

Ministry of Economic
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OFFSHORE TERMINAL BREMERHAVEN

INFORMATION FOR INFRASTRUCTURE INVESTORS



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OFFSHORE TERMINAL BREMERHAVEN

The offshore wind energy industry is displaying strong growth with a revenue potential that will increase greatly over the coming years and decades. As a prime location, Bremerhaven is well on the way to becoming the capital of Europe for this new industry. Thanks to its proximity to deep water, outstanding infrastructure and the targeted development of a high-performance industrial/research cluster, a number of leading wind energy companies have already settled at this location. These qualities offer excellent prospects for creating many thousands of new jobs in the region.



The rapid growth of the offshore wind energy industry is continuing to fuel the demand for large port and logistics areas, both now and for the future. Today, Bremerhaven with its Labradorhafen heavy load terminal and the Container Terminal I already offers an attractive port infrastructure for the pre-assembly and shipping of offshore wind turbines. However, the demand for specialized port infrastructure will rise in the foreseeable future. This has prompted plans for an additional logistics facility for the offshore wind industry to be built and operated by private investors. Current cost/benefit analyses indicate that a private financing of the “Offshore Terminal Bremerhaven” (OTB) will be of great interest, since the project offers attractive yield prospects for investors.

In January 2010, the Senate of the Free Hanseatic City of Bremen decided that a new transshipment facility on the Weser River was to be commissioned for the offshore industry beginning in 2014. After a comprehensive examination of diverse options at three possible sites in Bremerhaven, it became clear in the early summer of 2010 that the northern section of the “Blexer Bogen” would be optimally suited to the planned OTB. Above all, this choice permits an ideal development of the directly adjacent industrial zone on the Luneplate, offering over 200 hectares. At the same time, the Ministry of Economic Affairs and Ports was authorized to initiate the necessary planning procedures.

It is the goal of the Free Hanseatic City of Bremen to give the offshore wind energy companies that are already situated in Bremerhaven an efficient infrastructure and also to offer prospective users the optimum prerequisites for facilitating logistics in Bremerhaven.

For these reasons, the Offshore Terminal Bremerhaven enjoys the very highest political priority for me. We have a clear goal: to pursue – consistently and forcefully – the successful development of Bremerhaven in becoming the European centre for offshore wind energy.

With this publication, we are starting the search for infrastructure investors for the OTB. The fundamental conditions in Bremerhaven are most promising for a successful partnership between the public sector and private investors.



Senator Martin Günthner
Minister of Economic Affairs and Ports
of the Free Hanseatic City of Bremen

OFFSHORE TERMINAL BREMERHAVEN

The Free Hanseatic City of Bremen and the City of Bremerhaven are planning the realization of an offshore terminal in the south of Bremerhaven on the Weser River (“Blexer Bogen”) as a heavy load, assembly and transshipment facility for the offshore wind energy industry.

Leading companies in the offshore wind energy industry have located in Bremerhaven to make it the hub of this growth sector within a very short time. The rapid growth of this industry will result in a high demand for specialized port and logistics facilities, in both the near and the foreseeable future. The specific requirements for efficient logistical operations in the construction of wind farms at sea are to be met by the Offshore Terminal Bremerhaven (OTB). At the same time, this will further enhance the attractiveness of Bremerhaven for companies of the wind energy sector looking to locate manufacturing and service activities to supply North Sea wind farms. This brochure describes the specific market opportunities of the planned OTB.

Potential terminal customers already on site

The offshore wind energy industry is a sector of exceptionally strong growth with a revenue potential that is poised to increase greatly over the coming years and decades. Bremerhaven is developing into the center of Europe for the offshore wind energy industry. Owing to its favourable position on a deep waterway, its outstanding infrastructure and the targeted development of cluster structures, a number of leading manufacturers of wind energy components – such as AREVA Wind GmbH, REpower Systems AG, WeserWind GmbH Offshore Construction Georgsmarienhütte and PowerBlades GmbH – have already decided to locate in Bremerhaven. Over the past few years, the State of Bremen has invested hundreds of millions in Euros for the sponsorship of research and development, zoning as well as infrastructure development, thus creating locational advantages of the very first rank for this new industry.

Local firms have been able to expand their position considerably in the offshore market at the Bremerhaven location, and have likewise invested hundreds of million Euros in production facilities. As a result, over 1,000 jobs have already been created. For example, REpower Systems AG and AREVA Wind GmbH have each set up production capacities for some 100 offshore wind turbines per year in Bremerhaven. WeserWind GmbH Offshore Construction Georgsmarienhütte has invested in a production facility for

offshore foundation structures. With PowerBlades GmbH, the company SGL Rotec has teamed up with REpower Systems AG in Bremerhaven to operate a joint venture for the manufacture of onshore and offshore rotor blades. As a result, sales of complete offshore installations can occur directly from the Bremerhaven location.

Offshore wind farms advancing worldwide

Offshore wind energy is making an important contribution towards meeting the global targets for climate protection. In its market analysis of the OTB, the economic research institute Prognos AG predicts an enormous growth in offshore wind energy, of which a large part is forecast to take place in Europe. Great Britain and Germany represent by far the largest markets.

Thanks to the strong offshore wind energy cluster and the head start in experience, the City of Bremerhaven and the region around the Weser estuary are well on the way to becoming the European hub for this innovative and fast-growing industry. The German Federal Government’s goal of generating 25 gigawatts (GW) at sea by the year 2030 could – in the near future – be achieved to a considerable degree through wind turbines “made in Bremerhaven”.

In addition to the economic competence, the proximity to the planned wind farms in the North Sea also plays a



significant role. Measured from the future OTB, wind farms with a requirement of almost 300 wind turbines per year are now already within range of the transport and installation vessels. If one considers a radius of 200 sea miles around Bremerhaven, the offshore wind farms of Germany, the Netherlands and parts of Denmark can all be served from here.

According to experts, there will be three to four offshore wind energy ports in the North Sea, and the shipment of the 300 wind turbines predicted annually for projects in the North Sea is likely to be shared between Bremerhaven and one or two other ports. This in itself yields – independently of the terminal concepts for the various ports – a theoretical transshipment potential of 100–150 complete units (foundation structures, towers, nacelles, hubs and rotor blades) a year via the Offshore Terminal Bremerhaven.

In comparison to the competing harbours in the North Sea, the OTB will offer a decisive and unique selling proposition: leading companies in this sector have already decided in favour of Bremerhaven as a prime location by settling in the industrial properties around the future OTB.

An added benefit is the reserve area directly adjoining the OTB and totalling more than 200 hectares, which will then be available to further manufacturers and suppliers for the establishment of production facilities. For these facilities, the OTB will function as a “goods handling zone” right in front of the production halls. Accordingly, potential customers for the services offered by the OTB are already situated right at the “location of the future”: Bremerhaven.

Structures for optimum process and transportation logistics

The successful installation and operation of offshore wind farms depends decisively on achieving the optimum work flow and transportation logistics. This factor exerts a substantial influence on realization of the wind farms within the given cost and time constraints.

Here the OTB will play a key role. The logistics concept for Bremerhaven envisages that the components of offshore wind turbines will be produced, stored, pre-assembled and loaded onto ships in Bremerhaven. The OTB is to create an important cost-cutting link between the production on shore and the installation at sea. By applying the principle of having a “goods handling zone” for the companies that manufacture in Bremerhaven, transportation problems arising from overland routes before shipping can be minimized. Furthermore, it will be possible to dispense with cost-intensive transfers by water to another loading berth. As a result, the potential customers of the OTB who are already on site, or will be settling there in future, can avoid large investments in costly overland or overseas logistics.

