Polar Night Energy

Industrial Decarbonization with the Sand Battery

NIM Webinar, Nov. 25, 2025

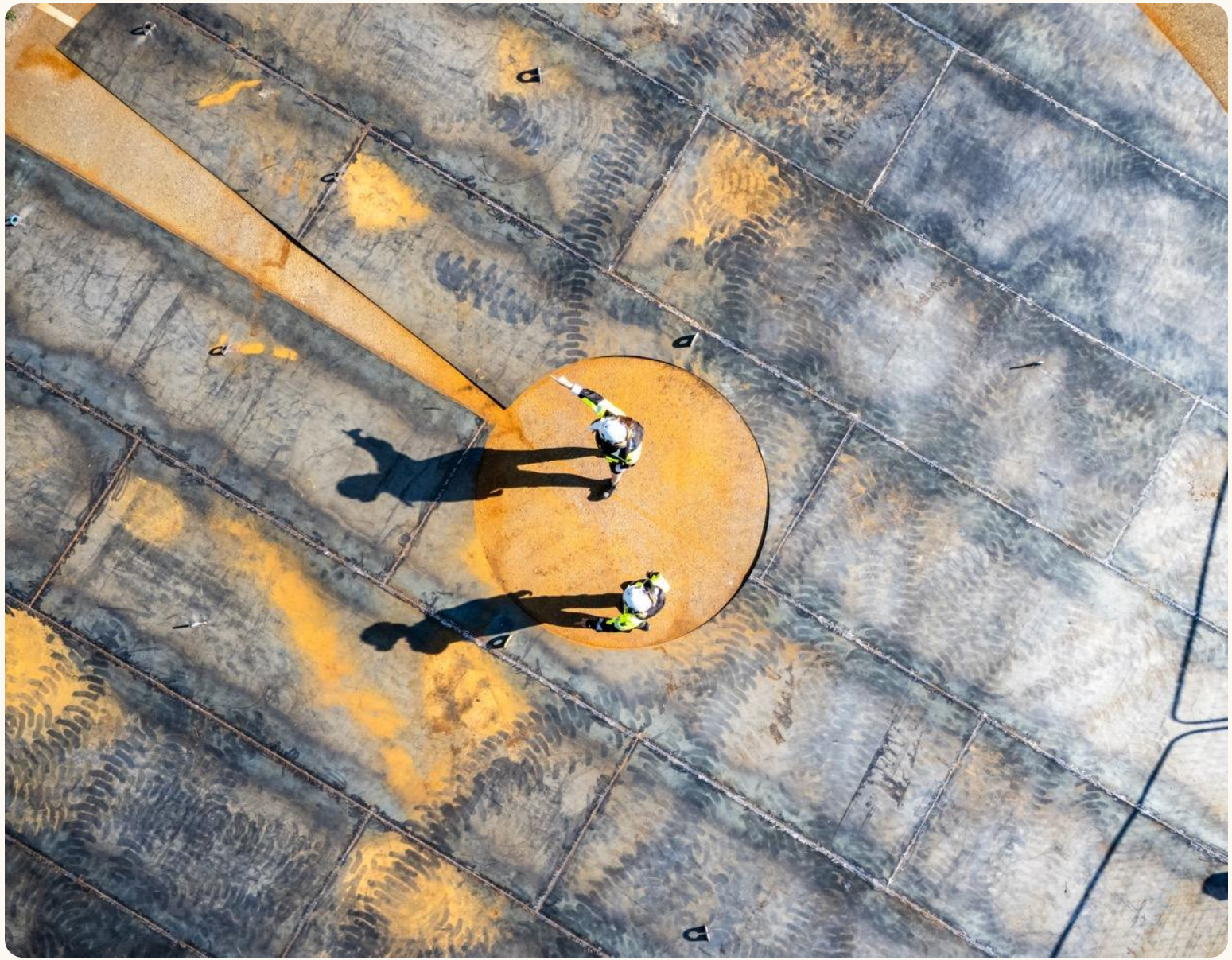
In Brief

Polar Night Energy's patented thermal energy storage systems refine clean and cheap surplus electricity to valuable heat, when needed most.

Our vision is to decarbonize energy production and be the global market leader in industrial-scale renewable energy storage solutions.

Polar Night Energy's Sand Battery is the most efficient and scalable thermal energy storage product on the market.

