



EWEA
WIND IS POWER

THE **CURRENT STATUS** OF THE WIND **INDUSTRY**

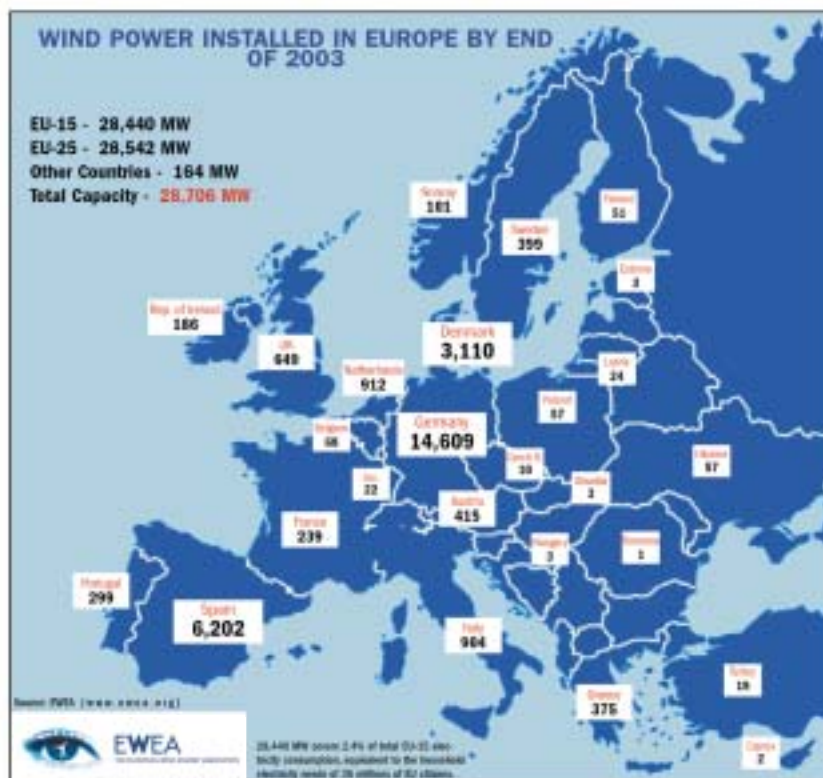


INDUSTRY OVERVIEW, MARKET DATA, EMPLOYMENT, POLICY



“Developing Europe’s potential for using renewable energy will contribute to security of energy supply, reduce fuel imports and dependency, reduce greenhouse gas emissions, improve environmental protection, decouple economic growth from resource use, create jobs, and consolidate efforts towards a knowledge-based society”

- The share of renewable energy in the EU’ Communication from the Commission to the Council and the European Parliament Brussels 26.5.2004



EU 15 CAPACITY INSTALLED (MW)

	Total at end 2002	Installed Jan-Dec 2003	Total at end 2003
Germany	11,964	2,645	14,609
Spain	4,025	2,177	6,202
Denmark	2,089	240	2,310
Netherlands	683	229	912
Italy	766	118	904
United Kingdom	552	332	648
Sweden	343	56	399
Greece	287	76	376
France	148	91	239
Austria	141	276	415
Portugal	195	101	299
Ireland	127	40	186
Belgium	25	32	68
Finland	43	0	43
Luxembourg	17	5	22
EU-15	23,096	5,411	28,440
EU-25	23,159	5,452	28,542

Note: 10 MW were decommissioned in 2003

ACCESSION STATES (MW)

	Total at end 2002	Installed Jan-Dec 2003	Total at end 2003
Poland	27	20	57
Lithuania	24	0	24
Czech Republic	3	7	10
Hungary	3	0	3
Estonia	2	0	2
Cyprus	2	0	2
Latvia	0	0	0
Malta	0	0	0
Slovakia	0	0	0
Slovenia	0	0	0
Total	61	27	100

OTHER COUNTRIES (MW)

	Total at end 2002	Installed Jan-Dec 2003	Total at end 2003
Norway	97	4	101
Finland	46	11	57
Switzerland	5	0	5
Romania	1	0	1
Total	149	15	164





Over the past five years, global wind power capacity has expanded at an average cumulative rate of 32%. In 2003 8,133MW of new capacity was added to the electricity grid worldwide, worth €8 billion.



In 2003, 80% of the wind turbines sold worldwide are by European companies, and Europeans dominate the global industry.



An international industry

The modern wind energy industry has its origins over 20 years ago, but only in the last decade has the international market taken off to the point where it has become the leading renewable energy technology.

Wind energy experienced a surge of activity in California during the 1980s, nurtured by a combination of state and federal energy and investment tax credits. Over the fifteen years up to 1995 around 1,700 MW of wind capacity was installed.