TECHNICAL DATA

PURPOSE	<ul style="list-style-type: none">• Handling, pre-assembly and storage of offshore wind turbines• Exporting of components• Logistics centre for the transportation / transhipment of large industrial components
OPERATING TIME	24 hours a day, 365 days a year
TARGET	Up to 160 wind turbines and foundation structures of wind farms per season
QUAY LENGTH	500 m
BERTHS	2 to 3
NAVIGABLE DEPTH	14,5 m
HEAVY-DUTY SLAB AT THE QUAY	70 m wide, 500 m long
TERMINAL DEPTH	498 m
AREA	Approx. 25 ha
CAPACITY	Technically, 160 units per season

Attractive yield prospects for investors

With the OTB and the directly adjoining 200 hectares of additional industrial land, Bremerhaven is responding to the growing demand in the offshore sector for larger harbour and logistics areas. The holistic approach for the logistics yields further locational advantages for the leading companies in this industry. With the construction of the offshore port, structural economic effects of a long-term and sustainable nature will also be attained.

This 200 million euro project on the Weser River is scheduled to commence operations in 2014. Economic viability analyses based on current market prices and tested for plausibility have indicated that a private financing of the heavy load terminal through a concession model will be of great interest to private investors, because the project offers attractive yield prospects.

More than 200 hectares of space for expansion and settlement

A special strength of the future OTB lies in its good transport-specific development, together with directly adjacent expansion areas for the offshore industry and logistics.

The infrastructural linkage of the OTB to the production facilities in the industrial zones of Luneort and Luneplate is secured within the scope of the master plans. An efficient connection of Luneort und Luneplate to the road and rail network and the waterways is ensured through their closeness to the industrial quays of the Fishery Harbour (and especially the existing heavy load facility in the southern part of the Labradorhafen basin) as well as through a short section (B71) to the A27 motorway (junctions “Bremerhaven-Süd” and “Wulsdorf”). An alternative route to the motorway runs via the B6 (junction “Fischereihafen”). In the same way, the area is linked to the national freight railway network through Wulsdorf train station.

Structured bidding process on the basis of a negotiated procedure

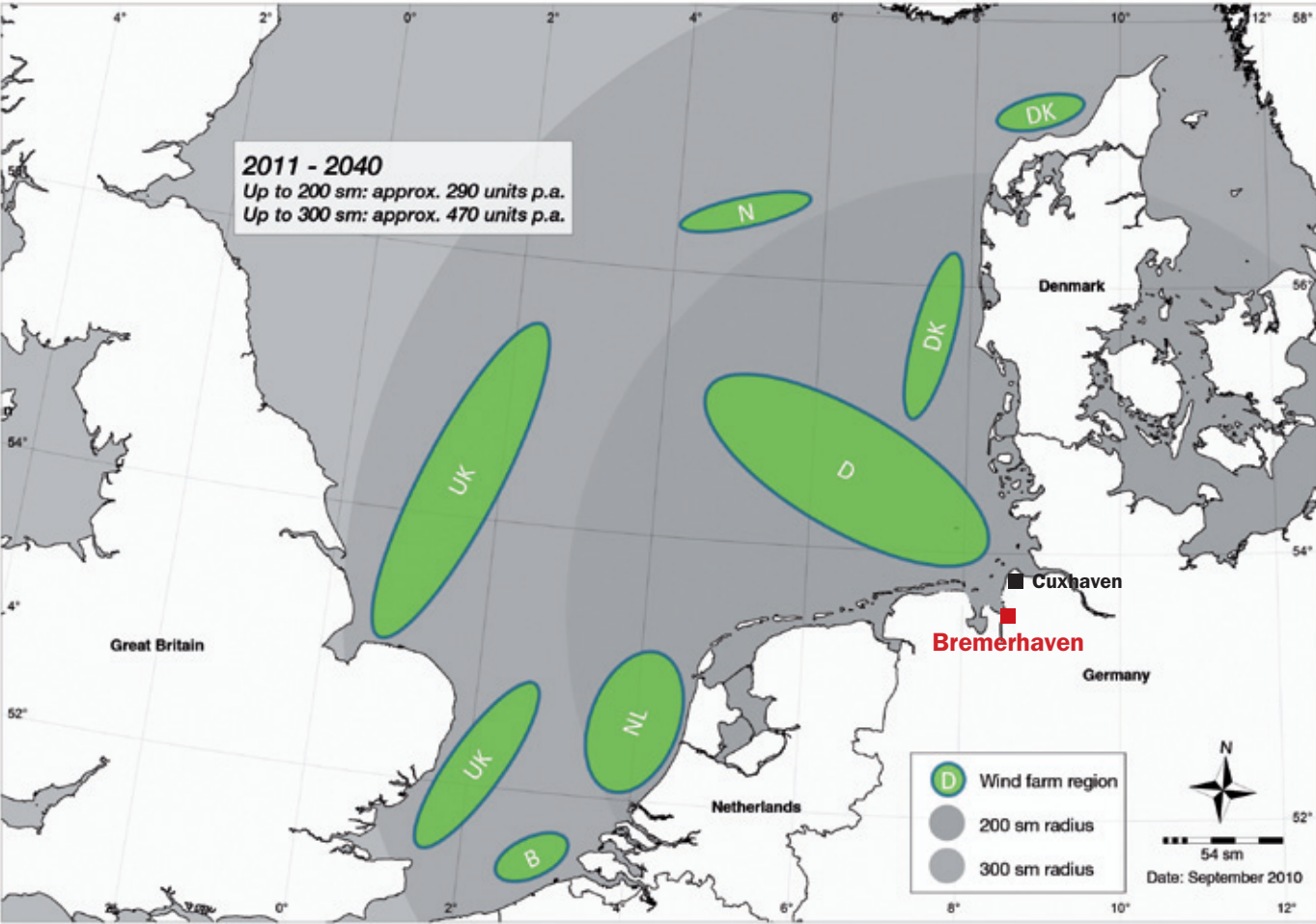
The OTB project is to be realized as a concession model. bremenports has been commissioned on behalf of the Free Hanseatic City of Bremen (FHB) to put the construction, the financing and the operation of the OTB – and, if applicable, the infrastructure needed on land – out to public tender Europe-wide in a transparent and competitive bidding procedure. The FHB is going to be the concession grantor. The intention is to have the investor carry out the planning, building, financing and operation of the OTB at its own expense, with the outlay to be refinanced through user fees. Start-up financing will not be provided.

At present, the concept envisions the conclusion of the planning and preparation activities for the OTB project by the start of 2011. The structured bidding process is to be initiated during the first half of 2011 through an announcement in the Official Journal of the European Union.

In accordance with the applicable legal stipulations for public works concessions in the water, energy and transport sectors, the procedure will be oriented towards the requirements resulting from the regulations and principles of the EC Treaty. In the structured bidding process, a bidder prequalification phase (accessible throughout Europe) is followed by several rounds of bids and negotiations to select the best commercial offer for the concession to plan, construct, finance and operate the OTB.

It must be expressly pointed out that the procedure outlined here is not binding and will be adapted to meet specific needs and legal requirements.

Deployment radii (200 and 300 sea miles) for the installation vessels from the base port in Bremerhaven



Source: Prognos AG, Regionalwirtschaftliche Potenzialanalyse für ein Offshore Terminal Bremerhaven, Januar 2011

POTENTIAL TERMINAL CUSTOMERS ALREADY ON SITE

As a major focus for the future, offshore wind energy occupies a prominent place in Bremerhaven, both in industrial production and in research and education. Leading manufacturers of offshore wind turbines and other components for wind energy systems have built up and are successfully operating their production plants in Bremerhaven. At no other European location will one find such a well-developed cluster of offshore wind energy, with producers and service providers on all levels of the value chain, as in Bremerhaven.