Watch our introduction video →



About Us

Founded in 2018, Polar Night Energy is a Finnish company specializing in the design and manufacture of high-temperature thermal energy storage systems.

Our mission is to reduce combustion in energy production and accelerate the expansion of wind and solar energy.

€9M

In 2024, we achieved a significant milestone by securing €7.6 million in seed funding. Total funding is €9 million.

TRL9

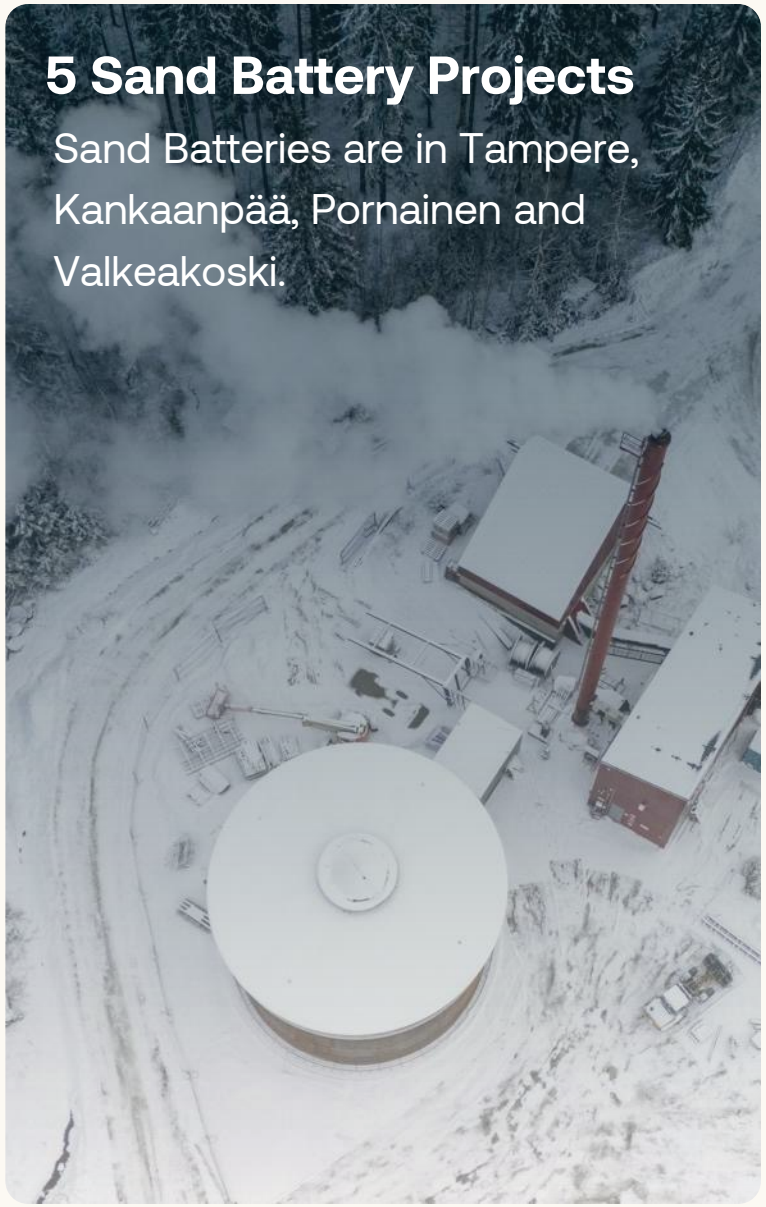
The Sand Battery is ready for commercial delivery, offering a reliable solution for thermal energy storage.

24 employees

Our team is focused on developing innovative energy solutions to fight climate change.

