Renewable energy sand storage

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Polar Night Energy (PNE), a Finnish company, is leading the way in demonstrating that large power storage solutions need not be made using lithium. Instead, the company has turned to a widely available resource: sand. In 2022, the company revealed the world’s first sand battery.

As the world scales up renewable sources of energy in a bid to reduce its carbon emissions, storage of generated energy has been a new problem. Energy generation from the Sun and the wind is not a continuous process and the difference in power levels generated during peak and non-peak hours can be significant. Green utility companies are turning to large-scale battery storage solutions made using lithium and its derivatives to tide over these differences.

PNE’s solution turns to resistive heating to utilize the excess power generation during peak hours. The energy is used to heat air, which is then transferred to a tower of sand through a heat exchanger. Since the melting temperature of sand is hundreds of degrees Celsius, a tower of sand has a high potential for storing energy.

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More importantly, a battery is built in such a manner that it can store energy for many months at a time, providing an option for long-term storage. To demonstrate their technology, PNE set up a small sand battery in western Finland using 100 tonnes of sand which is used in construction.

The stored heat energy can be used to heat water and pump it to offices and homes during winter. The energy conversion ratio is rather poor when it comes to converting heat into electricity. However, it could still be useful as a source of industrial heating, which is a major contributor to emissions.

Unlike innovations that take a few years to mature and reach the markets, the sand battery is a technology that is available right away. Since demonstrating its technology, PNE has been offering sand-based energy storage solutions through its two products.

One with 2MW heating power and a capacity of 300 MWh and the other with 10MW heating power and a capacity of 1000MWh (1 GWh). The latter is a 100x scale-up of the technology demonstrator the company had built and the company told IE in an interview that it expects most of its installations to be in this category.

Finnish companies Polar Night Energy and Vatajankoski have built the world"s first operational "sand battery", which provides a low-cost and low-emissions way to store renewable energy.

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The battery, which stores heat within a tank of sand, is installed at energy company Vatajankoski"s power plant in the town of Kankaanpää, where it is plugged into the local district heating network, servicing around 10,000 people.

The company behind the technology, Polar Night Energy, says it helps to solve one of the key obstacles in the transition to full renewable energy: how to store it for use during times when the sun isn"t shining or wind isn"t blowing, and particularly for use in the wintertime when demand is high.

"Solar and wind power is basically already really competitive in terms of energy price per produced energy unit," Polar Night Energy co-founder and chief technology officer Markku Ylönen told Dezeen.

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