In addition to small and medium-sized firms, large and well-known companies in the wind energy industry are invested here. For example, REpower Systems AG and AREVA Wind GmbH have each established production capacities for some 100 offshore wind turbines per year in Bremerhaven. WeserWind GmbH Offshore Construction Georgsmarienhütte has invested in a production facility for offshore foundation structures. Through the joint venture PowerBlades GmbH, the company SGL Rotec GmbH & Co. KG has teamed up with REpower Systems AG to operate a production facility for the manufacture of rotor blades in Bremerhaven, with an initial output of 300 per year. Over and above that, companies such as wpd AG, Energiekontor AG, WindMW GmbH and energiequelle GmbH are managing offshore wind farms and working closely with firms belonging to the offshore industry in the region.

Offshore base port for RWE Innogy

RWE Innogy has already chosen Bremerhaven as its offshore base port because it is a location offering ideal infrastructural conditions. Recently, RWE Innogy and Eurogate Container Terminal Bremerhaven GmbH signed contracts for the leasing of areas within Bremerhaven's container harbour. Starting in summer 2011, RWE Innogy will use this area as a base port for the construction of its offshore wind farm "Nordsee Ost". At the signing of the agreement, Prof. Fritz Vahrenholt, Chief Executive Officer of RWE Innogy, remarked: "Eurogate offers us excellent conditions in Bremerhaven for constructing our first German offshore wind farm. We need very large areas and the necessary infrastructure if we are to use our offshore wind farm construction ship "Seabreeze". Bremerhaven already made the necessary investments for this new sector of industry at an early stage. Today, this far-sighted decision is bringing benefits not only to the city, but also to the offshore industry in general."



alpha ventus turbines – made in Bremerhaven

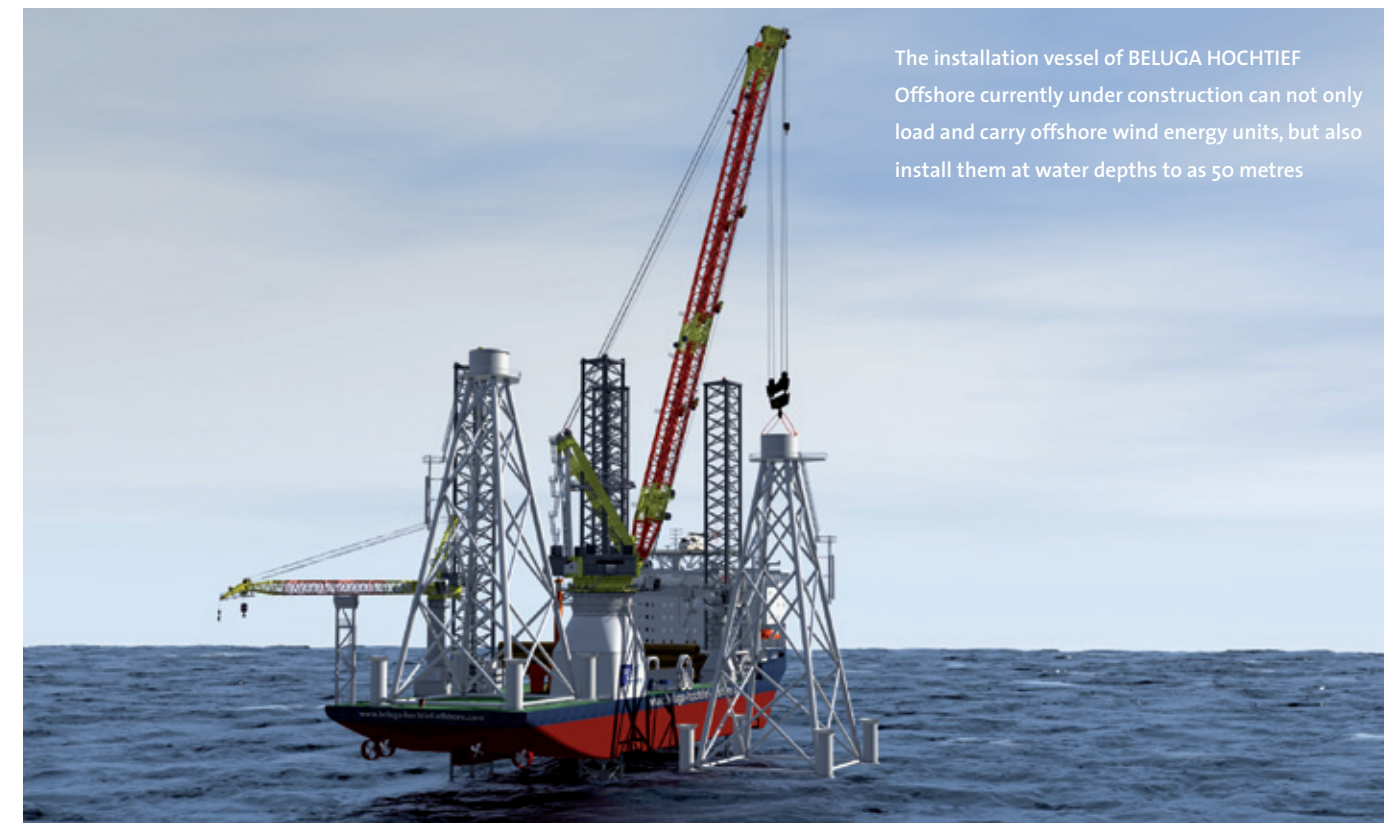
Bremerhaven-based companies are also responsible for manufacturing all the turbines for the "alpha ventus" offshore wind farm. This pioneering project conducted jointly by EWE, E.ON Climate & Renewables and Vattenfall Europe Windkraft is as exceptionally ambitious as it is successful: all twelve wind turbines of the very first German wind farm at sea were erected in 2009 under real offshore conditions, 45 kilometres north of Borkum Island and at a water depth of 30 metres. With alpha ventus, fundamental experience is being gained in preparation for the commercial utilization of offshore wind energy in Germany.

Location for specialized offshore research facilities

Not only has Bremerhaven established itself as a leading production base for the industry, it also offers a wealth of scientific know-how on the topic of wind energy. The research organization Fraunhofer-Gesellschaft has set up its new Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) with a special focus on serving the interests of the wind energy sector. Deutsche Wind-Guard Engineering GmbH in Bremerhaven is operating an acoustically optimized wind tunnel that is unique in the field of wind energy research. With the Bachelor and

Master's degree programs in "Wind Energy", Bremerhaven University of Applied Sciences is making sure that the wind power companies can tap into the know-how of well-trained young graduates. The Education and Training Centre for Offshore Wind Energy in Bremerhaven is directed at the ongoing qualification of skilled industrial employees. Also based in Bremerhaven, the Alfred Wegener Institute for Polar and Marine Research (AWI) and the Institute for Marine Resources (IMARE) are concentrating on the application of marine research for offshore wind energy. Starting early in 2011, the Danish company Falck Nutec will be offering comprehensive training course in Bremerhaven's new Offshore Safety Training Centre for the employees of wind energy firms engaged in the installation, maintenance and dismantling of offshore plants.

Over 1,000 new workplaces have already been created within a short space of time at the Bremerhaven location. The specific expansion plans of the resident companies point to good prospects for rapid growth. With the OTB, the largest city on the German North Sea coast will be taking an important step towards a promising future. The orders placed recently by RWE Innogy, Hochtief/Beluga and BARD for the new construction of numerous transport and installation vessels for the erection of offshore wind farms underscore the great potential for an offshore port on the Weser as well as the necessity of its construction.



