

# The German Wind Energy Industry

## Europe's Primary Wind Energy Market

### Market Overview

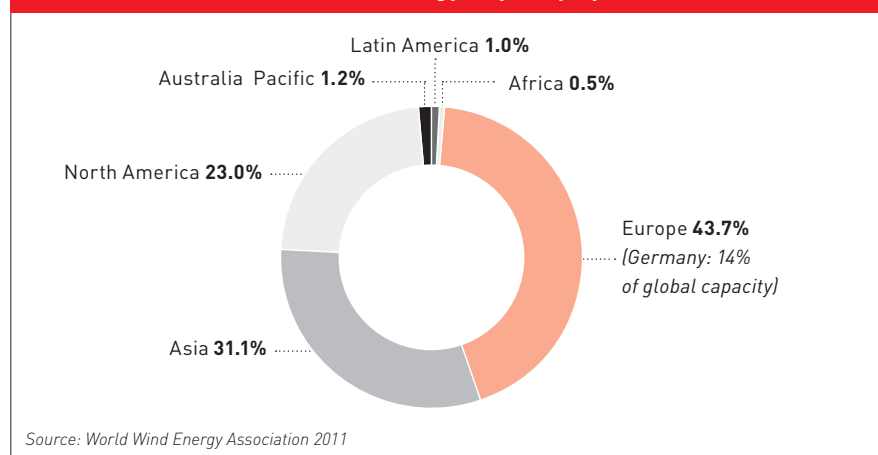
As Europe's primary wind energy market, Germany represents around 32 percent of total installed capacity in Europe and 14 percent of global installed capacity. By the end of 2010, total installed capacity accounted for 27,215 MW and 37.8 billion kWh respectively. Domestic electricity produced from wind energy sources accounts for 6.2 percent of total net consumption and is the dominant mode of renewable electricity production.

German wind energy sector development has been driven by a strong onshore market. By mid-2011, 21,863 turbines were installed onshore in Germany. The federal states are currently evaluating further land areas for wind energy deployment. The onshore wind market also provides significant potential through the repowering of first-generation turbines, replacing them with modern multi-megawatt class wind turbines. The offshore wind market is likewise forecast to grow in importance in the short to midterm. Around 210 MW offshore capacity was installed in Germany by mid-2011, with over 60 offshore wind park project developments currently in progress. A further 30 offshore wind parks had already received formal approval by mid-2011.

### Redefining the Energy Mix

In May 2011, the German parliament formally announced plans to phase out nuclear energy by 2022. In the same year, electricity produced

### Share of Total Installed Wind Energy Capacity by Continent 2010



from renewable energy sources reached a landmark 20 percent of total German power supply. Wind energy will be one of the key technologies in Germany's future energy mix, with wind share of total domestic electricity production forecast to reach 25 percent by 2025. To reach this goal, wind energy will benefit from strong government support to expedite both onshore and offshore installations.

According to the German Wind Energy Association (BWE), wind energy capacity in Germany could reach 45,000 MW onshore and 10,000 MW offshore by as early as 2020. Germany is already home to one of the world's largest wind industries - having grown from 65,000 employees in 2005 to a current level of over 100,000 employees - and is expected to grow even more in the future.

### Thriving Export Hub

Both domestic and foreign markets are highly relevant to the industry producing in Germany. Beyond the domestic energy market, Europe is a key market for German products. Europe dominated the global wind energy market in 2010 with a 43.7 percent share of total installed capacity. World-renowned engineering, "made in Germany" product quality, and a well-rehearsed global export infrastructure have helped create export levels which represent around 66 percent of total German wind industry output. Thanks to its excellent export conditions, Germany plays and will continue to play a decisive role in meeting global and European wind-based power generation demand.



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# Offshore Wind Energy Opportunities

## German Offshore Market Growth

Around 210 MW offshore wind capacity was installed in Germany by the middle of 2011. At the beginning of May 2011, Germany's first offshore wind farm in the Baltic Sea went online. The nearly 50 MW park, known as Baltic 1, is situated 16 km north of the Darss/Zingst peninsula. The park joins North Sea wind farm alpha ventus (60 MW), which began operating in 2010. The BARD Offshore 1 (400 MW) and Borkum West II (200 MW) projects are currently under construction in the North Sea. This is only the beginning of Germany's offshore wind era. Project developments of over 60 offshore wind parks are currently in progress. Twenty-six offshore wind parks in the German Bight and another four projects in the Baltic Sea were formally approved by mid-2011.

