



EMD Wind Energy Consultancy

Independent Assessment

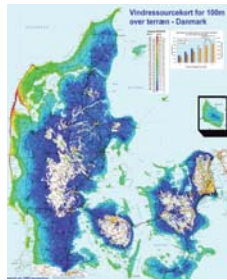
Projects

Case Studies



Norway – Offshore Challenges

EMD has been chosen as the lead wind consultant during the ongoing development of the world's largest offshore wind project - "Havsul" in Norway (1,500 MW). EMD is currently monitoring the wind measurement campaign and carrying out the micro-siting and energy production calculations for a variety of turbine layouts ranging from the current generation of 3MW turbines to the future generation of up to 8MW offshore turbines.



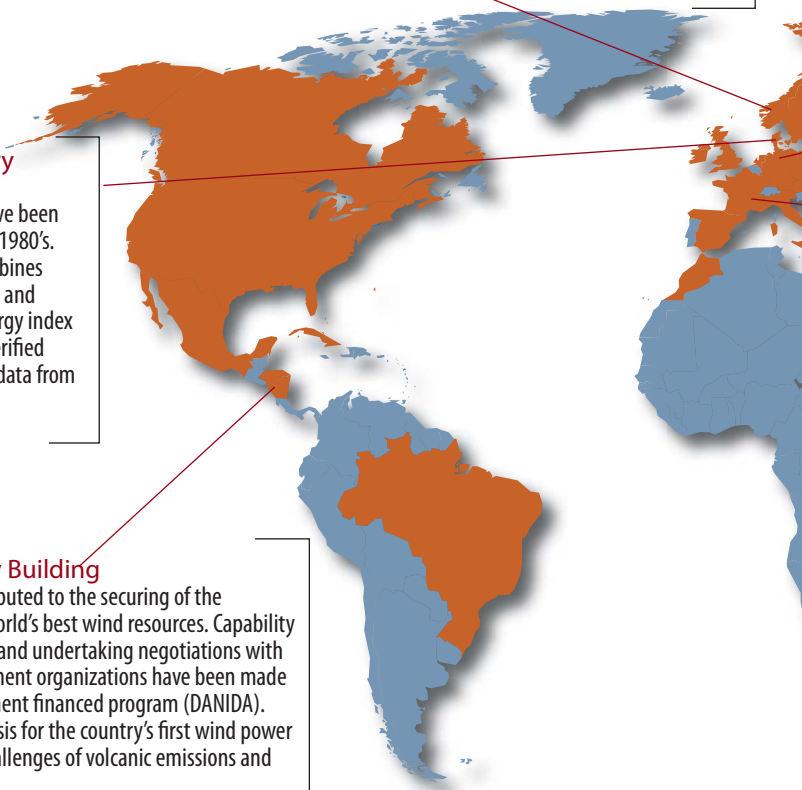
Denmark – The Home Country of Wind Energy

Based in Denmark, EMD consultants have been involved in wind energy since the early 1980's. Closely monitoring more than 5,000 turbines now installed in Denmark, EMD collates and manages the Danish monthly wind energy index providing the most detailed and best verified wind resource map in the world (using data from over 1,500 operational turbines).



Nicaragua - Capacity Building

EMD is proud to have contributed to the securing of the utilisation of some of the world's best wind resources. Capacity building, feasibility studies and undertaking negotiations with utilities, banks and government organizations have been made possible through a government financed program (DANIDA). EMD has established the basis for the country's first wind power plants, whilst facing the challenges of volcanic emissions and very steep terrain.



Wind Energy Assessment Bankable

EMD can provide all aspects of site assessment, including verification of data collected at measurement masts, classification of the surroundings and confirmation of sensor calibrations. We also offer wind data analyses and long term correction and model calculations (WindPRO - WAsP – CFD models) for your proposed wind farm with a full bankable report including loss and uncertainty evaluations.

Site Finding (Prospecting)

EMD advises developers on how to get started. Calculation of preliminary wind resource maps, recommendations on measurement mast locations etc.

Micro siting

Finding the best layout of the windfarm involves many disciplines – in some places the environmental restrictions define the major layout constraints, in others it may be accessibility, but most often the wind resource, wake losses and load restrictions determine the layout of the project.

Site Compliance

EMD offers experienced advice on selecting the most appropriate WTG for your project, maximising yield whilst achieving IEC compliance with the predicted loads.

Performance Check (Wind-index)

A wind index is a robust way to estimate the real long term energy production expectations for existing turbines based on short-term production data. EMD has been involved in development, calculation and validation of wind energy indices for many regions around the world helping wind farm owners with documentation for insurance, acquisitions (reselling) and further developments.

Feasibility Studies Decision

In close consultation with the client we collect the relevant data and evaluate the potential opportunities for a specific site/project. We propose wind farm layout(s) and a choice of turbines based on IEC classification compliance, accessibility, etc. Wind energy assessment, visualisations, environmental considerations, grid connection issues and financial feasibility are typically elements of the study.

Second Opinion Study Assurance

Financial institutions worldwide use EMD for a bankable second opinion on wind farm projects. EMD provides independent annual energy production (AEP) calculations performed in connection with financing of new projects or acquisition of existing wind farms.