The installation vessel of BELUGA HOCHTIEF Offshore currently under construction can not only load and carry offshore wind energy units, but also install them at water depths to as 50 metres

AREVA Wind GmbH

Since its founding in 2000, the company AREVA Wind (formerly Multibrid GmbH) has been engaged in the development and manufacture of the 5 MW offshore wind turbine M5000 in Bremerhaven. It is the first unit worldwide to have been developed exclusively for large offshore wind farms. Thanks to years of systematic developmental work, this technology has yielded solutions that are optimally adapted to the demands of offshore operation. The maritime setting at the Bremerhaven location supports the focus on engineering offshore applications, with comprehensive know-how in transport and assembly far out to sea.

www.avea-wind.com

WeserWind GmbH Offshore Construction Georgsmarienhütte

The company WeserWind GmbH Offshore Construction Georgsmarienhütte supplies both foundation structures and complete meteorological masts for the offshore wind energy sector. The production facility newly established in Bremerhaven can be used for components with diameters ranging up to 30 m and a maximum weight of 1,200 tonnes each. The firm's services include the manufacture of steel offshore foundations as well as the production and erection of complete metmasts, including the measurement technology, power supply and electrical systems. Another key focus lies in the servicing of metmasts for ensuring the data availability and the maintenance of offshore foundation structures, including the installation and evaluation of a structural assessment system (residual life analysis). In addition, WeserWind designs and manufactures transformer units for offshore applications, and delivers substations as main components for wind farms at sea.

www.weserwind.de

REpower Systems AG

The firm REpower Systems AG is one of the leading manufacturers of wind turbines in the onshore and offshore sector. The company concentrates on the development, production and installation of plants in the multi-megawatt class. Its product portfolio comprises several types of turbines with rated outputs ranging between 1.8 and 6.15 megawatts. To date, this internationally active wind turbine producer draws on the production, project management and construction experience gained with some 3,000 wind turbines. The reliable high-output turbines are manufactured in Bremerhaven, amongst other locations. With the

REpower 5M turbine – currently one of the largest wind turbines in the world with a rated output of 5 megawatts and a rotor diameter of 126.5 metres – the company extended its turbine portfolio in the multi-megawatt class. In winter 2008/09, the REpower 5M went into series production at the Bremerhaven site. The nacelles and hubs can be shipped across the globe directly from here. The technological advancement of the 5M, the REpower 6M, will also be produced in Bremerhaven.

www.repower.de

PowerBlades GmbH

Together with the rotor-blade manufacturer SGL Rotec GmbH & Co. KG, the wind turbine maker REpower Systems AG founded a company for the production of its own rotor blades in the offshore sector. The joint venture produces the offshore rotor blades developed by REpower.

With a length of 70 metres, the 300 rotor blades of the RE series produced annually by PowerBlades were developed in-house by REpower Systems AG for the 6 MW turbines.

www.powerblades.de



OFFSHORE WIND FARMS ADVANCING WORLDWIDE

The expansion of offshore wind energy is making an important contribution towards meeting the global targets for climate protection. Currently, 34 countries all over the world are studying, planning or implementing the construction of offshore wind farms. The total energy capacity of the offshore wind farms approved, under construction and being operated worldwide amounts to almost 28 gigawatts (GW). With a share of 86 percent, Europe is taking on the role of trailblazer in the advancement of offshore technologies. Outside of Europe, only China belongs to the “big players” in this field, with just over 2 GW approved. The demand analysis described below refers to the “Regional Economic Potential Analysis for an Offshore Terminal Bremerhaven” (translation of the German title) commissioned by the State of Bremen and carried out by the economic research institute Prognos AG.

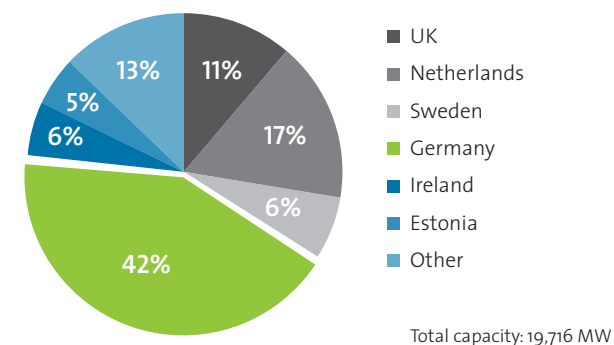
Germany has the greatest offshore potential

Europe has a leading position worldwide in the quantity of electrical power produced at sea. For existing plants and those under construction, the United Kingdom is by far the largest market at present. Throughout the European Union, the European Wind Energy Association (EWEA) estimates that the offshore wind energy generation capacity will lie between 40 and 55 GW by 2020. This figure is expected to rise to as much as 150 GW by 2030. Besides Great Britain, the Federal Republic of Germany is one of the major growth markets. With an approved capacity of 8 GW, Germany already has the greatest potential, followed by the Netherlands. This means that 40 percent of the approx. 20 GW approved in Europe are to be found in German waters. In the German North Sea alone, wind farms with over 1,500 wind turbines have been approved, and another 1,800 units are undergoing the approval procedure. Apart from the approved offshore capacity, Germany is also a global leader with the projected wind farm capacity currently moving through approval procedures. Regarding other states with offshore wind farms currently under construction, Belgium and Denmark have only 3 and 2 percent respectively of the European offshore projects in the approval process.

Enormous market potential: 600 units a year expected for Europe

In view of the geographic proximity to Bremerhaven, a closer examination of the offshore plans of the adjoining North Sea states – Belgium, Denmark, the Netherlands

Shares of approved offshore capacity in Europe

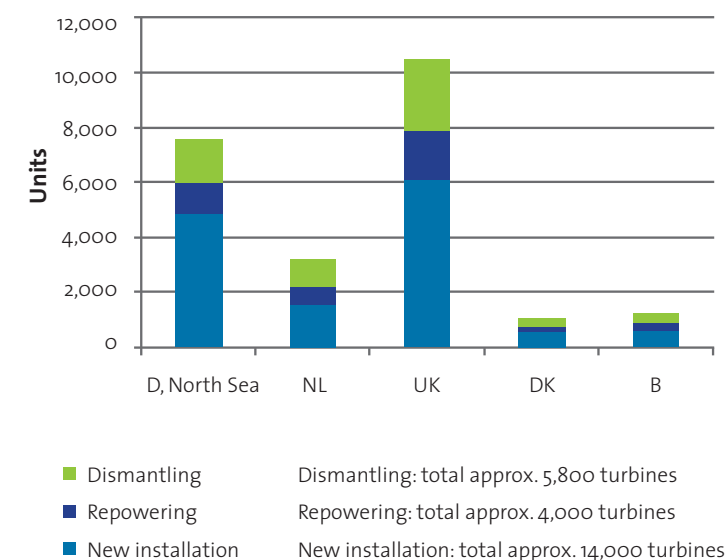


Source: Prognos AG, Regionalwirtschaftliche Potenzialanalyse für ein Offshore Terminal Bremerhaven, Januar 2011

and the United Kingdom, known here as the EU5 (including Germany) – is of particular interest. Starting with an annual installation rate of approx. 100 units in the period 2006–2010, the number of wind turbines erected every year will increase to over 300 units by 2015. Between 2016 and 2020, the number of new annual installations in the EU5 will amount to more than 700 wind turbines, the peak being reached at the beginning of the 2020s with over 750 units. Analogous to the German development, repowering will also commence in offshore German wind farms from 2025 to 2030. Inclusive of repowering, an annual average of about 600 wind turbines will be erected in the EU5 up until 2040. The highest level will be attained towards the mid-2030s with approx. 13,000 wind turbines.