5 Sand Battery Projects

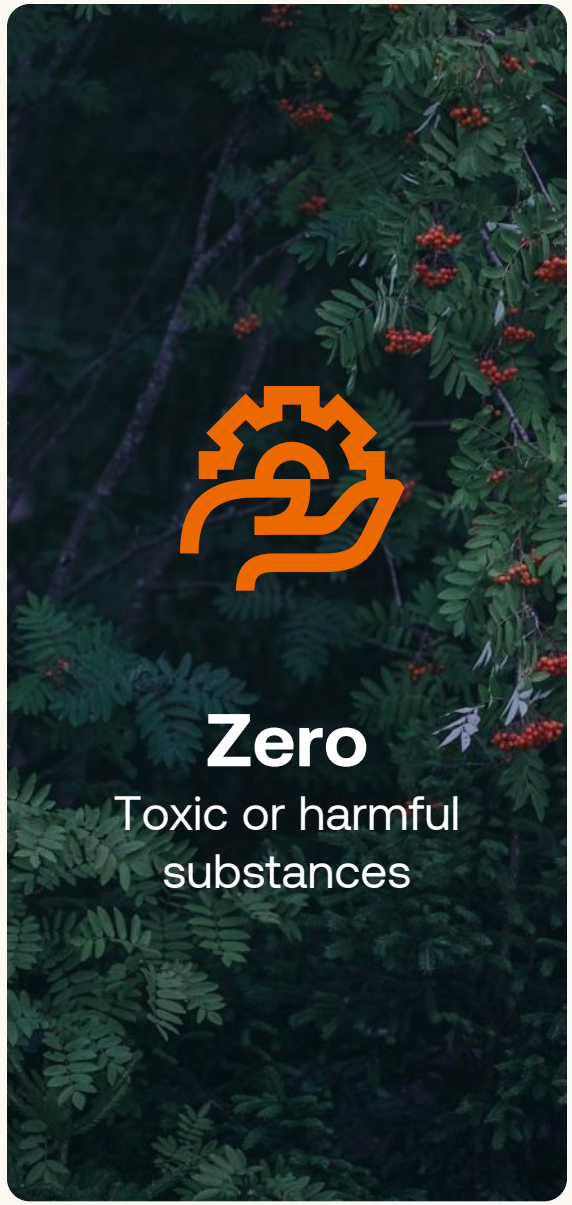
Sand Batteries are in Tampere, Kankaanpää, Pornainen and Valkeakoski.



Thousands of tons
of GHG savings

Low €/kWh
Price per capacity
Low maintenance cost

30+ years
System design life
No degradation



Zero
Toxic or harmful substances

The World Is Turning to Renewables

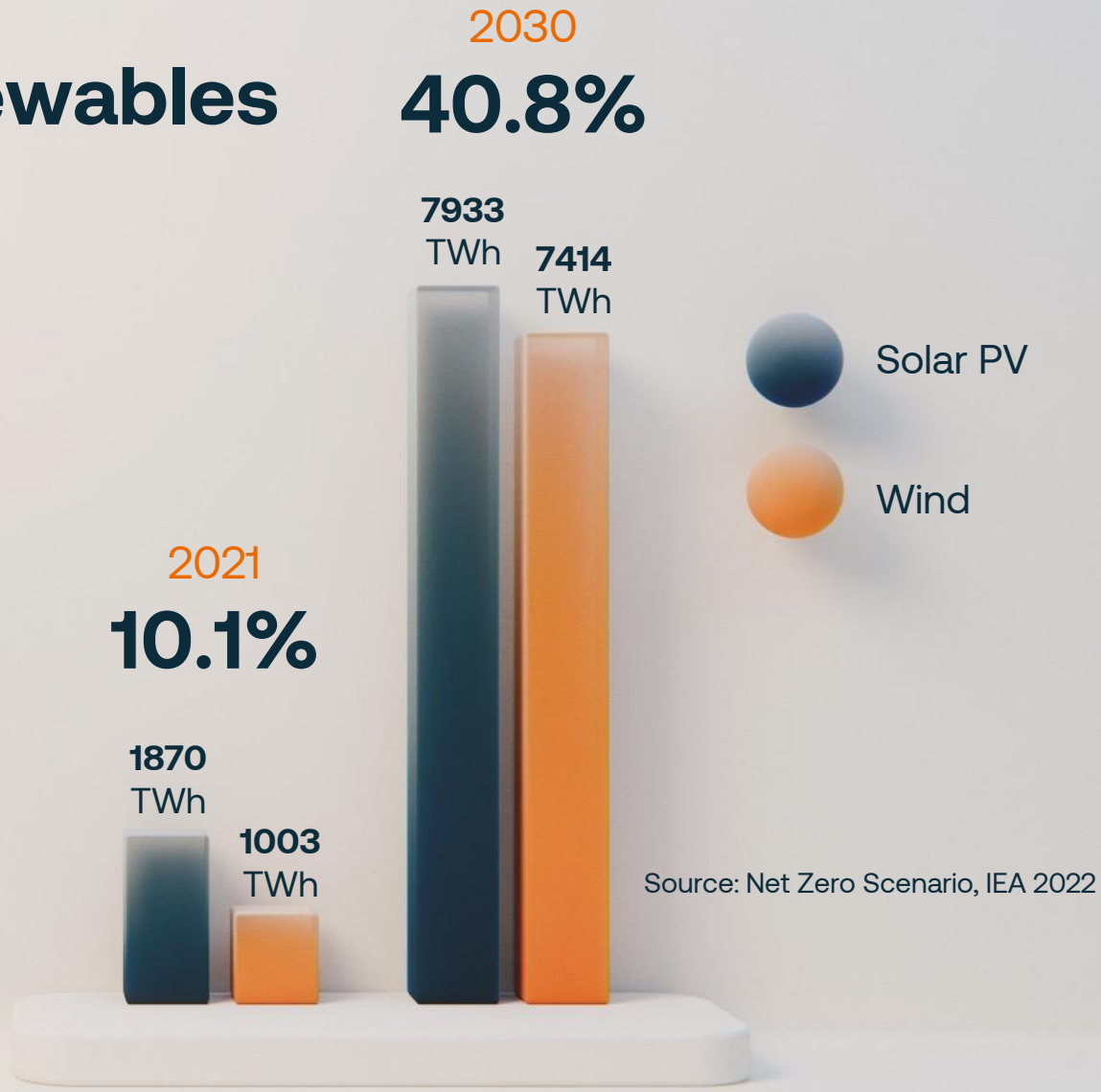
Intermittent renewables like solar and wind energy are a key ingredient in mitigating climate change. The demand for large-scale energy storage is soaring.

