

# **Frequency regulation of Nordic energy storage power stations**





## Overview

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Do energy storage stations improve frequency stability?

With the rapid expansion of new energy, there is an urgent need to enhance the frequency stability of the power system. The energy storage (ES) stations make it possible effectively. However, the frequency regulation (FR) demand distribution ignores the influence caused by various resources with different characteristics in traditional strategies.

What is the normal frequency range in the Nordic power system?

Normal state is shown in green, Alert state in yellow and Emergency state in red. In the Nordic power system the standard frequency range is 50 Hz  $\pm$ 100 mHz. During large imbalance events the frequency is allowed to transiently deviate  $\pm$ 1000 mHz for up to 60 seconds, after which the frequency has to settle within  $\pm$ 500 mHz.

What is a Nordic power system?

The Nordic power system is designed for a nominal frequency of 50 Hz, however, the actual frequency always fluctuates around the nominal value depending on the imbalance between production and consumption. When there is more electricity production than consumption the frequency will start to increase and vice versa.

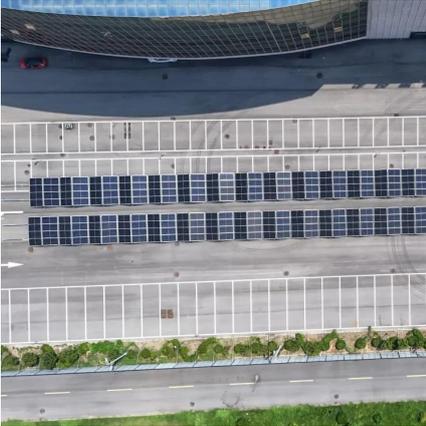
How many system states are there in the Nordic power system?

There are five different system states: Normal, Alert, Emergency, Blackout and Restoration . The first three of them are illustrated in Figure 2 with respect to frequency. Figure 2: System state limits with respect to frequency in the Nordic power system. Normal state is shown in green, Alert state in yellow and Emergency state in red.



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### How is the frequency regulation of energy storage power stations

Apr 14, 2024 · Energy storage units provide essential services that not only enhance grid performance but also advance the efforts toward sustainable energy Transition. The ...

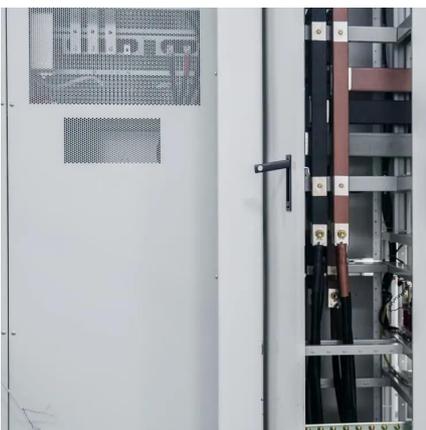
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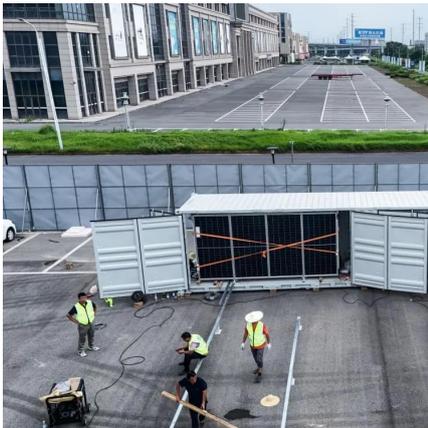
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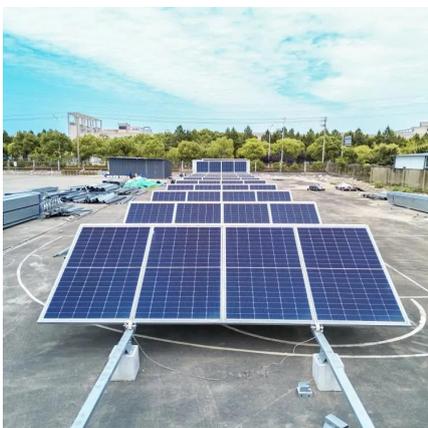
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