After the maximum installation rate is reached at the beginning of the 2020s, the EU5 will then exhibit a stronger decline in new units than for Germany. For the German part of the North Sea, a decrease in new installations will also be noted for the period 2031 to 2035, but this drop will stabilize again to a large degree between 2036 and 2040 and then lie at a similar level to that of the previous period. In the rest of the EU5, however, a higher decrease in new installations must be expected.

Erection and dismantling of wind turbines in the EU5 between 2011 and 2040



Source: Prognos AG, Regionalwirtschaftliche Potenzialanalyse für ein Offshore Terminal Bremerhaven, Januar 2011

Federal Government setting the course

The offshore strategy of the German Federal Government shows that a total wind energy output of 25 GW at sea can be achieved by 2030. Together with the wind farms on land, a fourth of the electricity demand in Germany alone could be covered by wind energy.

Expert studies indicate that today's average unit size of more than 4 MW will rise to almost 9 MW in 2040. Of these units, about 31,000 will be erected within the European Union by 2040. For German waters, a regional distribution of 10:1 (North Sea to Baltic) is assumed, which points to a considerable boost in the cargo volume potentials for the shipment of individual components in the offshore ports of the North Sea.

Ideal for the giants of wind energy: the German North Sea

Germany's North Sea region consists of the “12 nautical mile zone” as well as the “exclusive economic zone” stretching out to a maximum of 200 nautical miles from the coast. In this area, average annual installation activity (new installations and repowering) of about 200 wind turbines may be expected between 2011 and 2040. By 2040 the peak will have been reached in the German North Sea with approx. 4,500 units erected. This forecast includes the dismantling and repowering of antiquated units and corresponds to an electrical output of over 30 GW.

According to the economic analysis of Prognos AG, starting with very restrained growth up to 2010, an appreciable rise to more than 80 wind turbines per annum is to be expected for the subsequent 5-year period up to 2015. From 2016, i.e. shortly after the planned completion of the Offshore Terminal in Bremerhaven, the annual new erection of wind turbines in the German North Sea will increase to 230.

Repowering drives revenue growth

Experience with onshore wind energy shows that repowering, i.e. the exchanging of a large number of older wind turbines for newer, more powerful units, will take on a decisive role in the growth of offshore wind energy about 20 years after initial installation. The corresponding size ranges of the plants can be determined from the MW capacity to be renewed and the turbine size prevailing at that time. In terms of the time frame, this assumption represents a conservative approach. However, in comparison to land-based plants, offshore wind turbines are subject to more extreme physical and environmental influences, which could lead to a shorter operational life and hence also an earlier onset of repowering. The planners and operators of offshore wind farms have a similar view of the situation. An earlier start to the repowering phase – before the projected 20 years – would then also result in an increase in transshipment volume at the planned OTB.

Bremerhaven developing as Europe's offshore centre

The offshore wind energy industry is a sector of exceptional growth and will achieve considerable increases in revenue over the years and decades to come. Bremerhaven is well on the way to becoming Europe's center for this new industry. The 25 GW which the Federal Government aims to generate at sea by the year 2030 could – in the near future – be produced to a considerable degree by wind turbines “made in Bremerhaven”. The high average wind speeds prevailing on the North Sea hold the promise of enormous energy generation.

Great offshore potential around Bremerhaven

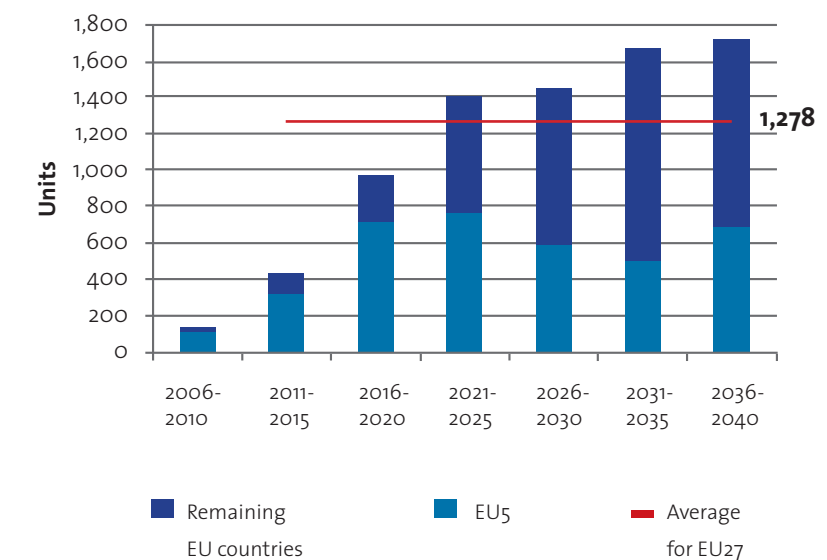
The annual installation rates of about 200 turbines for the German North Sea and of approx. 600 turbines for the EU5 described above bear witness to the great offshore potential of this region. In order to derive well-founded statements on the possible utilization of the Offshore Terminal in Bremerhaven, however, an additional aspect must be taken into account.

A limiting factor for the use of an offshore harbour as the base port is given by the maximum range to which the ships employed for the installation work are able to operate profitably. The so-called installation vessels are used for erecting and installing complete wind turbines that have been largely pre-assembled in the base port. According to shipowners and offshore companies with installation vessels currently under construction, the range up to which such vessels can operate economically lies at about 200 sea miles. Measured from the future OTB, there are now already wind farms with a requirement of almost 300 wind turbines per year within this range. If one considers this 200 sea mile radius around Bremerhaven, the wind farms of Germany, the Netherlands and parts of Denmark can be served from this port. The offshore wind energy ports in the North Sea are expected to number three or four, whereby the 300 wind turbines will most probably be distributed over Bremerhaven and one or two further ports. This yields – independently of the terminal concept pursued by the individual ports – a theoretical transshipment potential of 100–150 complete turbines a year for the OTB.

The experts go even further: assuming a learning curve in logistics and assembly, an extended radius is conceivable. Considering a radius of 300 sea miles, the Belgian wind farms and parts of the Norwegian and British wind farms will contribute a demand of 470 units per annum. This transshipment potential is based on a purely quantitative forecast that assumes a uniform distribution of the overall potential amongst the various base ports. With due consideration of the diverse locational advantages of Bremerhaven and the existing plant and component manufacturers, it may be assumed that Bremerhaven will achieve a higher market share. Local nacelle builders, as essential manufacturers in the production chain of wind turbines, represent the chief prerequisite for the shipment of pre-assembled plants. The target figures of the resident manufacturers indicate an increase in the production capacity to as much as 400 nacelles p.a. in Bremerhaven. With these production figures, a significantly higher transshipment potential appears probable, in view of the fact that the manufacturers not only produce for the North Sea but also for the export of components.

The remaining 22 EU states only reach this point a decade later. This time-lag yields substantial potential for the handling and shipping (export) of individual components from Bremerhaven. Moreover, the maximum installation rate of the 22 EU states (not including EU5) for the period 2031 to 2035 compensates for the declining number of installations of wind turbines in the EU5.

Average annual installations of wind turbines in the EU up to 2040



Source: Prognos AG, Regionalwirtschaftliche Potenzialanalyse für ein Offshore Terminal Bremerhaven, Januar 2011

In addition, the worldwide export opportunities for components must be considered for the evaluation of the transshipment potential at the planned OTB. The predictive strength of the forecasts on the worldwide development of offshore wind energy (outside the EU) is, however, still relatively low. On the whole, there are a number of countries worldwide that stand out through their strong initiatives in fostering offshore wind energy.

