

# ADVANTAGES OF FINNISH AIR-COOLED ENERGY STORAGE



Is energy storage a viable option in Finland? This study reviews the status and prospects for energy storage activities in Finland. The adequacy of the reserve market products and balancing capacity in the Finnish energy system are also studied and discussed. The review shows that in recent years, there has been a notable increase in the deployment of energy storage solutions.



Which energy storage technologies are being commissioned in Finland? Currently, utility-scale energy storage technologies that have been commissioned in Finland are limited to BESS (lithium-ion batteries) and TES, mainly TTES and Cavern Thermal Energy Storages (CTES) connected to DH systems.



What factors influence the development of energy storage activities in Finland? Several parameters are influencing the development of energy storage activities in Finland, including increased VRES production capacities, prospects to import/export electricity, investment aid, legislation, the electricity and reserve markets and geographic circumstances.



Is the energy system still working in Finland? However, the energy system is still producing electricity to the national grid and DH to the Lempäälä area, while the BESSs participate in Fingrid's market for balancing the grid. Like the energy storage market, legislation related to energy storage is still developing in Finland.



Is energy storage the future of wind power generation in Finland? Wind power generation is estimated to grow substantially in the future in Finland. Energy storage may provide the flexibility needed in the energy transition. Reserve markets are currently driving the demand for energy storage systems. Legislative changes have improved prospects for some energy storages.

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Can PHS be used as energy storage in Finland? Plans exist for PHS systems, but studies have indicated that there may be few suitable locations for PHS plants in Finland [94,95]. While large electrolyzer capacities are planned to produce renewable hydrogen, only pilot-scale plans currently exist for their use as energy storage for the energy system (power-to-hydrogen-to-power).



Two centrifugal chillers of 3.8 MW each are used for the ice storage. The main advantages of this storage system is to decrease the network cold water temperature from 4°C to 2,2°C in order to increase the density of the energy ???



In addition, solar assisted local energy solutions with seasonal heat storage could reduce the emissions and increase energy self-sufficiency of a Finnish district (Paiho, Hoang, ???)



A 100% renewable energy scenario was developed for Finland in 2050 using the EnergyPLAN modelling tool to find a suitable, least-cost configuration. Hourly data analysis ???



Battery Energy Storage Systems (BESS) play a crucial role in modern energy management, providing a reliable solution for storing excess energy and balancing the power grid. Within BESS containers, the choice ???

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A cool thermal energy storage system uses stored ice or chilled water as a medium for deploying energy. (Image courtesy of Trane.) There is hot and cold thermal energy storage. Hot TES would include the water heater in ???



Liquid cooling and air cooling are two common cooling methods for energy storage systems, which have significant advantages and disadvantages in terms of performance, price, and development trends. The liquid cooling ???



Liquid cooling vs air cooling; Advantages: Easy installation, small size, high heat dissipation efficiency, Studies have shown that the energy consumption of forced air-cooled energy storage equipment can be reduced ???