Price Arbitrage

- ✓ Price volatility
- ✓ Balance & curtailment

Grid Support

- ✓ Stable and reliable
- ✓ More resilient power grids



Source: Net Zero Scenario, IEA 2022

Closed loop heat transfer system

Electricity from the grid
or local renewable production

Easy integration into
existing energy systems

A patented closed loop heat transfer mechanism is used for the storage of thermal energy into sand.

Scalable for up to 1000 MWh storage capacity

Efficiency Management

Heat losses from the system remain low even at high charge levels.

The solid material conducts heat slowly, and the layered charging and discharging process ensures a steep temperature gradient, keeping temperatures low in the outer layers.

Efficiency up to 90%

Applications

Sand Battery's role in the process:

- Partial coverage of heat production (replacing e.g. oil and gas)
- Periodical replacement (e.g. summer)
- Full replacement
- Flexible combinations possible

Hot Water

District heating

Steam

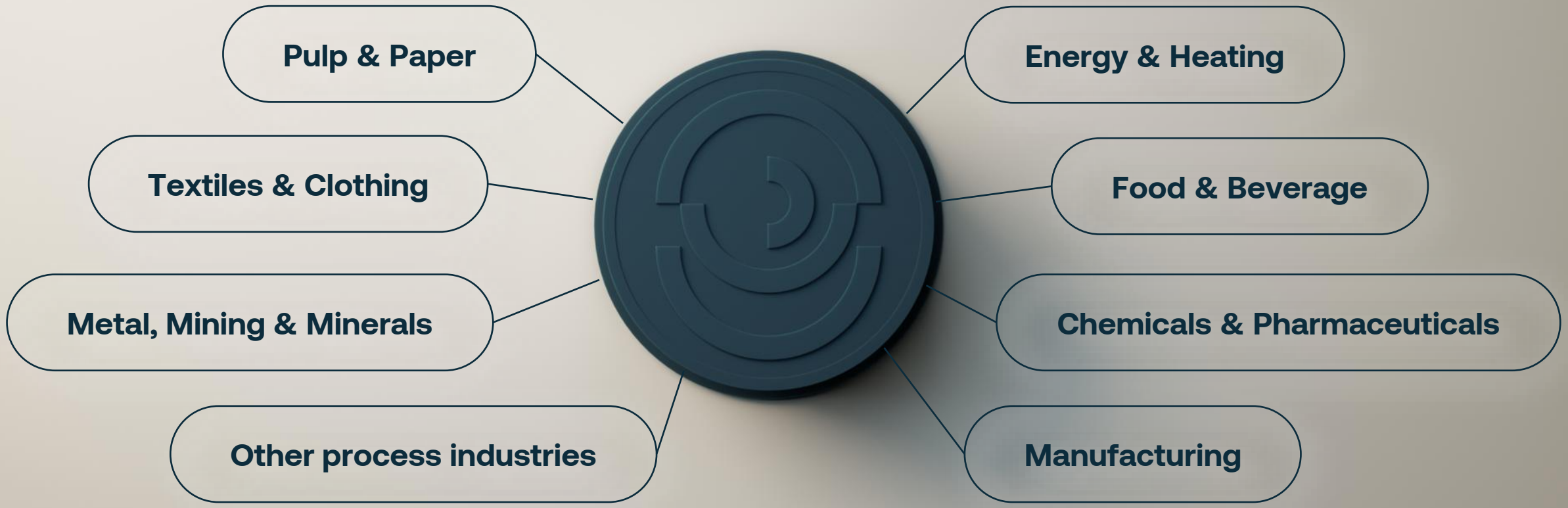
Saturated steam

Hot air

Furnaces

Electricity

Use Cases


Pulp & Paper
Textiles & Clothing