What applies on the European level in terms of repowering will also become a decisive factor for the OTB: from the beginning of the 2020s, an additional transshipment potential will be generated through the exchange of existing wind turbines for new, more powerful units. The return transport and the landing of the “old” dismantled wind turbines and the shipping of new plants can in future be handled via the OTB.

Gateway for complete units and individual components

In addition to the transshipment of pre-assembled wind turbines, which are then conveyed by the installation vessels from the planned offshore base port of Bremerhaven to the offshore assembly sites as complete units, the turnover of individual components (nacelles, rotor blades etc.) must also be considered for the utilization levels and capacity planning of the Offshore Terminal. Unlike the coverage ranges for pre-assembled complete units, which are limited from 200 sea miles to a maximum of 300 sea miles for economic reasons, these individual components can theoretically be carried worldwide by “traditional” cargo ships, with the result that the offshore potential of further countries could be added to the market potential existing within the EU5.

The world's largest market for offshore wind energy is the European Union. For the 27 member states of the EU (including the EU5 mentioned previously), it is expected that almost 1,300 wind turbines will be erected annually by 2040. From 2016 on, an installation rate of about 1,450 wind turbines p.a. may be expected. A striking feature is that the projected development of offshore wind energy in the EU5 takes place much earlier than in the other EU states. Within the EU5 the maximum installation rate is reached in the period 2021 to 2025.



Erecting a wind turbine at “alpha ventus”, the first German offshore wind farm

Ideal: Resident companies can use the OTB as a “goods handling zone”

In comparison to the competing ports in the North Sea, the OTB will take up a very special position and thus offer a decisive and unique selling proposition: Owing to its favourable position on a deep waterway, its outstanding infrastructure and the strategic development of cluster structures, a number of leading companies in the industry have already decided in favour of Bremerhaven as a prime location. At no other location will one find such a well-developed cluster of offshore wind energy, with producers and service providers on all levels of the value chain, as in Bremerhaven. Besides the presence of manufacturers of the pertinent industrial sectors, the high concentration of specialized service providers, the availability of generous storage areas and the loading possibilities all represent attractive and unique selling propositions. Through initiatives targeted at the wind energy industry, reputable companies such as AREVA Wind GmbH and REpower Systems AG (wind turbines of the 5 MW class and above), PowerBlades GmbH (rotor blades) and WeserWind (steel foundations) have been won over to settle on the industrial properties around the future OTB. For these enterprises, the OTB will act as a “goods handling zone”, both for completely pre-assembled wind turbines and for the export of components directly from the production buildings. As a result, customers interested in the services offered by the OTB are already situated right at the “location of the future” in Bremerhaven.

The need for the exported components, such as nacelles and rotor blades, is not restricted to offshore wind turbines, but also extends to the onshore wind energy sector. Here the global market is even larger, so that the sale of high quantities appears to be a realistic projection. According to Prognos, the companies in Bremerhaven are adjusting their export plans to rely on the existing cargo handling possibilities at the Labradorhafen basin and on the additional capacities at the planned Offshore Terminal Bremerhaven.

Bottom line: Market potential assures OTB utilization

The quantitative results for the development of the offshore wind energy market indicate that a full utilization of the Offshore Terminal in Bremerhaven appears to be both realistic and realizable. The transshipment target of up to 160 (partially pre-assembled) wind turbines a year is already achieved on the market side almost entirely by the minimum of 100 to 150 wind turbines situated within the supply range of 200 nautical miles around Bremerhaven. Further realization of the potential within the supply range depends on the relative development of competing offshore ports. Here it may be expected that even if four instead of three offshore base ports are established on the North Sea, the transshipment volume in Bremerhaven will be in the upper part of the forecasted range or even above it. This is borne out by Bremerhaven’s good competitive

position. The above-mentioned figure is based purely on a uniform distribution and thus does not consider that national offshore projects are generally served from a national port. Within the supply zone of Bremerhaven, this corresponds to approx. 200 wind turbines a year. Furthermore, the proximity of the projects within the German exclusive economic zone (EEZ) is a factor in favour of supply by a German port, since the shorter supply routes allow cost savings in logistics.

In addition to the handling of completely pre-assembled wind turbines by installation vessels, further potential is obtained through the loading and shipping of individual components. A special focus must be placed on the European market, which is set to grow rapidly from the 2020s.

For the global offshore wind energy market too, export opportunities and hence additional transshipment potential will arise. Furthermore, it will be possible to compensate for any fluctuations in the workload of the terminal through the decommissioning and shipping of dismantled wind turbines (from the mid-2020s). The recycling of these units could then be take place in Bremerhaven. It is conceivable that reusable parts or components of importance to the producers can first be removed, with subsequent onward shipment of the residual unit to other ports worldwide. This will generate further handling activities at the Offshore Terminal Bremerhaven.



Loading of REpower 5 M offshore turbines at the “Labradorhafen” heavy load terminal in Bremerhaven

STRUCTURES FOR OPTIMUM PROCESS AND TRANSPORTATION LOGISTICS

The construction of an offshore wind farm calls for logistics infrastructure on an enormous scale. The parameters of a 250 MW offshore wind farm consisting of fifty 5 MW turbines exemplify the logistical challenges posed by an offshore terminal: rotor diameters of approx. 110 m, tower heights of approx. 90 m, and an estimated total weight per turbine of the order of 1,000 to 1,500 metric tonnes. The total weight of the material moved for an offshore wind farm adds up to more than 50,000 metric tonnes. The successful installation and operation of offshore wind farms depends decisively on achieving optimum process and transportation logistics. This exerts a substantial influence on the realization of the projects within the cost and time constraints, and also has a direct and verifiable effect on the electricity production costs (€/kWh) of an offshore wind farm.

