

Wind and Wave Measurements at Offshore Locations

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Lasse Johansson and Sven-Erik Thor

Background

Electricity from renewable energy sources will make an important contribution to tomorrow's energy policy. Especially offshore wind (located in the territorial waters and the European Exclusive Economic Zones) has an enormous potential to contribute substantially to European and global climate protection.

According to estimations of the European Wind Energy Association (EWEA) 10,000 MW offshore wind power will already be installed within this decade, and by 2020 it will be 75,000 MW. At this stage more than 300 wind turbines with a total of 600 MW are installed off the coasts of Denmark, Sweden, UK and Ireland.

Several measuring stations are either planned or already operating in the North and Baltic Seas. They deliver all sorts of technical and environmental data that is required for the planning and approval of offshore wind farms. For manufacturers of wind turbines and foundations, the findings will lead to designs which are better adapted to the offshore conditions. On the basis of measured wind data, banks and investors will make their economic assessments. Institutes, standardization bodies and certification organizations will use the results to cross-check and validate the requirements derived from other fields (onshore wind energy and offshore technology). In the end, with the increase in knowledge in the field of offshore wind energy, it will be possible to push forward the development and generation of wind energy at sea.

One of these measuring stations is the German research platform, FINO 1, in the North Sea. It was installed in 2003 and has delivered comprehensive series of data since then. One of the main objectives of the FINO project is to improve the available knowledge on the meteorological and oceanographic conditions at sea. Some results are expected to be presented and discussed within this Topical Expert Meeting (TEM) and workshop.

Objectives of the meeting

The objective was to report and discuss progress of R&D on all of the above mentioned topics. Since this area of research is relatively new (for offshore wind turbines), many challenges and solutions are still to be discussed and tested. It was expected that the expert meeting would result in new and challenging directions for R&D from the discussions between experts of different origin.

Participants / Presentations

A total of 28 participants attended this meeting with representatives from Germany, Sweden, the Netherlands, and USA. The participants mainly represented National Research Organizations, utilities and entities performing measurements.

The number of presentations was 23, covering the following subjects:

Wind and Wave	11 presentations
Wind	8 presentations
Wave	4 presentations

Summary

At the concluding discussion a number of different topics were handled. A general attitude was that better knowledge of wind and wave climates offshore may result in more effective ways of designing wind turbines and foundations. This may in the end result in lower cost per produced kWh.

The opening discussion concerned the future needs in wind and wave data availability. The view among most of the participants was that there is a deficit of good wind data. The existing sources provide data of inferior quality; such as, reanalysis data with too coarse spatial resolution, insufficiently validated model data, too short observational time series or data with restrictions or too costly. A lack of recommended practices and standards for wind data analysis was also reported from some participants.

Whether existing databases, such as, "winddata.com", which was originally an IEA initiative, are updated any longer or not, was subject to some discussion.

Several model wave databases exist, but more measured time series are needed. The meeting came to the consensus that simultaneous measurements of waves and wind are needed. To perform and compile these data, a recommendation on how these should be performed and documented would be needed.

It was expressed that a new version of the IEA "yellow book" is necessary to suit the needs of offshore work. The "yellow book" deals with land-based measurements, and it is doubtful if the recommendations put in it would be possible to realize offshore. It may be necessary to review the document in order to check whether the document has to be updated for offshore conditions.

The meeting discussed how the needs for standards and recommendations could be met. A joint effort is needed, and the means has to come from the parties in such an effort. IEA can support and aid efforts in this direction, but it can not finance them.

Similar efforts were mentioned, eg. Measnet and the former Seanet (a cooperation between Bundesamt für Seeschifffahrt und Hydrographie, Rijkswaterstaat and more) and in connection to this, the opinion was expressed that an effective initiative for guidelines, etc., should not be as exclusive (closed) as these bodies are. On the other hand, the groups should not be too big.

The chairman closed the discussion by offering IEA:s support to future development of recommendations and guidelines.