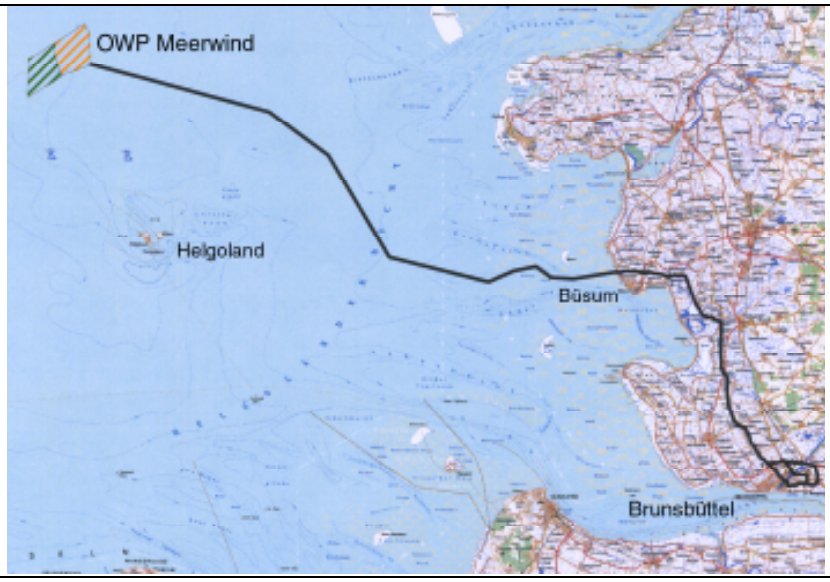
Meerwind Offshore Wind Park

A venture by the Windland Energieerzeugungs GmbH

Location	The Windland Energieerzeugungs GmbH is developing the Meerwind Offshore Wind Park (two parts: OWP Meerwind Süd and OWP Meerwind Ost) in the North Sea. The pilot phase is to be commissioned from 2011/2012. • mean distance between rows: approx. 1150 m • mean distance between wind turbines in a row: almost 600 m • water depth: approx. 23 m to 26 m (nautical chart zero) • forecast wind speed: annual average approx. 9,5 m/sec (height 90 m) • ground: firm subsoil, predominantly medium densely or densely bedded sands
Situation	 German North Sea, Exclusive Economic Zone (AWZ) Distance from Helgoland: 23 km in a north- westerly direction
Type of wind turbine	• Number of wind turbines of the pilot phase: 80 (2x40), with 3 – 5 MW output each • Total output of the pilot phase: 200 - 400 MW (dependent on typ of turbine) • Rotor diameter: approx. 90-126 m • Overall height: approx. 112-148 m
Power transmission	Internal power distribution: 33 kV three-phase altern. current, alltogether about 67 km Land connection: approx. 155 kV three-phase cable to the nearby sea converter of E.On Netz (grid operator), from there planned direct current connection to Brunsbuettel
The Windland enterprise	Based in Berlin, the Windland Energieerzeugungs GmbH was founded in 1990 as one of the first wind park project developers in Germany. Since year 2000 the Windland has concentrated on offshore development and network feed connections. Managing Director: Dipl-Ing. Dipl.-Ök. Joachim Falkenhagen Address: Windland Energieerzeugungs GmbH Markstaedter Strasse 4 12555 Berlin Germany Tel: +49 30 650177-00 Fax:-06 falkenhagen5@meerwind.de www.meerwind.de Last edited: December 20th 2007

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Project status

Approval for the wind park	• Application made in accordance with the Maritime Installations Directive (Seeanlagenverordnung), Aug 2000 • Ecological field studies since 2001 • Hearing with the Federal Office for Shipping and Hydrography April 2004 • Documentation presented as to environmental compatibility in the second year of investigation: October 2004 • Reappraisal of locations for wind turbines according to the stipulations of the Water and Shipping Directorate (WSD): summer, 2005 • Approval granted May 16th 2007 for OWP Meerwind Ost (40 turbines) and OWP Meerwind Süd (40 turbines)
Subsoil	Seismic testing has been carried out since 2001 and in April 2003 drilling operations were carried out for the investigation of the subsoil within the project area of the Meerwind Offshore Wind Park. In summer 2007 seismic testings and CPT-tests at remaining sites has been carried out again. The results of all surveys largely show a highly supportive and very densely consolidated subsoil where ramming is possible. Additionally, 11-15 drillings are commisioned based on results of the former surveys for December 2007 to January 2008.
Environment	In summer 2005, the locations of the wind turbines were redesigned for naval traffic reasons. Potential risks, possible consequences of a collision as well as measures to limit the risk have been examined in two separate multistage safety reports. The wind park has been authorized within an area initially described as “important bird area”. However, the results of an environmental compatibility study (on birds, fish, sea mammals and benthos) based on long-term tests according to the stipulations of the standard concept for environmental investigations could dispel these considerations. A distance of 2 km is kept from the neighbouring sanctuary for seabirds on the eastern side.
Realization network connection via cable route	November 24th of 2006, a law was passed stipulating that grid operators will be responsible for the grid connection of offshore wind farms (collection of the power at the sub-station of the wind park and transport to the shore). Earlier plans of the applicant concerning a shorter cable route from the wind park to Wilhelmshaven are therefore no longer valid. Several permits have already been granted for the cable route to be used by E.On Netz. Furthermore, E.On Netz can benefit from the fact that for the major part of the route, rights of way have already been secured.
Schedule	Construction of the pilot phase is intended in 2011/2012. It is important that E.On Netz has enough time to realize the grid connection. Probably, a DC-sea converter with sufficient capacity will be constructed anyway by E.On Netz on demand of other wind parks.