Although some early turbines were of poorer quality, this boom provided a major export market for European manufacturers, and did much to establish the credibility of the industry. Since then, Europe has taken the lead in developing the technology and has consolidated its position as the global market leader.

Since the early 1990s onwards wind power has consistently outstripped its anticipated expansion rate.



Market growth

- Over the past five years, global wind power capacity has expanded at an average cumulative rate of 32%. In 2003 8,133MW of new capacity was added to the electricity grid worldwide, worth €8 billion.
- By the end of 2003, the capacity of wind turbines installed globally had reached a level of 39,294 MW. This was enough power to satisfy the equivalent needs of 19 million average European households, or close to 47 million people.
- 67% of the wind power installed worldwide in 2003 was in Europe.
- 72% of the total wind power installed worldwide is in Europe.
- Wind energy has grown most consistently in Europe, with capacity multiplied by 27 times over the decade between 1992 and 2002.
- The total installed capacity in Europe at the end of 2003 had reached 28,706 MW. This provides enough power to meet 2.4% of the EU-15's electricity demand, and is the equivalent power needs of 14 million average households, or 35 million citizens.

The leading nations in wind energy are Germany, Spain and Denmark, which accounted for 84% of the total European wind capacity. Emerging markets include Austria, Italy, the Netherlands, Sweden and the UK.

Other regions of the world which are developing important wind power industries include the United States, India, China and Japan. Over 50 countries around the world now contribute to the global total.

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In the longer term, a sea area of 150,000 square kilometres with a water depth of less than 35 metres could be available. This would provide enough power to satisfy all of Europe's electricity demand.



Market leaders

Within Europe, **Germany** is the market leader for installation. By the middle of 2004 Germany had installed a total capacity of 15,688 MW, enough to generate 6.2% of the national electricity demand.

Spain has been the next most active market after Germany. In 1993 just 52 MW of wind energy capacity was operating in Spain, ten years later this had increased to 6,420 MW, spread across most of the country's regions, and supplying about 5% of the nation's electricity.

A crucial impetus for wind development in Spain has come from regional governments keen to see factories built and local jobs created. A pioneer of this approach has been the north-western region of Galicia: the regional government's plan is to install a capacity of 4,000 MW of wind turbines by 2010, enough to satisfy about 55% of the province's power demand.

The success of wind energy in **Denmark** has been based on a flourishing manufacturing industry. Since the 1980s, Danish designed and manufac-

tured wind turbines have dominated the world market, and today account for 38% of global sales. Denmark itself now has over 3,200 MW of installed capacity, which supplies 20% of annual national electricity consumption.

Other European countries aim to catch up with these market leaders, with a number of State-adopted targets for either wind energy or renewables in general. The **UK** has recognised the huge potential of offshore wind and embarked on a major programme of development. Over the next two years about 700MW of capacity should be built, with more already having consent, and projects totalling over 7,000MW will be applying for permits in the next 1-2 years. **Portugal** has a target for 3,750 MW of wind capacity by 2010.

All ten Member States which joined the EU in May 2004 have also adopted targets for the level of renewable energy they are expected to achieve. The most promising markets for wind energy that have so far emerged are Poland, Hungary, Estonia and Latvia.



The largest development so far – the 166 MW Nysted wind farm off the southern coast of Denmark – started to produce electricity in December 2003. This project alone can generate enough electricity for 145,000 homes.



For Europe overall including manufacture, installation and maintenance, the number of people employed in the European industry has increased from 25,000 in 1998 to more than 72,000 by 2002.



Offshore developments

Whilst land-based wind farms will continue to provide the core contribution to ongoing development, the new frontier for wind energy is offshore. Locating wind farms in the sea has the dual advantage of offering higher and more predictable wind speeds whilst avoiding potential conflicts with other land uses. Against this, costs are currently higher than on land, with economies of scale needed to bring them down to a competitive level.

By the end of 2003 a total of almost 600 MW of offshore wind farms had been constructed around Europe in the coastal waters of Denmark, Sweden the Netherlands and the UK. Over the past two years individual projects have increased in size to more than 50 MW, with the largest development so far – the 166 MW Nysted wind farm off the southern coast of Denmark – starting to produce electricity in December 2003. This project alone can generate enough electricity for 145,000 homes.

EWEA's expectation is that by 2010 up to 10,000 MW of offshore wind capacity could be operating around European coasts.

In the longer term, a sea area of 150,000 square kilometres with a water depth of less than 35 metres could be available. This would provide enough power to satisfy all of Europe's electricity demand.

