



LLSE CONTAINERS

# Nordic solar power station energy storage frequency regulation





## Overview

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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 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  $50 \text{ Hz} \pm 100 \text{ mHz}$ . During large imbalance events the frequency is allowed to transiently deviate  $\pm 1000 \text{ mHz}$  for up to 60 seconds, after which the frequency has to settle within  $\pm 500 \text{ mHz}$ .

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.

What is the Nordic system operation Agreement – Annex load-frequency control & reserves?

The Nordic System Operation Agreement – Annex Load-Frequency Control & Reserves further elaborates the requirements of SOGL and EBGL in a Nordic context to ensure that the Nordic synchronous area is operated on a high level of reliability and quality.



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