Metal, Mining & Minerals
Other process industries
Energy & Heating
Food & Beverage
Chemicals & Pharmaceuticals
Manufacturing

Decarbonizing Heat Production

By 2050, renewables will cover around 80% of global power generation and much of that will be used directly for heating.

Nearly all heat demand can be met with clean energy when supported by thermal energy storage.

Reaching net zero by 2050 requires a full transformation of the energy system and clean heat is a key part of the solution.

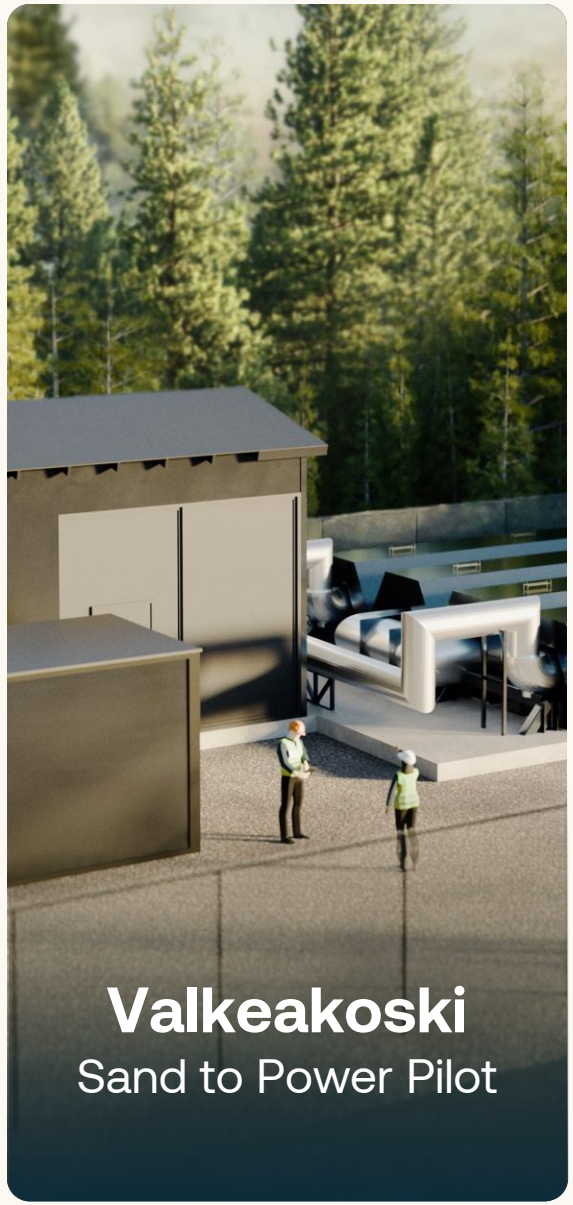
500 000 tons

The amount of CO2eq emissions saved by a single 1000 MWh Sand Battery during the whole life cycle when compared to traditional fossil fuel powered power plants.

Hiedanranta
Pilot | 3 MWh

Vatajankoski
200 kW | 8 MWh

Loviisan Lämpö
1 MW | 100 MWh



Valkeakoski
Sand to Power Pilot

The First Large Scale Sand Battery

Pornainen

1 MW | 100 MWh

Industrial-scale Sand Battery for Loviisan Lämpö, Pornainen, Finland. Serves as the primary production plant of the local heating network.

“If it works here, it works anywhere”

Sauli Antila
CapMan Infra

Polar Night Energy