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**Statnett's on-going R&D activities and vision towards the next generation
control centre**

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Abstract;

The Nordic Power system is changing [1, 2]. The main drivers for the changes are climate policy, which in turn stimulates the development of more variable RES (variable Renewable Energy Sources), technology development and a common European framework for market operation and planning. These changes lead to five common Nordic challenges, which are issues regarding System Flexibility, Transmission Adequacy, Generation Adequacy, Frequency Quality and Inertia. They put pressure on, amongst others, the operators in the control centres. To prepare for the future, we need to explore how more automation, monitoring and control can supplement the current tools in system operations.

In Statnett's R&D Smart Grid programme, we aim to prepare the power system for a more complex future by building expertise and developing new methods and tools. The long term vision is an analogy to a cockpit or a self-driving car, where the system optimizes the tasks with regard to economy, risk and security of supply. In order to approach this vision, we have to investigate possibilities within real time monitoring and control, using artificial intelligence on big data, predict system behavior based on different models and prescribe the best response to undesired situations. Functional visualization and dash boards for the operators are also an important parts of it.

SPANDEX is one of the projects where some of these building blocks are tested. In this project, we bring data from phasor measurement units (PMU) to the control room and develop applications that will provide the operators with real-time information about situations that are difficult to capture with the current tools. GE Grid Solutions, NTNU and SINTEF are our partners in this project. GE provides a wide area monitoring tool (PhasorPoint) and is about to make available a new application developed at NTNU for testing by the operators at the control centre.

Topics for discussion (option 2):

Challenges Statnett is experiencing in order to reach the future scenario as fast as needed:

- Question 1: How can vendors increase the interoperability of software tools for the control centre to allow for faster development and prevent vendor lock-in situations? Statnett is afraid that choosing a platform (Predix, MS Azure etc.) will prevent cooperation with vendors using a different platform.
- Question 2: How can TSOs protect themselves from cyber security threats in the future control centre? How do TSOs ensure that interfaces between systems from different vendors do not introduce vulnerabilities? Which questions are suited for R&D within this area?
- Question 3: How can control centre operators rely on more automatic control? This is both regarding the possibilities to control and to verify that the systems work correctly. And how can the competence of operators be maintained when they most of the time is left with a more passive role?

Reference:

[1] Nordic Energy Technology Perspectives 2016 – Norden (Nordic Energy Research, Nordic Council of ministers) and IEA (International Energy Agency), www.iea.org/etp/nordic

[2] Challenges and Opportunities for the Nordic Power System, 2016, Statnett, Energinet dk, Svenska Kraftnät, Fingrid