Repowering

The replacement of older and smaller wind turbines with new models of larger size and capacity is becoming an increasingly common feature of the European wind power market. This is especially the case in countries such as Denmark and Germany where development has taken place over a relatively long period. "Repowering" also enables better use of limited land space. In Denmark, a successful re-powering scheme had a substantial effect on market development during 2002. In Germany it is anticipated that re-powering of wind farms, both on land and offshore, will account for the majority of market development in the period from 2025 onwards.





In Denmark, for example, the number of people employed both directly and indirectly in wind turbine manufacture increased from about 2,900 in 1991 to 21,000 by 2002. This was a higher share of employment than for either cement or steel production.



Manufacturing industry

In 2003, 80% of the wind turbines sold worldwide are by European companies, and Europeans dominate the global industry.

The largest manufacturers of complete wind turbines are based in the three busiest country markets – Denmark, Germany and Spain. Alongside these there are also hundreds of companies involved in the supply of components, such as blades, gear-boxes and generators, and businesses offering specialist services such as offshore construction vessels, wind speed monitoring, project development advice and financing expertise.

Most wind farms are financed and constructed by development companies operating separately from the manufacturers. Some of these are linked to large electricity suppliers which already have a port-

folio of generating capacity, others are independent companies specialising in renewable energy. In Germany, for example, the pattern of development has often been through individual projects financed from a fund in which a number of private investors take out shares. In Spain, by contrast, a single financing arranged by a leading electricity company in 2001 was for more than 1,000 MW of capacity.

Major structural changes have taken place in the industry in recent years, bringing in new companies. The increased size of wind farms, growth of business at a rate of approximately 30% per annum, improved technology and improved turbine availability have all allowed the wind energy business to attract players in the conventional power and energy industry, with entrants such as Shell, General Electric and Siemens.



Employment

Employment in the European wind energy sector has been growing rapidly. In Denmark, for example, the number of people employed both directly and indirectly in wind turbine manufacture increased from about 2,900 in 1991 to 21,000 by 2002. This was a higher share of employment than for either cement or steel production.

In Germany last year, the wind industry turnover was €4.2 billion and resulted in the employment of 45,000 people.

It is estimated that in Europe roughly 12 people are employed in the manufacture and installation of wind turbines for every MW of capacity installed (with 1MW valued at c. €1 million). This figure is higher if global employment impact is taken into

account, and there is a slight O & M employment increase.

For Europe overall including manufacture, installation and maintenance, the number of people employed in the European industry has increased from 25,000 in 1998 to more than 72,000 by 2002. This figure is higher as it does not include jobs associated with exports and construction of wind farms outside the EU. Worldwide, the number of people employed in the industry is estimated to be 90-100,000.

Looking forward, following the projections from the EWEA scenario “Wind Force 12”, employment in Europe could reach almost 200,000 by 2020, with double that number for global employment.





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European policy framework

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- The share of renewable energy in the EU’s Communication from the Commission to the Council and the European Parliament, Brussels 26.5.2004

The 2001 EU Directive on the promotion of electricity from renewable energy sources set indicative targets for the level of electricity to be achieved from renewables in each member state by 2010. The overall Community target is to increase renewables’ share of electricity from 14% in 1997 to 21% in 2010.

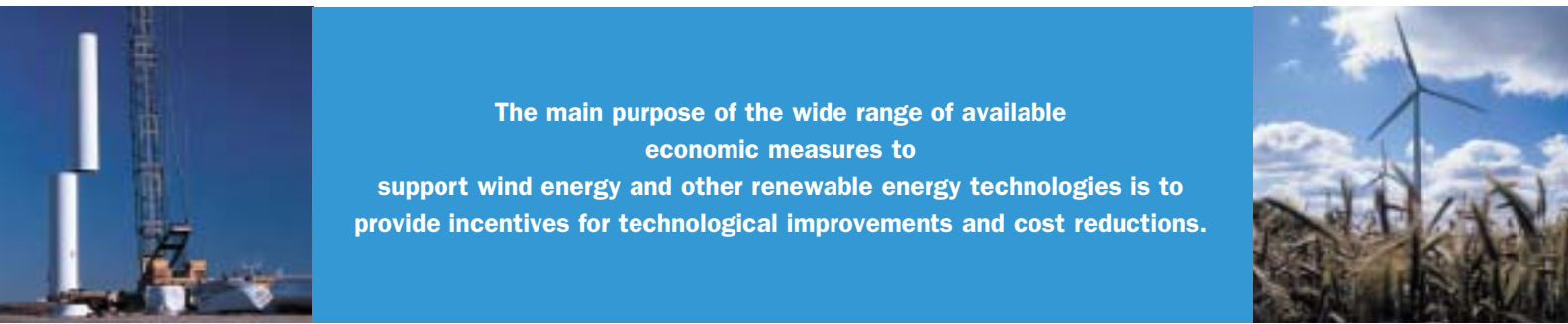
Overall, the Renewables Directive provides crucial assurance that the EU is determined to progress

the development and integration of renewable energy technologies. It sends a powerful signal to the industry of long-term political commitment at a European level which, in return, reduces investment risks and thereby the cost to society of developing and integrating renewable energy sources.