Due Diligence Technical

EMD offers independent technical due diligence of projects including review and analyses of wind resource, layout and AEP; turbine certification and site compliance; review of environmental studies and permits, reviews of infrastructure design and geotechnical studies, review of contracts (grid connection, construction, operation, off-take) and warranties, review of local planning permits and approvals as well as calculation of financial valuation figures (CAPEX and OPEX) and review of project time schedules.



Germany – Experience
 With relatively light winds, Germany typically installs turbines with very large hub heights (currently 90m or more). This presents greater challenges to the wind calculation models. Through more than 400 wind assessments and second opinion provisions alone in Germany, EMD has gathered the best experience and background for providing our clients with accurate wind energy predictions.



Southern Europe – Growing markets
 Italy, Spain, Portugal and France are countries where EMD focuses a lot of its consultancy manpower. Many developers and financial institutions seek an experienced partner when considering the development of new projects. The nature of the wind resources demands extensive assessments and feasibility studies as well as a thorough financial evaluation before a project becomes a reality.



Egypt – Large scale production
 Participating as part of an international team of consultants, EMD provided the necessary wind expertise to secure the installation of 222 turbines in one of the worlds largest wind farms (Zafarana). Handling array losses in such large wind farms was a particular challenge that needed to be faced. The results provided valuable knowledge to developers in the desert regions along the Gulf of Suez, which has an especially good wind resource.

Environmental Impact Assessment Consideration

EMD can offer the technical elements that contribute to a full EIA (Environmental Impact Assessment), often in corporation with local consultants. A typical assessment includes the impacts of noise, flickering and zones of visual influence (ZVI) as well as visualisations of the project with photomontages or virtual reality presentations.

Offshore Wind Farms Forefront

EMD has developed special tools for designing optimised offshore layouts and has the following to offer developers:

- pre-feasibility studies/project idea outlines
- special experience in large scale wind farm array losses
- optimisation based on advanced cost functions including energy production, cable and foundation costs, ideal water depths etc.

EMD has been involved as consultants on many major offshore installations in Northern Europe. Our specialist knowledge based on analysis of existing offshore wind farm production data and our participation in research projects regarding offshore array loss calculation makes EMD a recognised partner for offshore development.

Capacity Building Competence

Providing training courses in the use of WindPRO software for wind farm project development is a key activity for EMD's wind energy consultants. EMD also offers individual capacity building programmes within topics related to project planning and development of wind farm projects for organisations, governments, developers and other institutions. Contact us for a tailored education, training or advisory program for your organisation.

Software State of the Art



WindPRO is the world's leading software for project design, planning and evaluation. Developed by EMD over the last twenty years, WindPRO is recognized and accepted by all major turbine manufacturers, developers, utilities as well as local planning authorities worldwide.

The wind energy consultants at EMD provides hot-line support and service to thousands of WindPRO users worldwide.

The wind energy consultants at EMD also participate in the on-going development, testing and validation of the WindPRO software package and through contribution to many international research and development projects within wind energy, EMD's wind energy consultants are keeping up-to-date within all technical aspects of the wind energy industry.

When using EMD Wind Energy Consultancy, the above assures that your projects are designed and developed by the leading WindPRO experts with an unsurpassed expertise and experience in using the best modelling software available.



The Experts' Expert Expertise

EMD Wind Energy Consultancy was established in the 1980's, participating as a major player in forming the Danish wind energy adventure and building the foundation for extensive work around the globe over the last ten years.

Our consultants are very experienced and used to perform calculations on all aspects of wind energy projects worldwide. They typically hold a university degree (M.Sc.) and combine this with up-to-date knowledge of the latest developments within turbine technology, wind modelling and environmental topics related to on- and offshore wind energy projects.

The EMD consultancy team includes English, German, Scandinavian, French and Italian speaking consultants. All wind consultants are also certified WASP users. As independent consultants we guarantee our clients the highest degree of objectivity and confidentiality.



Experience Worldwide

Region	Total MW	Sites	Ave. MW/site
Western Europe	16,845	435	39
Eastern Europe	4,130	91	45
North America	2,185	14	156
South/Central America	286	7	41
Asia	418	9	46
Middle East/Africa	1,791	43	42
Total	25,655	599	43

The table shows the number of projects and planned capacity where EMD has performed wind energy assessments and feasibility studies from 1998 - 2008. Environmental and second opinion studies are not included.

Pay-Off Value

Engaging with EMD Wind Energy Consultancy, you're benefiting from our comprehensive experience and priceless skills proven through thousands of assessments on thousands of MW on projects around the world. This is your guarantee for the highest possible accuracy, minimizing the risks to your wind farm projects. We focus our work efforts on providing you with the highest quality consultancy service with the shortest possible lead time. Our reputation and track record makes EMD Wind Energy Consultancy the right choice. Take us on board today!

Selected Clients References

- Government and Institutions
- WTG Manufacturers
- Financing and Insurance
- Developers
- Utility Companies
- Consulting Engineering Companies



For a complete project list see www.emd.dk