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Funding

EEG (Renewable Energy Law)	The basic financial conditions for the expansion of wind power off Germany's coastline are defined by the Renewable Energy Law (EEG) of August 2004 and the changes in the Energiewirtschaftsgesetz (EnWG) of November 2006. The EEG commits grid operators to buy the energy produced offshore and to do so at a minimum price regulated by statute. The EnWG stipulates grid operators to be in charge of the grid connection of offshore wind farms. Hence, the necessary planning and investment security for manufacturers, plant operators, investors and banks is significantly improved. The amendment of the EEG (still drafted) would lead to following financial conditions for the Meerwind Offshore Wind Park (if commissioned until 2013),: • A statutory initial remuneration of 14.00 Euro Cents per kWh • Term-time of the initial emolument: approx. 13.4 years • Term-time of the following basic reimbursement of 3.50 Euro Cents per kWh : until the end of the 20th year of operation
Funding design phase	The planning permission of the BSH is granted to two wholly owned subsidiaries (Meerwind Südost GmbH & Co. Rand KG und Meerwind Südost GmbH & Co. Föhn KG) of the Windland Energie-Erzeugungs-GmbH for 40 turbines for each of the both parts OWP Meerwind Süd and OWP Meerwind Ost. Only individuals, among them dormant partners, are involved in Windland. Expenditure during the design phase is covered by the company's own resources and to a larger extent by loans from company owners.
Funding realisation phase	The entire funding requirement for the realisation of the Offshore Wind Park ranges from € 700 to € 1200 million, depending on the choice of turbines. This necessitates a majority take-over by a third party and substantial capital investments. Windland would prefer to keep a share in the project. There are no contractual commitments to any particular suppliers. Talks with plant manufacturers have revealed that it would be advantageous to bring about an apportionment of the award along the lines of the main works, i. e. wind turbines, support structure/installation, cables and other electrical installations. A cooperation of contractors in a working group is aspired.
Structure of risks	Lower electricity tariffs come about in years when there is above-average generation from wind power. The economic outlook for a wind park is further improved by restrictions on the operation of fossil-fuel power stations on account of the re-evaluation of climate risks. The admixture of wind park participation to a portfolio with thermal power stations or shares of conventional power utilities therefore leads to a reduction of risk inherent from the prior investments.

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Economic Efficiency

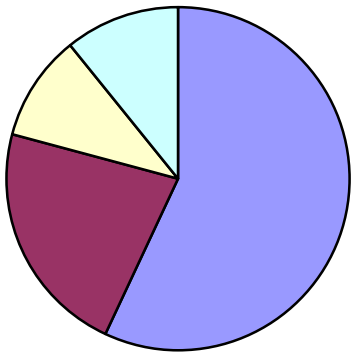
Expert's wind report	WASP expert's report: middle wind speed at 9,5 m/s in a height of 90 m Weibullfactor: A=10,8 m/s k=2,22 Park efficiency approx. 89% (for S3.6, taking into account the neighbouring windpark)

Investments

The entire investment requirement for the realisation of the Offshore Wind Park Meerwind depending on the choice of turbines.

INVESTMENT (in case of 80 mid-sized turbines) without obligation, December 2007

Wind power installations		**450.000.000 €**
Foundation/grounding/tower/installation		**176.000.000 €**
grid connection, internal		
Park cabling (33/245 kV) and 2 offshore sustations		**81.000.000€**
Sub-total		*707.000.000 €*
Miscellaneous costs / security premium (12%)		**84.840.000 €**
Total investment:	approx.	**800.000.000 €**



The diagram shows the approximate division of the investment costs.

Detailed Information about the economics is available on request.

Type of wind turbine

Current planning allows the use of wind turbines of leading manufacturers such as Vestas or Siemens with an output of up to 3.6 MW that have been offshore-proven over many years or of wind turbines of smaller manufacturers with an output of up to 5 MW.
Larger wind turbines show a cost advantage in vue of the costs for support structure realtive to output. This has to be measured against the overall turbine costs and the larger operating experience for other makes. Furthermore, the wind speed hardly increases with the hub height and the park efficiency drops with the increasing size of turbines.

