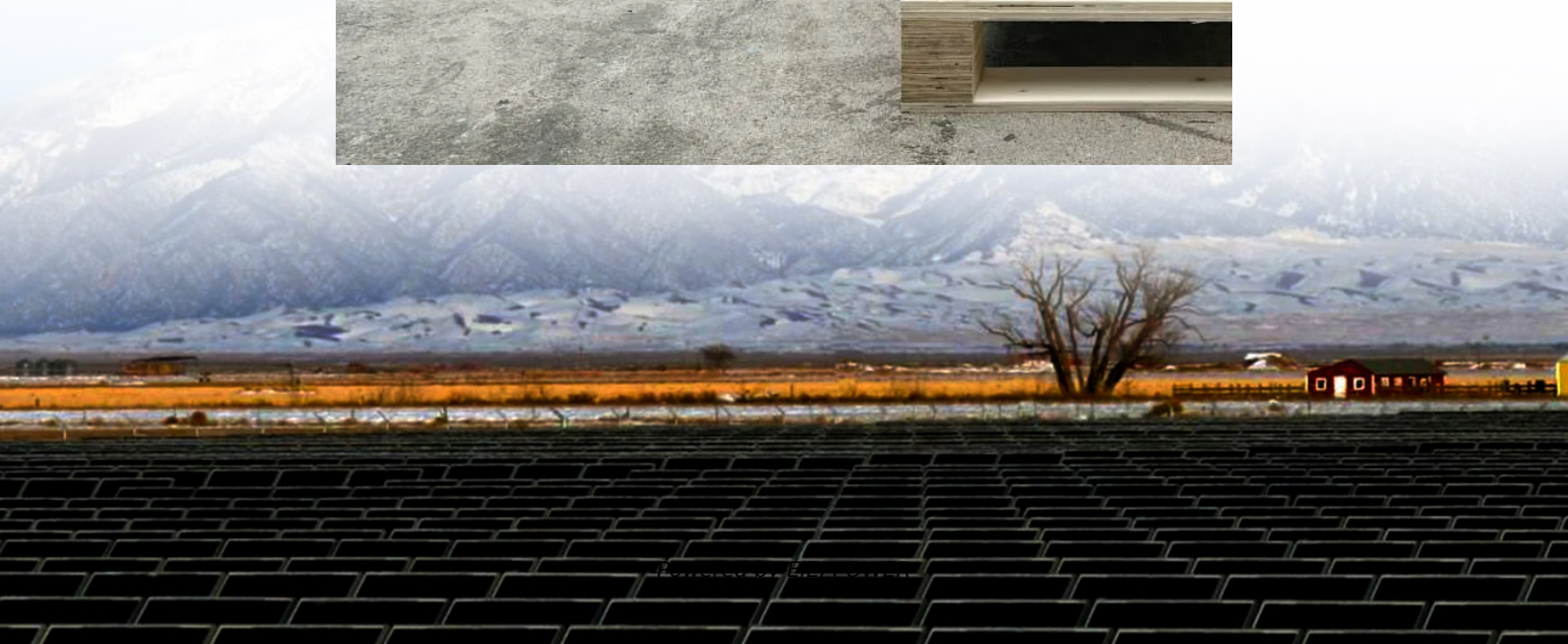


Nordic Energy Storage Frequency Modulation Power Station





Overview

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.

What is dynamic frequency modulation model?

The dynamic frequency modulation model of the whole regional power grid is composed of thermal power units, energy storage systems, nonlinear frequency difference signal decomposition, fire-storage cooperative fuzzy control power distribution, energy storage system output control and other components. Fig. 1.

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.

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.



Nordic Energy Storage Frequency Modulation Power Station



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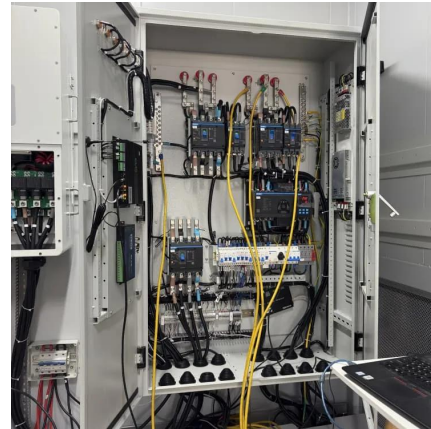
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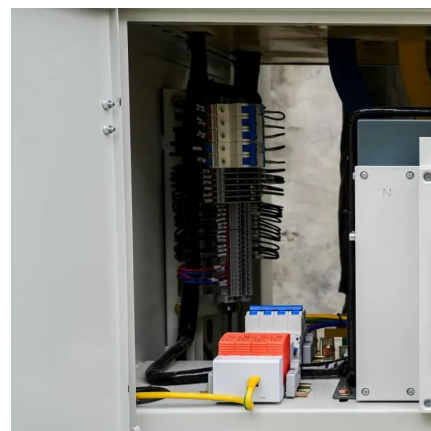
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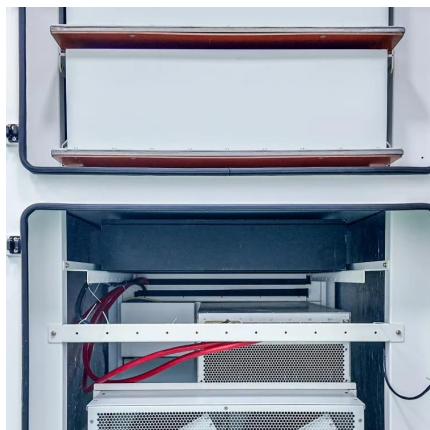


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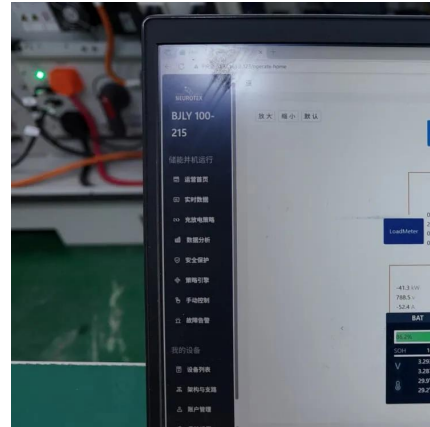
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