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Abstract content

Abstract title

DESIGN TOOL FOR OFFSHORE WIND FARM CLUSTERS

Introduction

The Design Tool for Offshore wind farm Clusters (DTOC) is a software tool to facilitate the optimised design of individual and clusters of offshore wind farms. DTOC is developed with the support of an EC funded FP7 project with contribution from science partners from the European Energy Research Alliance (EERA) and industrial partners. .

Approach

The approach is to develop a robust, efficient, easy to use and flexible tool which integrates software relevant for planning offshore wind farms and wind farm clusters. The software include wake models, energy yield models, inter-array and long cables and grid components models, grid code compliance and ancillary services models. The common score for evaluation is levelized cost of energy (LCoE). The integrated software is developed within the DTOC project and has open standard whereas most of the software from partners are commercial with intellectual property.

Main body of abstract

The EERA DTOC project work has included three benchmark validation tests of several wake models including engineering wake models, CFD models and linearized/parabolized CFD models. The results from Horns Rev 1, Lillgrund and Rødsand-2 show the wake models to compare well to SCADA data. The energy yield and losses have been investigated. Also the grid connection options and model integration have been done. Based on this initial work, the software integration has been defined. The industrial partners of the project defined the main tasks to focus on through so-called user-stories. This guided us to select the interconnection and functionality of the tool. Thereafter software implementation is carried out.

The DTOC work includes not only the software development, but also efforts to test the new integrated tool. Several so-called application scenarios have been defined and the project partners have calculated a series of possible, potential plans for three 'general' scenarios: 1) developer case of around 500 MW wind farm near other wind farms with 5 MW turbines not too far from coastline; 2) developer case of 1 GW near clusters of wind farms with 10 MW turbines far offshore; 3) far future scenario with large wind farms, several long-distance cables (infrastructure). The presentation will focus on the DTOC tool functionality, user options, and key results from selected calculations. One of the innovative new aspects of the tool is closer collaboration between wind energy experts in aerodynamics, wind conditions, grid planning of offshore wind farms and financial assessment. The tool allows integrated work on the DTOC platform to optimize offshore wind farm planning.

Conclusion

The EERA DTOC tool presents a new, fully integrated approach to wind potential assessment including the influence of large scale wind farm clusters, wake effect calculations of large offshore wind farms, electrical infrastructure planning and grid compliance, giving support for planning offshore wind farms and clusters of wind farms. LCoE is the score for inter-comparison of different layout variants, also supporting cost of foundations, O&M, and other expenditures. The DTOC tool will be presented life during the exhibition.

Learning objectives

The key learning objective is innovative new option for planning offshore wind farms and clusters. The DTOC tool include wind engineering expertise from diverse disciplines that in the future may challenge usual procedures but at the same time enable more comprehensive and so more economic analysis of potential planning for offshore wind farms.