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Advantages and promoting factors

Water depths	Water depths of 23-26 meters are predominant in the area of the offshore wind park Meerwind. This is moderate compared with the water depths of other offshore wind parks being planned in German territorial waters, with water depths of often as much as 35 m, whereas the Dutch Q7 wind park is situated in similar water depths of 19-24 m. British offshore wind farms are placed in regions with lower minimum water depths but sometimes very high tidal changes.
Subsoil	Knowledge of the subsoil is an important prerequisite for the design of the foundations of wind turbines in the sea. Several offshore wind park projects have already had to be postponed for an indefinite period because of unsuitable subsoil conditions. Therefore, seismic testing has been carried out in 2001 and in April 2003 drilling operations were carried out for the investigation of the subsoil within the project area of the Meerwind Offshore Wind Park. In summer 2007 seismic testings and CPT-tests at remaining sites has been carried out again. The results of all surveys largely show a highly supportive and very densely consolidated subsoil where ramming is possible. Additionally, 11-15 drillings are commisioned based on results of the former surveys for December 2007 to January 2008.
Wind	Offshore North Sea locations are distinguished by high wind speeds. This also applies to the area designated for the Meerwind Offshore Wind Park. Recent modelling results show that output yields are significantly higher than in offshore wind parks which are close to the coast.
Construction	The water depths which are prevalent in the design area allow using monopiles which are more favourable than other foundation structures and simplify the construction work for the wind park. The investment risk is minimised by the tried and tested monopile technology and maybe the renunciation of more powerful wind turbines which have not yet been operated offshore.
Division of the wind farm	Legally speaking, the wind park is assigned to two subsidiaries (Meerwind Südost GmbH & Co. Rand KG und Meerwind Südost GmbH & Co. Föhn KG) which have the legal form of GmbH & Co. KG and which may be separately, as one or jointly sold to interested purchasers. The preferred result for Windland is to keep a share in the project and to receive a remuneration for project development work and operator rights that is commensurate with output and success.
Grid connection	The power generated by the Meerwind park is to be transported by a short alternating current submarine cable to an offshore DC-converter of the grid operator E.On Netz. From there, probably a 81 km DC cable will lead to the coast and then to Brunsbuettel. Windland has been taking part in the evaluations of technical solutions for the grid concept since the beginning of 2006. In this process, E.On Netz has confirmed Brunsbuettel to be an adequate network access point for the power supply by the wind park. E.On has still to determine certain aspects of the connection to the DC converter (e g. control range for reactive power).

Prospects / Risks

Prospects	• Undercutting the estimated costs for expenditure on fixed assets. • Lower fault liability of the technical components (especially the turbines) during operation leads to lower maintenance and repair costs as well as greater availability of the wind turbines • The possibility of fitting out a maintenance and repair shop on Helgoland, which would reduce maintenance and repair times because of its proximity to the wind park area and would reduce installation down times • Greater wind strengths than those assumed would lead to greater power production • Possible improvements in technology, in the field of technical components (especially turbines and access systems), resulting in efficiency increases, higher or lower availability • Subsequent recalculation and recertification of the support structure resulting in a longer service life • The market and the in-feed remuneration are guaranteed by law, with the result that market fluctuations do not pose any risks for the take-up of offshore power • An increase in income is possible in the event of increases in the electricity prices: If electricity market prices rise above the EEG minimum rates (particularly through price increases for fossil fuels and for emission disposal), the power generated can be sold at higher rates, independently of the EEG • ongoing increase of the prices according to the EEG
Risks before and during the construction phase	• Delays in the setting up of a grid connection by E.On Netz • Price increases, capacity bottlenecks, extended delivery times by manufacturers and service providers • Risks resulting from the coordination process between the contractors, bankruptcy risks of suppliers • Higher construction costs for the wind turbine installation because of unforeseeable, poor subsoil conditions • Possibility of capacity bottlenecks at the network connection point when the wind park starts operation, resulting in only a limited feeding-in of current, according to priority regulations of the EEG, until a grid extension is completed • Discontinuation and/or delay in the construction work because of bad weather • Raising credit could be not possible or could only be secured on unsatisfactory conditions, proportional participation by several providers of equity capital could lead to financing difficulties with co-investors • Excessive insurance margins, or too little cover in the event of damage or loss
Risks in the operational phase	• Less wind potential than was expected from the expert's report on wind leads to a reduction of wind output (because of a bad year for wind, or shadowing effects) • Increased susceptibility to failure of the components and longer downtimes • Delays in the carrying out of repairs to cables and wind turbines, particularly as a result of delivery and capacity bottlenecks or difficult weather conditions • Inflation risk, risk of future law changes • Break of the E.On Netz cable or dysfunction of the DC converter • Soil risks to be borne by the constructor • Increased stresses on the wind turbines brought about by wrongly assessing swell and wind loads • Damage to the wind turbines or the cable due to accidents caused by other uses (gas conveyance, shipping traffic, the military) in the project area and nearby