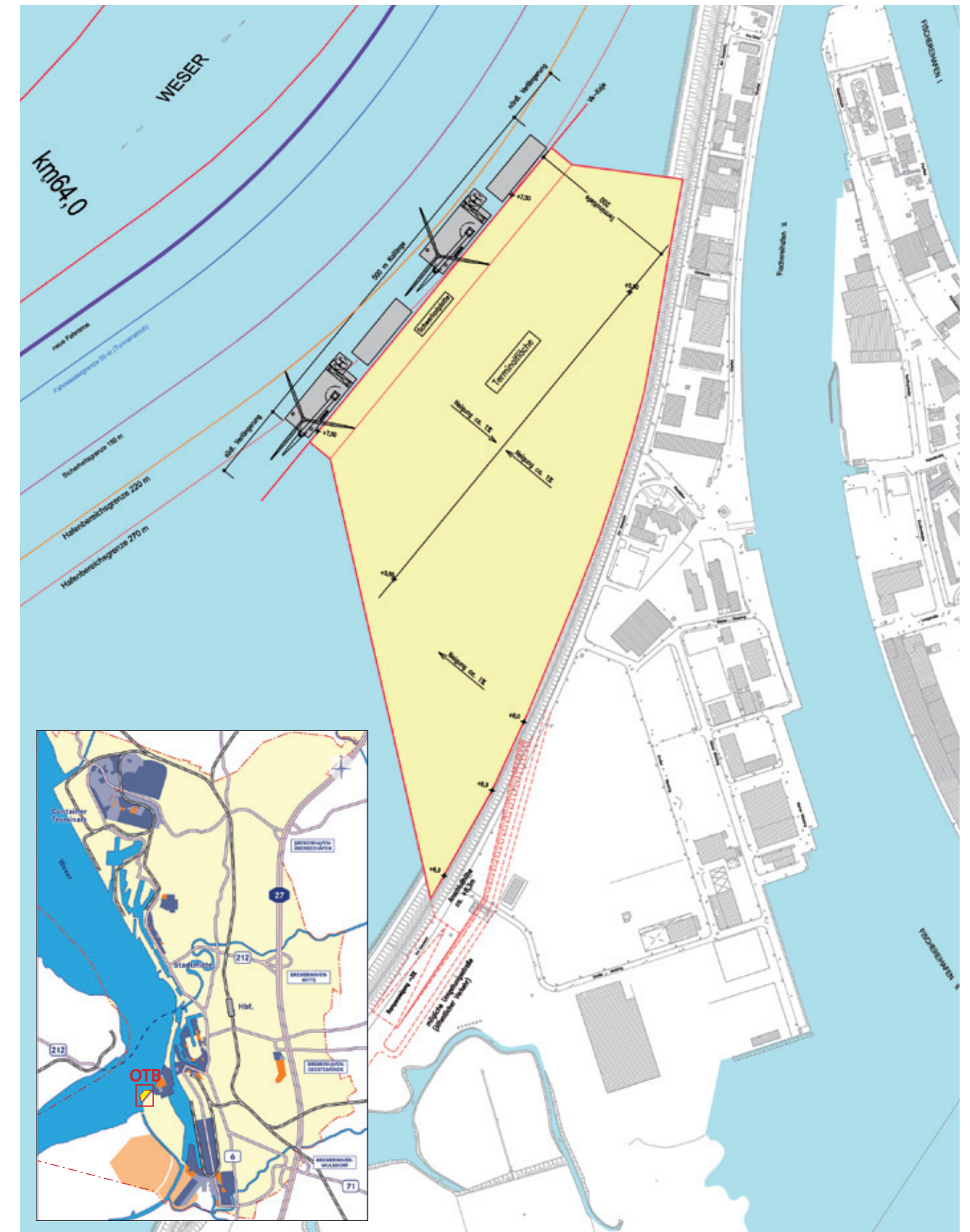


OTB: “Goods handling zone” for the companies on site

Locating in Bremerhaven offers potential users of the planned OTB the best possible conditions: the infrastructural prerequisites permit the combination of production on land with installation at sea. One of the benefits is, for example, that foundations and other main parts of the plants can be manufactured in the direct vicinity of the harbour. By employing the principle of having a “goods handling zone” for the companies that manufacture in Bremerhaven, transportation problems arising on the overland route before shipping can be minimized. What is more, it is possible to dispense with cost-intensive transfers by water to another loading berth. As a result, the direct customers of the OTB who are already on site or will be settling there in future can do without large investments in costly overland or overseas logistics.

In addition, consolidating the flows of goods provides a sound basis for resource-optimized logistics. This reduces transports as well as transport kilometres, also cutting the total volume of CO₂ emissions by the shore and sea transports.

Offshore Terminal Bremerhaven – Site Plan



TECHNICAL DATA

OTB: Special port with land and sea construction measures, quays and storage areas

PURPOSE	<ul style="list-style-type: none"> Handling, pre-assembly and storage of offshore wind turbines Export of components Logistics centre for the transportation/transhipment of large industrial components
OPERATING TIME	24 hours a day, 365 days a year
TARGET	Up to 160 wind turbines und foundation structures of wind farms per season
QUAY LENGTH	500 m
BERTHS	2 to 3
NAVIGABLE DEPTH	10,5 m
HEAVY-DUTY SLAB AT THE QUAY	70 m
TERMINAL DEPTH	498 m
AREA	Approx. 25 ha
CAPACITY	With 2 completely available berths: technically, 160 units per season

Functional assignment

<ul style="list-style-type: none"> Staging areas for 6 foundation structures (jackets, tripiles, tripods or monopiles) Staging areas for 18 tower segments (horizontal, vertical), 6 hubs, 6 nacelles and 18 rotor blades Assembly area for 6 “rotor stars” at the quay Assembly area for the erection of jackets and tower segments Assembly areas for a transformer substation Transport routes > 90 m in length > 30 m in width Quay areas Staging area for transportation and lifting equipment

Percentage distribution of the area usage

43%	assembly activities
27%	for transports within the Offshore Terminal (length > 90 m, width > 30 m)
15%	quay areas (also large crawler cranes with a working radius of up to 30 m)
15%	staging areas for loading operations immediately pending

Heavy goods transports

<ul style="list-style-type: none"> Number of heavy goods transports: approx. 2,000 (8/day) if 160 units are produced completely in Bremerhaven and installed in the German wind farms Additionally: Passenger traffic, return transports for transportation and lifting equipment as well as feeder transports for supplying the installation sites and the ships = > approx. 10–15 transports/day

Dimensions and weights of the individual components

Component	Approx. dimensions, without transport frame	Approx. weight
Foundation structures		
Monopiles	D 5.5–7 m, L up to 60 m	300–700 t
Transition piece	D 5.5–7 m, L up to 30 m	300 t
Jackets	L/W/H up to 20/20/50 m	550 t
Tripiles	L/W/H up to 17/17/21 m	490 t
Tripods	L/W/H up to 32/32/60 m	950 t
Driven piles		
Small	D 1–3 m, L up to 45–60 m	90–150 t
Large	D 3 m, L up to 45–60 m	150–300 t
Gravity foundations	D 30–40 m, H up to 50 m	3,000 t
Towers (2–3 segments/unit)	D 6–7 m, L up to 30–40 m	150 t
Hubs	D 6–7 m, H up to 7–8 m	90 t
Nacelles	L/W/H 21/8/9 m	300 t
Rotor blades (single blades)	D 4–5 m, L 60–90 m	20–25 t
Rotor stars	R, 65 - 95 m, H 7 m	140 - 160 to
Rotor blades pre-assembled in the “bunny ear” configuration with nacelle	L/W/H 24/60/30 m	450 t
Transformer substations and their components	L/W/H 34/27/24 m	1,000 t
Complete wind turbines	L/W/H 24/150/150 m	950 t

ATTRACTIVE POTENTIAL RETURNS FOR INVESTORS

In the recent past, the unique locational factors offered by Bremerhaven have convinced more and more wind sector investors to focus on the biggest city at the German North Sea coast. As a result, the seaport city is extending its leading position as a European centre for the offshore wind industry.

With the envisaged Offshore Terminal Bremerhaven and the more than 200 hectares of additional industrial space nearby, Bremerhaven is responding to the demand from the offshore wind industry for larger harbour and logistics locations. This yields further locational advantages for the major players in the industry, promising distinct gains in efficiency for the overall supply chain process. With the construction of a port tailored to needs of the wind energy industry, structural economic effects of a long-term and sustainable nature will also be achieved. The future OTB will therefore be a key project for the offshore wind energy industry in Europe.

The OTB is scheduled to commence its operations on the Weser River in 2014. Economic viability analyses based on current market prices and tests for plausibility have indicated that a private financing of the heavy load terminal through a concession model will be of great interest to private investors, even without any further public start-up funding, since the project offers attractive returns for investors.



MORE THAN 200 HECTARES OF SPACE FOR EXPANSION AND SETTLEMENT

A special strength of the future OTB lies in its good transport-specific development and the directly adjoining expansion areas for the offshore industry and logistics.