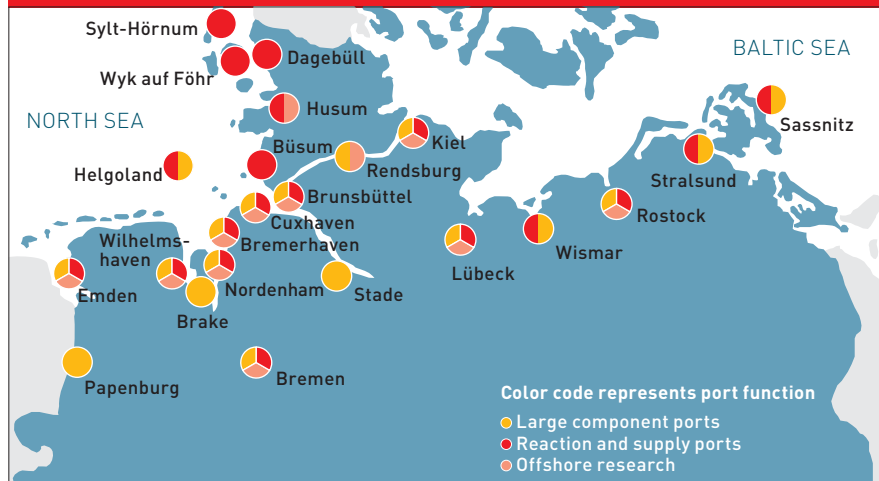
## Long-Term Planning Security

Changes to the Renewable Energy Sources Act (EEG) in 2009 have jump-started construction activities – thanks to an increased feed-in tariff guaranteed for 20 years and the requirement for transmission system operators to provide ready offshore grid connections. The German government's new Energy Concept 2050 makes further provision for an array of offshore wind energy support measures – including the KfW development bank's "Offshore Wind Power" program which will make a total credit volume of EUR 5 billion available for wind farm financing. These conditions create planning security for offshore wind projects and raise investor confidence along the entire supply chain.

## Large-Scale Port Infrastructure

German ports along the coastline are being expanded to meet offshore wind industry demands. European Union (EU) and federal state level authorities and private

## German Offshore Ports



Source: Federal Association of German Seaport Operators (ZDS) 2011

companies alike have made significant investments to develop heavy load port terminals in close proximity to production facilities. Large quayside storage areas and options for the preassembly of foundations and wind turbine components are opened up. The ports represent in-situ offshore logistics solutions and facilitate optimized in-bound and out-bound supply chain management.

The German offshore seaports are not only readily equipped to meet German offshore wind demand but also present an ideal hub to serve all northern European offshore wind farm projects. The 2011 "Offshore Grid" study conducted within the framework of the European Commission Intelligent Energy Europe program has identified offshore wind farm projects in northern Europe with a capacity of 42GW by 2020 and 116GW by 2030. The major markets by 2030 will be the UK, Germany, Netherlands, and Sweden. The study forecasts that the North Sea and Baltic Sea alone will record offshore wind potential of more than 100GW – marking them out as the main marine areas for offshore wind deployment in northern Europe.

Ports in Lower Saxony, Bremen/Bremerhaven, Hamburg, and Schleswig-Holstein lie directly along the North Sea coast. As well as this, Schleswig-Holstein and Mecklenburg-Vorpommern directly serve the Baltic Sea coast. Both coastlines are conveniently connected through the Kiel Canal, which is one of the most heavily used artificial seaways in the world. All of this means that these ports are optimally located at the center of all future northern European offshore wind activity.

## Project Location Identification

International and domestic companies alike are currently setting up production facilities and R&D centers in Germany. A number of offshore industry and service centers have already emerged in several locations in order to satisfy German and European demand. *Germany Trade & Invest's* team of experts can assist you in identifying your project-specific location factors to support your site selection process in Germany.

## Attractive Market Incentives

### A Key Future Technology

There is a shared political and public will regarding the future development and promotion of wind energy in Germany. Wind energy has been assigned a key role in the future energy scheme. Germany's ambitious renewable energy program – set out and implemented within the framework of the Renewable Energy Sources Act (EEG) – will increase the share of renewable energy sources for electricity supply to at least 30 percent by the year 2020.

### The Renewable Energy Sources Act

The springboard for positive German market development has been the profitability of wind energy as a result of ambitious government initiatives, and the EEG in particular. Subject to location and reference yield, the act guarantees a 20-year feed-in tariff of between 8.93 and 4.87 cents (EUR) per kWh for installations commissioned prior to January 1, 2013.

