

Background

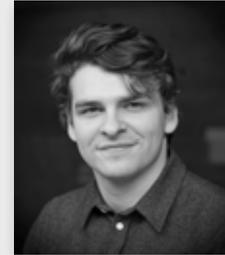
Investigate the relation between flexible operating patterns, mechanical loading and predict its maintenance costs.

The European electricity system is undergoing a radical change, with increasing contribution from intermittent renewable energy sources. Simultaneously there are potentially large changes in the profile of consumption. Large-scale conversion from gas and diesel engines to electrical vehicles for private transport, and subsequent conversion of short-range goods transportation and inshore marine transport may cause new significant peaks in the consumption. Smart grid solution may assist in smoothing out these peaks, but there is still large uncertainties in how efficient these demand side regulations will be. The transmission system operators and local distribution companies are thus faced with larger challenges to maintain reliable grid, with small frequency variations and good voltage stability. To meet this challenge many TSOs are considering introducing new markets for system services/

ancillary services. A common trait with many of these services are rapid response/rapid load changes. It is also probable the operation close to zero load for extended periods may be a requirement. It is a general observation in the Nordic markets that the liberalization of the energy markets in the 1990s led to changes in the operating pattern. It is inferred that this has led to increased mechanical loading and wear on the units but there exist little or no systematic documentation of this.

With stronger interconnections to continental Europe and UK and stronger integration with system services markets in this regions it is hypothesized that the trend of more dynamic operating pattern will continue. For a power plant owner wanting to operate in such market it is important to know both what will be the price in the market as well as the cost in terms of increased maintenance cost. As a starting point, it is of interest to understand how various operations increase the mechanical loading of the units.

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Spring 2018

**Impact from Flexible
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