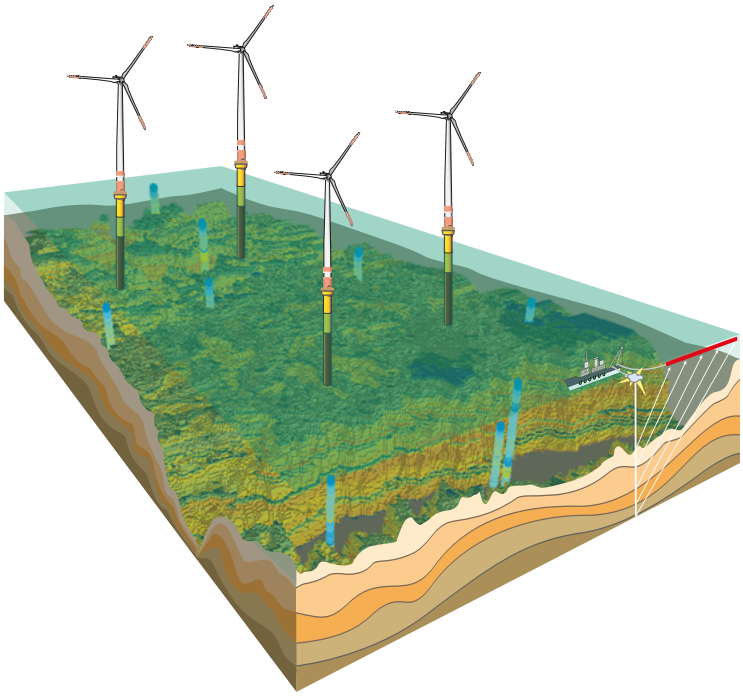
Fraunhofer IWES

Data and facts

Integrated Quantitative Ground Model for Offshore Wind Farm Areas

The assessment of the geological subsoil conditions are essential for the planning and development of offshore wind farms. The results of the geophysical surveys and the geotechnical campaigns have to be summarized and integrated for a comprehensive understanding of the subsurface. This knowledge is key in determining geotechnical design parameters for the foundation structures of offshore wind turbines.

Since 2019 Fraunhofer IWES is one of the world leaders in offshore wind farm site assessments. IWES has carried out the geophysical site pre-investigation for all wind farm sites in German waters on behalf of the Federal Maritime and Hydrographic Agency. In this time, striving for optimized costs for the industry, IWES developed unique workflows for the integration of geophysical and geotechnical data for ground modeling. The integration of UHR seismic datasets including the assessment of seismic attributes with the high quality geotechnical data enables the derivation of optimal design-relevant parameters. The Fraunhofer IWES workflow unlocks the full potential of these integrated ground models. Based on this approach, geotechnical parameters essential for the pile design are available for any possible location for wind turbines in the planning area and thus allows for the most flexible adaptation of designs for evolving wind farm layouts.

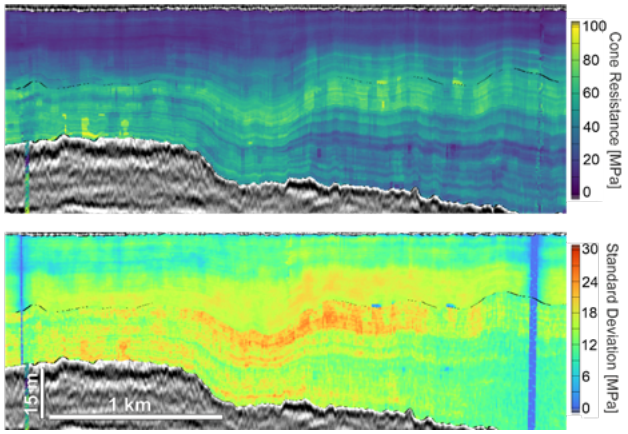


Our competences at a glance

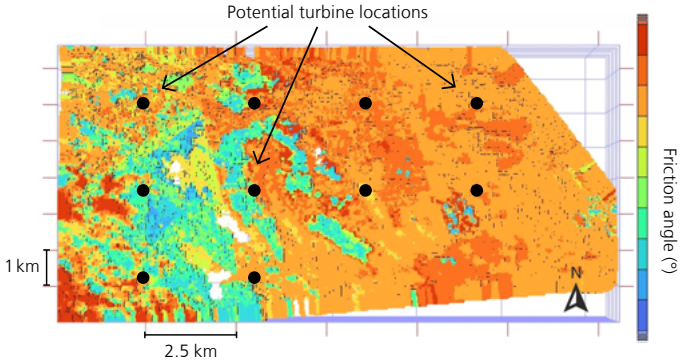
- (Re-)processing of seismic data
- (Re-)interpretation of geotechnical and seismic data
- Geological Ground Model (GGM)
- Integration of seismic and geotechnical data to create an Integrated Ground Model (IGM)
- Prediction of geotechnical parameters
- Estimation of the uncertainty of the results
- Interpretation and selection of design-relevant soil parameters (foundation design)
- Experience in certification process for specific wind farm projects

The IWES workflow

In recent years, Fraunhofer IWES has become known for delivering high quality UHR seismic data to the industry. Its self-designed measurement systems are unique on the market and were specifically designed to investigate wind farm areas. These high-resolution seismic investigations represent a reliable basis for the geotechnical exploration and assessment at the turbine locations. In addition, IWES has developed a unique workflow for the integrated interpretation of the Ground Model (IGM) in order to classify the planning areas geologically and geotechnically as well as to be able to generate design-relevant soil paramters at selected locations in the subareas without direct measurements.

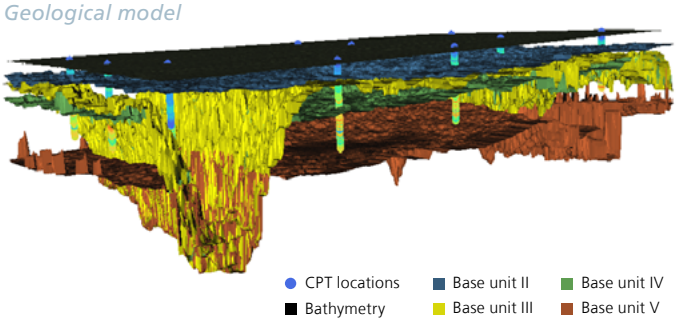


Predicted cone resistance and associated standard deviation along a 2D seismic line



Design parameter prediction as a horizontal 2D slide for a wind farm planning area.

Geological model



Further information

Fraunhofer IWES secures investments in technological developments through validation, shortens innovation cycles, accelerates certification procedures, and increases planning accuracy by means of innovative measurement methods in the wind energy and hydrogen technology sectors. At present, there are more than 300 scientists and employees as well as more than 100 students employed at the nine sites: Bochum, Bremen, Bremerhaven, Leer, Görlitz, Hamburg, Hannover, Leuna, and Oldenburg.

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Contact

Gino Frielinghaus
Head of Department
Sub-surface Investigations
Phone: +49 471 14290-174
gino.frielinghaus@
iwes.fraunhofer.de

Jan Hebig
Group Manager
Geotechnical Engineering
and Rock Physics
Phone: +49 471 14290-177
jan.hebig@iwes.fraunhofer.de

Fraunhofer Institute for Wind Energy Systems IWES
Am Fallturm 1, 28359 Bremen, Germany
www.iwes.fraunhofer.de

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