The EEG also provides bonuses of 0.49 cents (EUR) per kWh for improved network integration and 0.5 cents (EUR) per kWh for wind energy facility repowering. In the cases of installations commissioned in subsequent calendar years, the tariffs and bonuses shall be reduced progressively each year by 1.5 percent.

Offshore wind farms benefit from higher tariffs. Offshore, the initial 20-year long guaranteed EEG feed-in tariff is equivalent to 15 cents (EUR) for the first 12 years or 19 cents (EUR) for the first eight years and extended subject to location. The deeper the wind turbine stands and the further from shore it is located, the longer the higher initial tariff compensation level is paid. Thereafter the sum payable amounts to 3.5 cents (EUR) per kWh.

### Feed-in Tariffs for Electricity from Wind Energy (in EURct/kWh, 2012)

	Onshore	Offshore	
Year of commissioning	2012	2012	
Annual degression for later commissioning date	1.5%	0% After 2017: 7%	
Initial tariff	8.93 Minimum first 5 years	15.0 Minimum first 12 years	19.0 First 8 years
Final tariff	4.87	3.5	3.5
Bonus: "Repowering"	0.5	-	-
Bonus: "Net integration"	0.48	-	-

Source: Renewable Energies Sources Act (EEG) 2012  
Federal Ministry for the Environment Nature Conservation and Nuclear Safety 2011

The annual percentage degression for tariffs and bonuses for electricity generated from offshore wind installations shall be seven percent from the year 2018 onwards (commissioning date).

Another major factor which makes offshore sites especially attractive is the requirement placed upon transmission system operators to provide grid connections at sea to which an offshore site operator can directly connect.

### Supporting Investment Projects

A number of programs are available for setting up facilities in Germany. These are designed to fit the requirements of diverse economic activities at different stages of the investment process. Support ranges from cash incentives for setting up production facilities to labor-related incentives as well as research & development (R&D) grants.

Germany Trade & Invest's team of experts will guide you through all of the relevant administrative procedures during your business set-up phase and help you prepare all of the necessary application information for successful application.

## Sophisticated Business Environment

### World-Class Education Standards

According to the OECD, Germany has an excellent standard in higher education. In 2010, some 443,000 students – at more than 400 universities – embarked on a course of academic study. Technical fields of study experienced an undergraduate enrollment level increase of more than eight percent. Germany's share of university students in the sciences, mathematics, computer sciences, and engineering is the second highest in the EU, with 31 percent of all students. Many German universities have also developed specific technical degree programs focusing on renewable energies and wind energy.

### Outstanding Labor Force

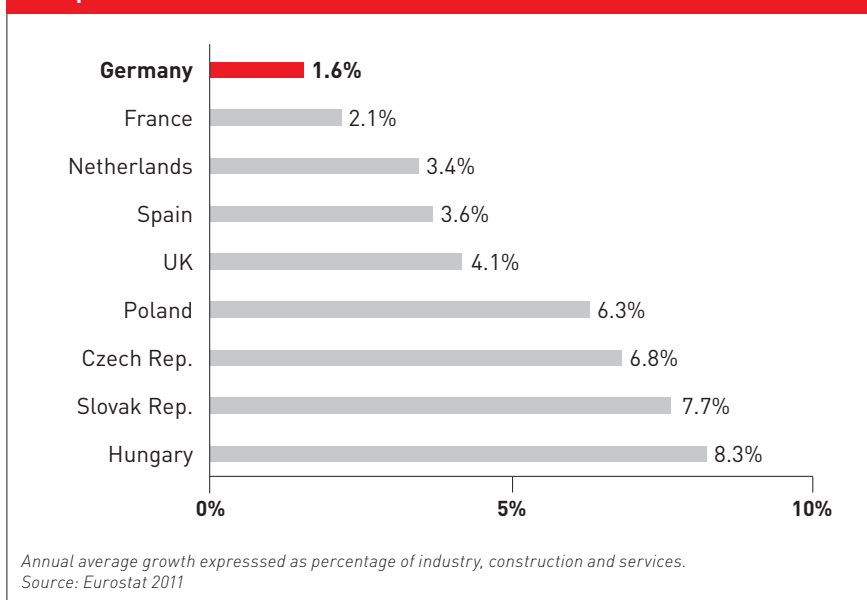
As best witnessed by previous wind project settlements, Germany provides ready access to a reliable workforce. Currently, the wind industry can call upon an estimated labor pool of around 100,000 employees.

More than 80 percent of the German workforce is in possession of an academic degree or has received formal vocational training. The country's dual education system – unique in combining the benefits of classroom-based and on-the-job training over a period of two to three years – is specifically geared to meet industry needs. Moreover, recruitment services are actively supported by government agencies.

