

# **Cigré International Symposium 2019**

**June 3-6 2019, Aalborg, Denmark**

## **GOING OFFSHORE**

### **CHALLENGES OF THE FUTURE POWER SUPERGRID**

This symposium is an initiative of Department of Energy Technology and Cigré Danish National Committee. The transmission grid is both looking at and undergoing major challenges in the future due to integration of renewables and especially offshore wind power plants OWPP are a key player in reaching the goals of reducing carbon emission.

The transmission grid faces challenges both with regards to the connection of OWPP as well as in the need for restructuring the grid to operate differently compared to its original layout.

The challenges of the before mentioned inherently resides in the fact that no real transmission grid exists offshore. Today's OWPP are point-to point onshore/offshore lines. Moreover the choice of technology depends on the technological development and HVDC is foreseen to be able to play a key role in some offshore grid scenarios together with HVAC.

The challenges of the latter are already ongoing. Transmission corridors are updated; new lines are built to accommodate the change in both geographical and timely generation/load patterns as well as the need to operate the system in a fundamentally different way than with large centralized plants close to load centers providing the majority of the power.

This symposium intends to share the latest research and real life system experience obtained in the context of the future transmission grid. The symposium is organized by six Cigré study committees who are highly active in the design and operation on a system perspective as well as in the technologies needed to overcome the challenges. These are:

- SC C4 System Technical Performance (leader of symposium)
- SC B1 Insulated Cables
- SC B2 Overhead lines
- SC B4 HVDC and Power Electronics
- SC C1 System Development and Economics
- SC C2 System Operation and Control

**The preferential subjects are proposed to be:**

With more than 40% wind energy today in the annual electricity production in Denmark we already clearly see the benefits of being part of an integrated European electricity system and market. Having a scope of 50% wind energy production and renewables in 2020 increasing towards 100% in 2035 Denmark faces strong needs for developing an even more integrated and reliable power system. Public opinion and environmental acceptance of new overhead lines necessitates new solutions to upgrade the capacity of the existing transmission corridors across Denmark and Europe and most likely to consider off-shore grid solutions. We would suggest the following preferential subjects for a Cigré symposium in Denmark:

- Offshore VSC-HVDC technology in a technical and economic *system* perspective (in-park MVDC, HVDC links, multi-terminal links and hybrids including HVAC)
- Challenges of network connection of OWPP (cable technology, HVAC, HVDC, power quality, harmonic stability, weak networks, spinning reserve, active and reactive grid support, underground cable transmission, reinforcements of existing grid, system phenomena like transients, stability, voltage/frequency regulation, dynamics, insulation coordination...etc)
- Upgrading and restructuration issues of the onshore transmission network employing both HVAC, HVDC, overhead lines and underground cables
- Issues of submarine cable planning, installation, operation and maintenance
- Operation and reliability issues of a power transmission network employing offshore HVAC and HVDC fed generation as a major source of power. Black start and emergency strategies. Network split-up's.