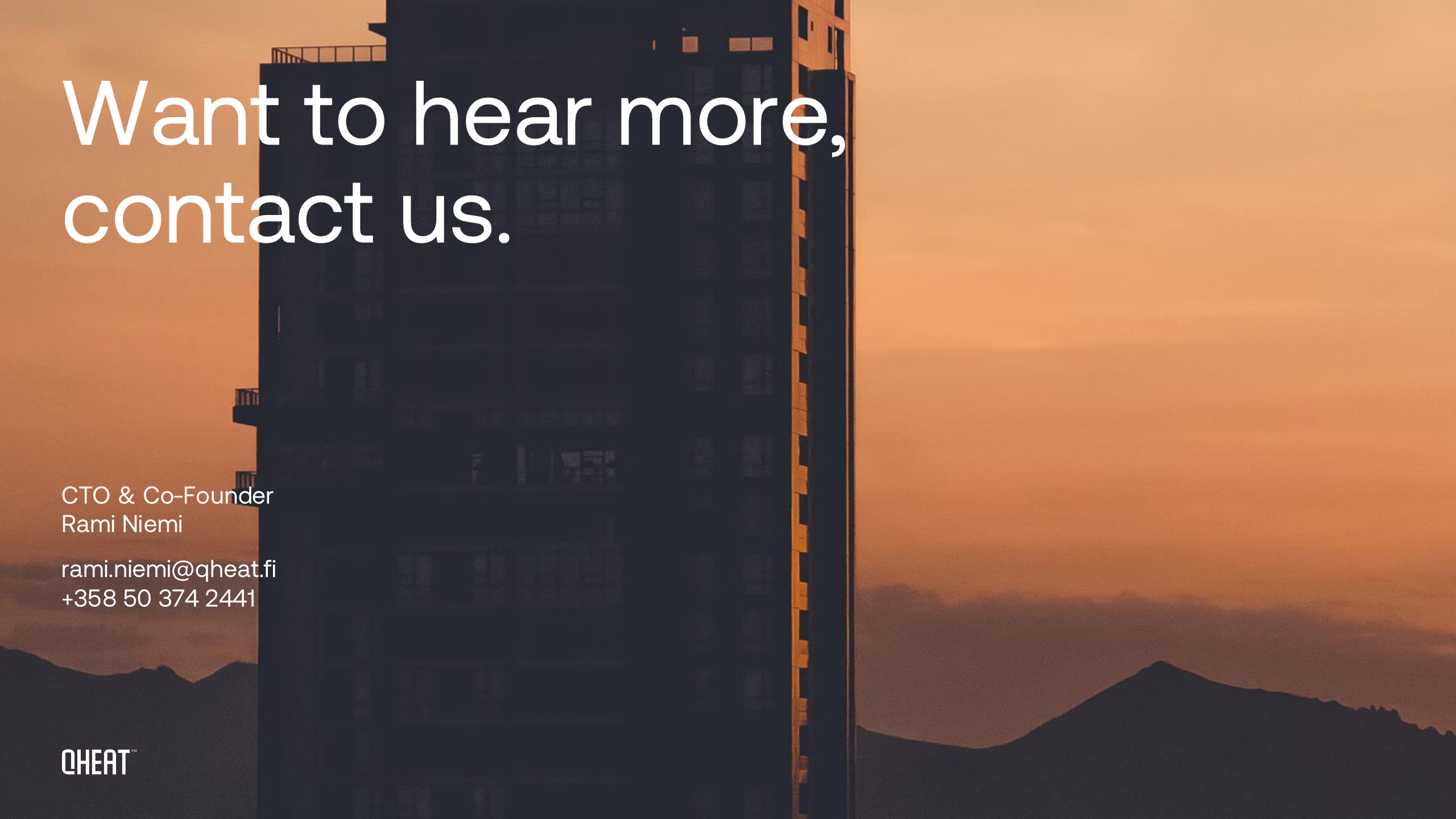
How can we help?

Planning to explore your geothermal potential

- Initial Consultation to find low-hanging fruit
- Feasibility Study and Simulations

Implementation and follow-up to deliver results

- Co-creation with energy companies and utilities
- Well field design
- Pilot Projects with a drilling partner



Want to hear more, contact us.

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