Workshop proceedings

EERA-DTOC and Cluster Design workshop

EWEA

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1. INTRODUCTION

The European Energy Research Alliance (EERA) in collaboration with valuable industry partners propose an integrated and validated design tool combining the state-of-the-art wake, yield and electrical models available in the consortium, as a plug-in architecture with possibility for third party models, namely the EERA – DTOC project.

To decrease uncertainties around wind farm wake predictions, a small measurement campaign together with the new data available from the industry partners will enable better tuning, and eventually better modelling of the far-field of wind farm wakes. With the large amount of offshore wind farms to be built in the next years, clusters of wind farms will appear at favourable locations, like in the German Bight and Dogger Bank. Large arrays of floating wind farms planned near long-distance grid cables independent of water depth will also start to appear in the next years. The planning and design of these clusters pose new challenges with regards to the siting of the connected wind farms, the design of the interconnecting grid structure and the integration of the large amount of power into the electricity supply systems.

The concept of this project is to combine this expertise in a common integrated software tool for the optimized design of offshore wind farms and wind farm clusters acting as wind power plants. The interfaces between the sub-models are going to be open.

In order to promote the project findings, EWEA is in charge of communication and dissemination activities. The European Wind Energy Association (EWEA) is in charge of organising 2 seminars and 3 workshops within Work Package (WP 6) Communication and Dissemination activities.

This is the first workshop from the series of three, organised in London on 06 June, 2013, in cooperation with the Cluster Design project run by 3 E. The event was organised for both projects by the European Wind Energy Association (EWEA).

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2. PROGRAMME AND PRESENTATIONS

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9:30–9:40	Design Tool for Offshore Clusters: objectives of the project	Peter Hauge Madsen, DTU Wind Energy, Denmark
9:40–9:50	Cluster design: objectives of the project	Rory Donnelly, 3E, Belgium
9:50–10:10	Integration and development of offshore cluster software	Gregor Giebel, DTU Wind Energy, Denmark
10:10-10:30	Scenarios, conceptual model coupling	Gerard Schepers, ECN, The Netherlands
10:30-11:00	Q&A	

11:00-11.30	Coffee break

Session 2: 11:30 – 13:00

Moderator: Peter Hauge Madsen, DTU Wind Energy, Denmark

11:30–11:50	Wake modelling	Pierre-Elouan Réthoré, DTU Wind Energy, Denmark
11:50-12:10	Interconnection optimization and power plant - scenarios	Luis Mariano Faiella, Fraunhofer IWES, Germany
12:10-12:30	Energy yield prediction of wind farm clusters	Elena Cantero Nouqueret, CENER, Spain
12:30-13:00	Q&A Wrap-up of the morning sessions	

13:00-14:15	*Lunch*

Session 3: 14:15 – 15:15

Moderator: Rory Donnelly, 3E, Belgium

14:15–14:30	Load calculation in wind farm clusters	Dirk Steudel, REpower, Germany
14:30–14:45	Cluster control modelling and testing	Aidan Marchand, RWE Innogy, Germany
14:45–15:00	Development of the Cluster design Toolbox	Thanos Kyriazis, 3E, Belgium
15:00–15.15	Q&A	

15:15-15.45	Coffee break

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Moderator: Peter Stuart, RES, UK

15:45–16:45	Panel discussion on the opportunities and challenges of design tools for the smooth operation of clustered offshore wind farms	- Matthijs Soede, European Commission, Belgium - Wei He, Statoil, Norway - Annemie Vermeylen, C-Power, Belgium - Gareth Craft, The Crown Estate, UK
16:45 – 17:00	Q&A Wrap-up of the afternoon sessions	

17:00 - 18:00	Networking drinks reception

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Overall, the event focused on the progress made by both projects as regards the development of the design tool and highlighted the complementarity of both projects. At the same time, the Cluster project does focus more on the operation of an "offshore cluster".

The event was structured in three sessions, including a panel debate.

