Design tool for offshore wind farm cluster planning

In the framework of the FP7 project EERA DTOC: Design Tool for Offshore wind farm Cluster, a new software supporting the planning of offshore wind farms was developed, based on state-of-the-art approaches from large scale wind potential to economic benchmarking. The model portfolio includes WAsP, FUGA, WRF, Net-Op, LCoE model, CorWind, FarmFlow, EeFarm and grid code compliance calculations. The development is done by members from European Energy Research Alliance (EERA) and guided by several industrial partners. A commercial spin-off from the project is the tool ‘Wind & Economy’. The software has been compared and validated to a wide extent. Around 10 wake models have been compared to SCADA data from the Horns Rev 1 offshore wind farm in the North Sea, and the Lillgrund and Rødsand-2 wind farms in the Baltic Sea. The Rødsand-2 wind farm is located nearby the Nysted-1 wind farm, thus an investigation of the wake influence between dual operation twin farms was possible. Furthermore both micro- and mesoscale wake models have been compared to satellite-based wind farm wake data in the North Sea. Regarding the planning of the electrical grid, both inter-array and long-distance cables were modelled by the software and several tests were performed. The calculations include the smoothing effect on produced energy between wind farms located in different regional wind zones and the short time scales relevant for assessing balancing power. The grid code compliance was tested for several cases and the results are useful for wind farm planning of the grid and necessary components and controls.

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