### Competitive Labor Costs

Since 2000, wages have risen in most European countries (EU-27), with the growth rate averaging 3.7 percent. While some countries – particularly those in eastern Europe – experienced a rise of more than seven percent, Germany recorded the lowest labor cost

### European Labor Cost Growth 2001-2010



growth within the EU at just 1.6 percent. High productivity rates and steady wage levels make Germany an extremely attractive investment location. Labor cost increase levels have been the lowest in Europe in recent years. Measured in unit labor costs, Germany experienced a major increase in productivity the past decade. In marked contrast to other European countries which have experienced an overall increase in unit labor costs, Germany's unit labor costs decreased by a yearly average of 0.3 percent for the period 2005 to 2010. Falling unit labor costs represent a genuine competitive cost advantage – particularly in manufacturing.

Highly flexible working practices such as fixed-term contracts, shift systems, and 24/7 operating permits contribute to enhance Germany's international competitiveness as a suitable investment location for internationally active businesses.

### Investment Security

Wind energy requires stable policy frameworks with well-designed feed-in tariffs and sufficient legal stability. Germany is world renowned for its highly developed economic, legal and political frameworks which provide investors – in all industry sectors – with the necessary security for their business investments.

### Open and Transparent Markets

German law makes no distinction between Germans and foreign nationals regarding investments, available incentives or the establishment of companies. The legal framework for foreign direct investment in Germany favors the principle of freedom of foreign trade and payment.

## Germany as a Wind Energy Business Location

### Sophisticated Supply Chain

All of the major international on-shore turbine manufacturers are represented with production facilities in Germany. The offshore sector is also well represented with further potential in a growing market. These include, among others, Enercon, Fuhrländer, GE Energy, Nordex, Multibrid, REpower Systems, Siemens, and Vestas. As well as these leading manufacturers, the supplier industry has also made a significant contribution to wind market turnover. The year 2010 brought another huge leap forward in terms of global capacity, with total installed capacity of 194 GW in 2010 being equivalent to a 22 percent increase on 2009 figures. This puts companies in Germany first in line to meet increased global wind-based power generation demand.

### Product Realization and Market Launch

Germany's unique market infrastructure – with its dynamic and diversified local supply industry – recommends the country as an ideal location for product realization and rollout. Companies located in Germany are able to scale their share of in-house production very flexibly – i.e. to “make or buy” product components. The manufacturer can adjust its production strategy from comprehensive manufacturing to assembling in a lean production line in order to achieve process advantages and cost reductions at will. Conversely, there are also opportunities to play a part as a supplier within this dynamic market.

### Engineering Excellence

Germany is home to a number of engineering companies recognized as being the brains behind the latest wind power generation developments. Examples taken from the

*“The setting up of our new offshore wind technology center in Hamburg is further proof of our commitment to Germany as an environmental and high-tech business location. Offshore wind energy has a very promising future, especially here in Europe, and that puts us in a position to create new local jobs at our company and at our suppliers.”*

**Ferdinando Beccalli**  
CEO, GE Germany



whole wind energy sector are the network characteristics of wind energy turbines made in Germany and the so-called “cold climate” versions produced by wind turbine manufacturers in Germany.

Nearly 60,000 engineering students graduated in 2010. German university engineering graduate numbers have recorded a remarkable year-on-year growth of 8.5 percent in the last five years. The country's world-class education system and applied science landscape provides direct access to a highly qualified and flexible labor pool to meet wind industry needs.

### Research and Product Development

Close cooperation between Germany's R&D institutes and equipment manufacturers helps maintain an internationally unparalleled competitive edge. German agglomeration of public and private R&D activities in wind energy utilization is helping more and more international companies to establish their R&D centers in Germany. Companies who have benefited to date include GE, Vestas and Suzlon.

R&D projects can count on numerous forms of financial support. Many programs allocate support in the form of R&D grants, interest-reduced loans, and special partnership programs. All investors, regardless of country of provenance, have access to attractive R&D incentives.

Fields of research that receive particular attention are, among others, projects that decrease current production costs. Potential lies, for example, in innovative tower-building concepts; the employment of new, more efficient sustainable materials; and the automation of production processes. In the offshore wind sector specific focus is placed on increasing the availability and reliability of wind energy plant. This includes the optimization of multi-megawatt turbines under offshore conditions and improvements in offshore installations and offshore construction technologies. In 2010, almost 40 percent of total renewable energy R&D funding was awarded to new projects in the wind sector. *Germany Trade & Invest's* experts help you identify the appropriate public funding instrument and financing options for your project.