



Offshore Wind Energy Projects

Within offshore wind energy projects EMD offers a wide range of consultancy services based on a long experience record within this area. Our core expertises within offshore wind energy are:

1. Layout/design – optimization
2. Energy yield estimation
3. Measurement campaign
4. Follow-up on energy yield

1. Layout/Design - Optimization

EMD has developed special add-on tools to the WindPRO software package for design of offshore wind farm layouts. With post processing tools it is possible to design the most feasible layout (production versus investment), taking parameters such as water depths, cable costs and array losses into consideration when optimizing the layout.

2. Energy Yield Estimation

Offshore winds differ from onshore wind in behaviour. Especially, stability conditions are different. Another important difference for offshore projects is the large arrays, which by their sizes reduce the amount of wind energy in the project area. This energy drain is not fully accounted for in the present array loss calculation models. EMD has recently taken part in several research projects and has developed model setup adjustments to handle these array loss problems.

Another difference is the lack of site-specific meteorological data during the investigation project phase. EMD has taken part in different research projects focusing on obtaining offshore wind information from alternative sources like satellite microwave scanning of the sea surface. By utilizing a number of different wind data sources, it is possible to get a reasonable estimate of the wind before an offshore measurement campaign is started.

3. Measurement Campaign

Measurements at the offshore location are typically considered essential due to the large investments for offshore projects. EMD has experience within planning and execution of several measurement campaigns for large offshore projects based on both traditional measurement equipment as well as new technology such as LIDAR measurements.

4. Follow-up on Energy Yield

After the establishment of an offshore project, continuous follow-ups of the production are conducted. In cases where the calculated and actual yield differ, it is important to analyze the reasons for possible discrepancies to be able to take actions to improve the performance or to make documentation for e.g. insurance purposes. EMD has developed a series of well-proven methods for analyzing the performance of projects in connection with a follow-up.

Selected Project References

All Danish existing offshore wind farms (8 in total) + new in planning: EMD has been involved in all projects with layout/design, energy yield calculations, visualisations and follow-up. Latest a 400 MW project currently in public planning

United Kingdom, Germany, Sweden & Korea:

Layout/design, energy yield calculations, environmental calculations and visualizations for numerous projects (10 to 600 MW).

North America:

EMD has performed layout/design, optimization and energy yield calculations for a 400 MW offshore project on the US East Coast and a 320 MW offshore project in Canada.

Havgul, Norway – In development:

EMD has performed micro siting (lay-out/design), energy calculations, environmental documentation, etc. and are also project manager for the ongoing measurement campaign. The aim of the project is a capacity of 1,500 MW.

Hiiumaa, Estonia – In development:

EMD is lead consultant for developing the maybe largest offshore project so far with a planned installed capacity of up to 4,000 MW.

Selected Research Work References

1. *SEAWIND – Offshore feasibility study guidelines, Al-tener, EU. EMD with partners from 5 European countries, 2003.*
2. *The necessary distance between large wind farms offshore – study; Risø National Laboratory, Roskilde, Denmark, August 2004*
3. *SAT-WIND project, Risø National Laboratory, Roskilde, Denmark, 2006.*
4. *WindPRO / PARK, Introduction to Wind Turbine Wake Modelling and Wake Generated Turbulence, Thøgersen, Morten, EMD, 2006.*
5. *Adapting and calibration of existing wake models to meet the conditions inside offshore wind farms, EMD, February 2008.*



Havgul Offshore Project, Norway - visualisation by EMD

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EMD is an independent and specialised company within the renewable and distributed energy sector, supplying software and consultancy services worldwide to companies, planners and researchers for the development of environmentally friendly energy projects.