

## O&M of Offshore Wind Farms



### EWIS

Being one of the leading institutes on wind energy research, ECN established the EWIS (ECN Wind Industrial Support) group in 2009 to better bring the R&D results to the market. During the last three decades, ECN has developed expertise on aerodynamics, structural analyses, turbine control, offshore operation and maintenance, and grid connection. With the growing wind industry, ECN received more requests for assistance and EWIS has become the vehicle to support the wind energy industry in their product developments.

EWIS's focus is on the high end of the market which means that we will make use of tools and knowledge that have been developed in-house and include the latest R&D results!

The EWIS team is a mixture of young professionals and experienced researchers which ensures a fast response and high quality.

#### More information

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### Description of service

#### The service

During the planning phase of an offshore wind farm, project developers are confronted with numerous options for carrying out operation and maintenance. A large variety of wind turbines with each a different reliability and maintainability are available and require a different maintenance approach. Choices should be made for personnel transfer, whether or not on-site accommodation, transporting and hoisting large spare parts, while taking into account the local situation such as the size of the wind farm, the wind and wave conditions, the nearest harbour, and the water depth. The services comprise an in depth study of possible O&M scenarios. The assumptions and results of the different scenario studies are discussed with the developer's O&M team in large detail before selecting the most efficient strategy in terms of minimum costs, downtime, and risk. ECN describes the results in bankable reports.

#### The approach

To analyse the maintenance aspects of an offshore wind farm, ECN uses a stepwise approach.

- At first, ECN together with the project team make a clear description of the wind farm and all its O&M aspects like the wind farm lay-out, the failure rates of components, maintenance devices in the turbine, the location of the wind farm, local weather conditions, and the nearest harbours.
- Next, an inventory is made of all possible means for accessing the turbine, transporting and hoisting spare parts, their costs, and the weather conditions under which they can be used.
- By means of meetings and interviews with the project team ECN drafts a baseline O&M scenario. Next, the ECN O&M Tool is applied to determine the costs and downtime and to provide information on the drivers for costs and downtime.
- Within the project team, the baseline results are discussed in large detail and based on the cost drivers alternative O&M scenarios are conceived and analysed ("What-If" studies).
- Finally, uncertainty analyses are performed to assess the robustness of the results in relation to the uncertainties of some input parameters, and to the assumptions and "guestimates" that inevitably need to be made.
- ECN uses a strict format for reporting the results. The O&M teams normally use these reports to communicate the selected O&M strategy with the project management.

## The experience

For more than one decade, ECN is recognised as the leading R&D institute on O&M of wind turbines. Within the field of O&M, ECN have worked on almost all aspects relevant for O&M optimisation, viz. collection and analyses of operational experience, maintenance management, condition monitoring, load monitoring, and modelling of O&M aspects of offshore wind farms.

For the analyses of the O&M aspects of offshore wind farms, ECN use its in-house developed software "ECN O&M Tool", a tool especially designed to consider the influence of wind and wave data on the downtime and O&M costs. The ECN O&M Tool is the only tool in this area that is validated by an independent certification institute (Germanischer Lloyd). The tool is presently being used by leading project developers and turbine manufacturers worldwide.

ECN has performed O&M analyses of many wind farms in Europe in the planning phase and most of these wind farms have recently obtained their finances and building permissions or are already under construction. The results and reports provided by ECN are being used for financing, project certification, and due diligence. A crucial aspect in the analysis of the O&M aspects is the use of failure frequencies of wind turbine components.

ECN usually provides a generic data set based on figures publicly available. However, it is advised to use more specific data for the turbines under consideration. ECN has available the knowledge and the tools to analyse large amounts of service reports and SCADA data in a structured and efficient manner. ECN can assist in analysing data sets available at the O&M departments to determine the relevant reliability figures as input for the scenario studies.

For more information about this service,  
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