Background

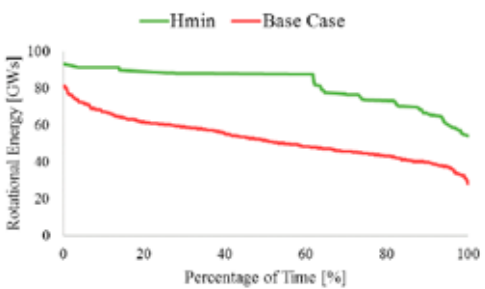
Having a stable system frequency is vital for safe operations of a power system. A small change in frequency is adjusted for by the system inertia. The system inertia has the important ability that it helps maintain a stable frequency. The consequence of an unstable frequency can in the worst case be a blackout.

The Nordic power system is changing, and it is expected that these changes will lead to more occurrences of low inertia situations. Low inertia situations must be avoided as they lead to a more unstable frequency. To avoid low-inertia situations it is necessary to introduce measures to increase the inertia in the Nordic power system.

Objective

The objective of the masters thesis is to find a cost-effective strategy to ensure sufficient inertia in the Norwegian power system. Three strategies will be evaluated based on their socioeconomic costs and their effectiveness in providing sufficient inertia. To analyze the effect of the strategies, a market model of the Northern European power system, implemented in GAMS, was used.

The first strategy is to define a minimum production level for the hydro generators and extend it to only apply on days with low inertia. The second is to reduce the capacity on an HVDC link, and the third strategy is load reduction by disconnecting the pumps for hydro storage.



Duration curve of the rotational energy in the Norwegtian power system when the first strategy (Hmin) is implemented, compared to the original data set (Base Case).

MASTER THESIS

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Fall 2017

Strategies to ensure sufficient inertia in the norwegian power system

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