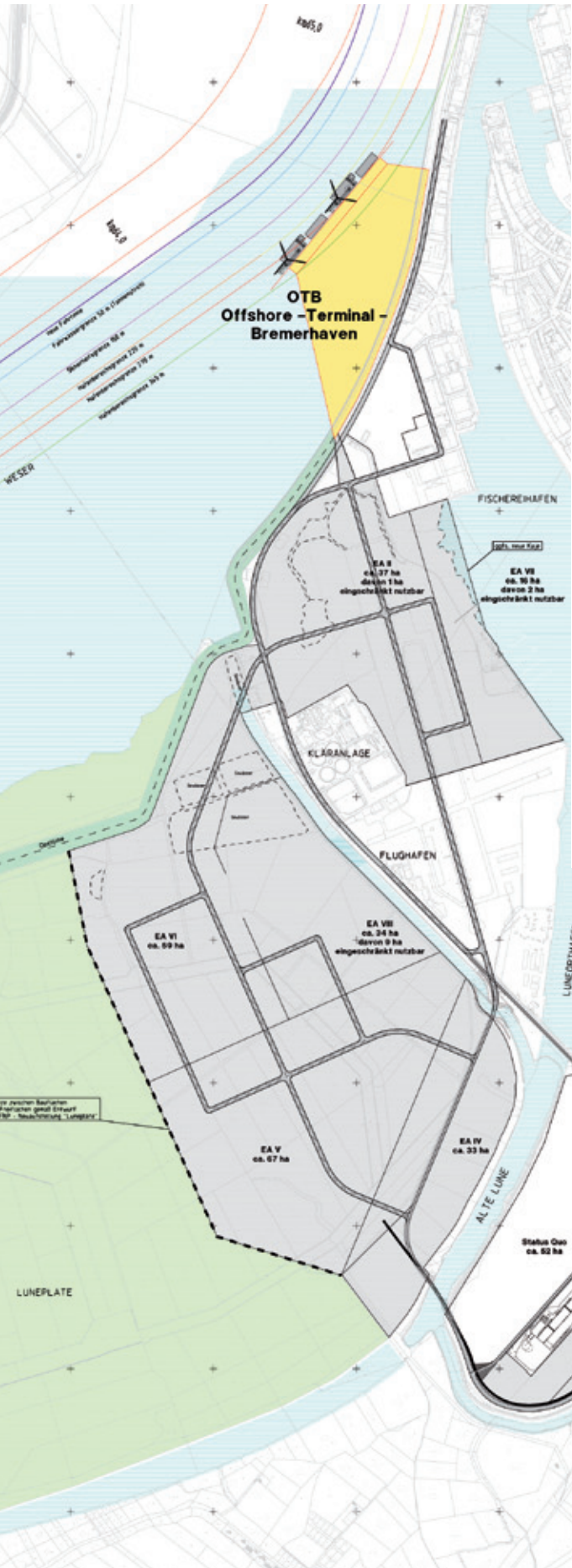
The infrastructural connection of the OTB to the production facilities in the industrial areas Luneort and Luneplate is secured within the scope of the master plans. An efficient connection of Luneort und Luneplate to the road and rail network and the waterways is ensured through their closeness to the industrial quays of the Fishery Harbour (and especially the existing heavy load facility in the southern part of the Labradorhafen basin) as well as through a short section (B71) to the A27 motorway (junctions “Bremerhaven-Süd” and “Wulsdorf”). An alternative route to the motorway runs via the B6 (junction “Fischereihafen”). In the same way, the area is linked to the national freight railway network through Wulsdorf train station.

The usage potential of 200 hectares in the future industrial area of Luneplate provides the desired expansion possibility for the companies already located there – PowerBlades GmbH, REpower Systems AG, AREVA Wind GmbH, and WeserWind GmbH. On the other hand, the cluster of resident firms will be joined by other companies with an offshore focus, for example from the fields of production, subcontracting, servicing and logistics at the Bremerhaven site, which in turn will enable the operators of the OTB to develop additional customers.



The Luneplate industrial zone with 200 ha of expansion area is situated in the direct vicinity of the planned Offshore Terminal and the existing production facilities of the offshore industry

DEVELOPMENT PLANNING
INDUSTRIAL AREA LUNEPLATE (Status: December 2010)



POSITION: South of the city centre
SIZE: 200 ha (gross area)
AVAILABLE AREA: 200 ha

- PLANNING PROCESS:**
- Land use plan
 - Water use approval
 - Aviation approval for the future use of the airfield

TRAFFIC CONNECTIONS

MOTORWAY: A27 (4 km)
NATIONAL HIGHWAY: B6 (1 km) und B71 N (1.5 km)
HARBOURS: Fishery Harbour (1.5 km),
Container Terminal (11 km)
AIRPORT: Regional Airport Bremerhaven (0,5 km)
Airport Nordholz (39 km)
International Airport Bremen (70 km)
RAILWAY: Bremerhaven main station (6.5 km)
PUBLIC TRANSPORT: Yes (bus route)
DISTANCE TO CITY CENTRE: 8,5 km

STRUCTURED BIDDING PROCESS ON THE BASIS
OF A NEGOTIATED PROCEDURE

The OTB project is to be realized as a concession model. bremenports has been commissioned on behalf of the Free Hanseatic City of Bremen (FHB) to put the construction, the financing and the operation of the OTB – and, if applicable, the infrastructure needed on land – out to tender Europe-wide in a transparent and competitive bidding procedure. The FHB is to be the concession grantor. The intention is to have the investor carry out the planning, building, financing and operation of the OTB at his own expense, with the outlay to be refinanced through user fees. Start-up financing will not be provided.

At present, the concept envisions the conclusion of the planning and preparation activities for the OTB project by the start of 2011. The structured bidding process is to be initiated during the first half of 2011 through an announcement in the Official Journal of the European Union. In accordance with the applicable legal stipulations for public works concessions in the water, energy and transport sectors, the procedure will be oriented towards the requirements resulting from the regulations and principles of the EC Treaty. In the structured bidding process, a bidder prequalification phase (accessible throughout Europe) is followed by several rounds of bids and negotiations to select the most economical offer to be granted the concession for the planning, construction, financing and operation of the OTB.

It must be expressly pointed out that the procedure outlined here is not binding and will be adapted to meet specific needs and legal requirements.

PERSONAL CONTACTS FOR PROSPECTIVE INVESTORS

**Ministry of Economic Affairs and
Ports of the Free Hanseatic City of
Bremen**

Jörg Peters
Head of Department
Ministry of Economic Affairs and Ports

Zweite Schlachtpforte 3
28195 Bremen
Tel: +49 421 3618 801
joerg.peters@wuh.bremen.de

**BIS
Economic Development
Company Ltd.**

Nils Schnorrenberger
Managing Director

Am Alten Hafen 118
27568 Bremerhaven
Tel: +49 471 94 64 69 00
schnorrenberger@bis-bremerhaven.de

**bremenports
GmbH & Co. KG**

Holger Banik
Head of Commercial Affairs

Am Strom 2
27568 Bremerhaven
Tel: +49 471 30 90 11 58
holger.banik@bremenports.de

Ministry of Economic
Affairs and Ports

 Freie
Hansestadt
Bremen

bremenports
:

Economic Development
Company Ltd.

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IMPRINT

Published by

BIS Economic Development Company Ltd.
Am Alten Hafen 118
27568 Bremerhaven
Tel: +49 471 94 64 69 10
Fax: +49 471 94 64 68 90
mail@bis-bremerhaven.de
www.bis-bremerhaven.de

bremenports GmbH & Co. KG
Am Strom 2
D-27568 Bremerhaven
Tel: +49 471 30 90 10
Fax: +49 471 30 90 15 32
marketing@bremenports.de

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Planning status

January 2011