Polar night energy sand

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Finnish startup Polar Night Energy has announced that construction is proceeding according to plan on its thermal energy sand-based storage system in the municipality of Pornainen in southern Finland. The 1 MW system will supply thermal energy for Loviisan L?mp?"s district heating network.

Once in operation, it will be capable of storing up to 100 MWh of thermal energy - a capacity equivalent to almost one month of heating demand in the summer and one week of demand in Pornainen in the winter. Polar Night Energy said its Sand Battery works as a high-power, high-capacity reservoir for excess wind and solar energy, storing energy in sand as heat.

The new Sand Battery in Pornainen will be filled with crushed soapstone, a by-product of Tulikivi"s heat-retaining fireplace production. A total of 2,000 tons of soapstone will be used in the Sand Battery, equivalent to the weight of about a thousand soapstone fireplaces. The filling process was completed at the end of October.

"We"re very pleased to use a by-product of Tulikivi"s production instead of virgin materials for the Sand Battery, supporting the principles of circular economy. We have high expectations for soapstone"s performance," says Polar Night Energy CEO Tommi Eronen.

The Sand Battery is delivered as a turnkey project and integrated with Loviisan L?mp?’s district heating network. It will be charged from the electric grid using charging algorithms developed by Polar Night Energy, which the company said will minimize the cost of electricity used for charging, while meeting demand from the district heating network.

"The Sand Battery will significantly reduce the combustion-based energy used in our district heating network, and the collaboration with Tulikivi has added a valuable circular economy aspect to this project," says Loviisan L?mp? CEO Mikko Paajanen.

In 2022, Polar Night Energy switched on the world"s first commercial sand-based, high-temperature heat storage system in the Finnish city of Kankaanp??, with 100 kW of power output and 8 MWh of storage capacity. In December 2023, it announced a partnership with Nordic energy company Ilmatar to develop its sand battery with power-to-heat-to-power capabilities.

Polar Night Energy, a startup in Finland, has developed technology for warming up buildings with solar-generated heat stored in sand. The team uses thermal modeling to optimize the design of their heat storage and distribution systems, which are helping Finnish cities reduce their consumption of nonrenewable heating fuels.

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As we try to objectively study nature, we are often reminded of how natural forces affect us personally. We can sit at a desk and consider heat in its various forms, but we might be distracted if our toes are cold! When we turn up the heat in our homes and workplaces, we must balance our personal need for warmth with the global impact of burning fossil fuels like oil, gas, coal, and biomass. Anthropogenic climate change confronts humanity with a challenge: How can we keep warm now as we try to prevent our world from overheating in the future?

Figure 1. The nation of Finland, part of which is above the Arctic Circle. Polar Night Energy's heat storage systems are currently installed in the cities of Tampere and Kankaanp??.

Big problems demand big solutions, and there is perhaps no bigger 21st-century problem than climate change. To meet this challenge, many governments and organizations are investing in new technology to help lessen the use of fossil fuels. These initiatives have largely focused on renewable electric power generation, distribution, and storage.

"When you ask people about cleaner energy, they think of electricity," says Tommi Eronen, CEO of Polar Night Energy. "But we also have to cut emissions from heating." Out of Finland"s energy-related emissions, 82 percent come from heating domestic buildings (Ref. 1). "We want to replace all of that if we are to have any hope of meeting our global climate goals," Eronen says.

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