The full presentations are available on the official website:
http://www.eera-dtoc.eu/events/past-events/

First session

The first session focused on the EERA-DTOC project. It started with a presentation on the project goals and key drivers delivered by Peter Hauge Madsen from DTU Wind, project leader of the organisation. He explained the importance of this project for the future development of offshore wind in terms of costs reduction and maximization of the energy yield.

The next presentation introduced the other cluster design project financed by the FP 7 programme, run by Rory Donnelly from 3 E.

The two presentations that followed focused on all the tools and models designed and tested in the previous phase of the project (wake modelling, grid interconnection and energy yield), and their validation through three possible type of scenarios and couple modelling.

Gregor Giebel from DTU Wind Energy focused more into detail on the EERA-DTOC project vision with 2 key aspects: a robust and validated tool, based on the need of the two key target groups, namely strategic planners and developers.

Gerard Schepers from ECN, the Netherlands, presented the validation steps and scenarios to reach a final robust design tool, efficient and easy to use, which consist of: a) bringing together all the existing models from partners, b) develop interfaces between them, c) implement a shell to integrate, d) fine-tune the wake models using dedicated measurements, e) validate and demonstrate the final tool through likely scenarios. He also pointed out that there are three types of scenarios meant to prove the industrial usefulness of the designed tool.

The question and debate session brought up several issues:
- *the design of the tool as such,*
- *the industry player's need*: strategic planners and developers for such a tool and how should the design of the tool be adapted so that it can encompass its needs. In terms of strategic planners, a comment was made as to whether strategic planners should be part of the design tool or not, and to which extent would this be useful.

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- *costs*: the tool is supposed to offer scenarios with different types of costs and parameters,
- *the optimisation of the tool*: Since a lot of questions focused of the optimisation of the tool, it was underlined by the EERA-DTOC partners that the intention was to have a tool that would allow optimisation through planning with different scenarios and parameters.

Second session

The second session introduced the final/main models and scenarios with regards to the wake modelling, interconnection and optimization of the grid and energy yield predictions. Pierre-Elouan Rhétoré from DTU Wind energy focused on the applicability of the selected wake models within the tool and uncertainty.

Luis Mariano Faiella presented the grid component side of the future tools. A very important challenge at this stage is to overtake the gap between the different models and modules of the interconnection grid due to their different characteristics, aims and the required or offered level of details.

Elena Cantero introduced the different results obtained in some test cases, the deviations and uncertainties obtained as regards the energy yield. The main aspects to be looked at in the future are the need to define how these uncertainties are carried out through the model in order to have an optimal energy yield.

The questions focused largely on the energy yield and the level of certainty in the testing phase as well as the accuracy of the data for offshore wind farms and its translation into 'real' offshore wind farms. With regard to the grid infrastructurethe questions focused on whether the grid optimisation part under TSO is taking into account existing plans (ENTSO-e, NASCOGI), connection points, complementarity with the Cluster Design project.

Third session

The third session focused on key issues under development in the Cluster Design project led by 3 E. Dirk Steudel from REpower introduced the load calculations in wind farm clusters. Aidan Marchand from RWE Innogy Germany explained the cluster control modelling and testing within the project. Finally, Thanos Kyriazis presented the development of the cluster design toolbox.

Panel debate: main questions and debate

The panel debate focused on the opportunities and challenges of design tools for the smooth operation of clustered offshore wind farms.
The panel included Matthijs Soede, the European Commission, Wei He, Statoil, Annemie Vermeylen from C-Power and Gareth Craft, the Crown Estate, UK and Frans van Hulle, XP Wind.

The panel kicked off with a question on what are the expectations for such a tool when it will be ready. The panellists underlined the need of an accurate tool, robust but flexible at the same time. A top down engagement with industry key players is essential for a smooth development of the software and to ensure developers will be able to use it once finalised.

It was also underlined that a good strategy for exploitation is needed, if this is to be accepted and used by the industry. Another important aspect for developers is the cost ratio.

The panel and the audience also interacted on the need to have a fully validated tool, without which its use by the industry can be compromised. Lively discussions on the optimisation of the tool and its meaning took place. Participants and panellists agreed on the need to have a tool that would allow different levels of optimisation through the parameters and functions included.

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