Since the parallel liberalisation of the EU’s electricity market will not create a level playing field overnight, the Directive ensures that short-term distortions do not undermine the possibility of developing those renewable energy technologies that will facilitate a future European energy supply that is cheap, clean and independent of fluctuating oil and gas prices.

Together with good planning procedures and fair conditions for accessing the electricity grid, the financial framework for wind power investments is one of the main ingredients of successful market development.





The main purpose of the wide range of available economic measures to support wind energy and other renewable energy technologies is to provide incentives for technological improvements and cost reductions.



Market incentives

Until external costs are fully integrated into conventional energy economics, some form of market incentive or support is required to encourage the development of renewable sources, including wind power. Whilst conventional power production technologies such as coal and nuclear continue to benefit from state aid, the cost to society of introducing new cleaner technologies into the market will continue to be artificially high.

An effective way of “internalising” external costs is through harmonised energy taxes which reflect the actual environmental impact of each technology. In the absence of such a method of levelling the playing field, a more equitable electricity market can be encouraged by market incentives for electricity generated from renewable energy sources.



Support mechanisms

There are two main types of incentive currently in operation in Europe - **fixed price systems** and **fixed quantity systems** – as well as a range of other measures used to encourage investment in renewable technologies. These include capital grants towards the initial cost of projects, tax concessions for investors, and “green energy” marketing schemes through which consumers voluntarily pay an extra amount on their electricity bill in order to be supplied with power from a renewable generator.

Since the early days of wind power development there has been a shift away from the use of capital investment payments on the basis that they encourage construction of plant but not necessarily its efficient operation. This was the case with some of the initial wind turbines erected in India, for instance. However, there can still be a useful place for investment subsidies coupled with other market incentives; in the UK, for example, capital grants have been offered to the first round of offshore wind farms (to reflect specific additional costs) alongside their eligibility for the Renewables Obligation, a fixed quantity support system.

Fixed price systems and renewables quotas are both ways of creating a protected market, separate from the open electricity market where electricity from new renewable energy sources would have difficulty competing with existing, already depreciated nuclear and fossil based power plants. They are also ways of offsetting (fully or partly) the competitive disadvantage arising from markets’ neglect of the environmental effects of conventional energy production.

The main purpose of the wide range of available economic measures to support wind energy and other renewable energy technologies is to provide incentives for technological improvements and cost reductions. The aim is to ensure the future availability of cheap, clean technologies as a competitive alternative to conventional power sources. It is less important whether markets are controlled through prices or through quantities. What matters is that control is achieved in a rational and effective manner.

The main difference between quota-based systems and price-based systems is that the former introduces competition between the electricity produc-



“More installations exploiting wind power can help to plug the growing gap in European electricity supply and at the same time dovetail with the Lisbon Strategy providing the EU with high-tech world-class technology”

–Introduction to Wind Energy The Facts, DGTREN, European Commission, May 2004



ers - the wind turbine operators. Competition between turbine manufacturers, which is crucial in order to bring down production costs, is present regardless of whether government dictates prices or quantities.

- **Fixed price systems**

Operators of a renewable generation project are paid a fixed price for every unit of output, with the extra cost borne by taxpayers or all electricity consumers. In Germany, for example, the additional cost of the “feed-in tariff” introduced under the Renewable Energy Law is approximately €1 per month on the average household electricity bill.

Fixed price systems have been highly effective at attracting wind energy investment in Denmark, Spain and Germany. Other countries with such systems in place are Austria, France, Greece, Luxembourg, the Netherlands and Portugal. Greece and France are both examples, however, of where development has been slower than expected

because of difficulties with grid connection agreements and the planning process.

- **Fixed quantity systems**

Also known as “renewables quota” systems, fixed quantity systems involve a decision on behalf of national governments about the level of renewable electricity to be achieved over a certain period, while market forces are left to establish the price. Under tendering versions of this system, as in Ireland, competitive bidding occurs for a limited number of power purchase contracts. Under the green certificate model, tradable certificates are issued to reflect the additional cost of renewable electricity produced to meet the agreed quota.

Tradable green certificate systems are in operation in the UK, Belgium, Sweden and Italy. These are all at a relatively early stage of market development, and using these systems to provide financeable long term power purchase contracts remains a challenge.

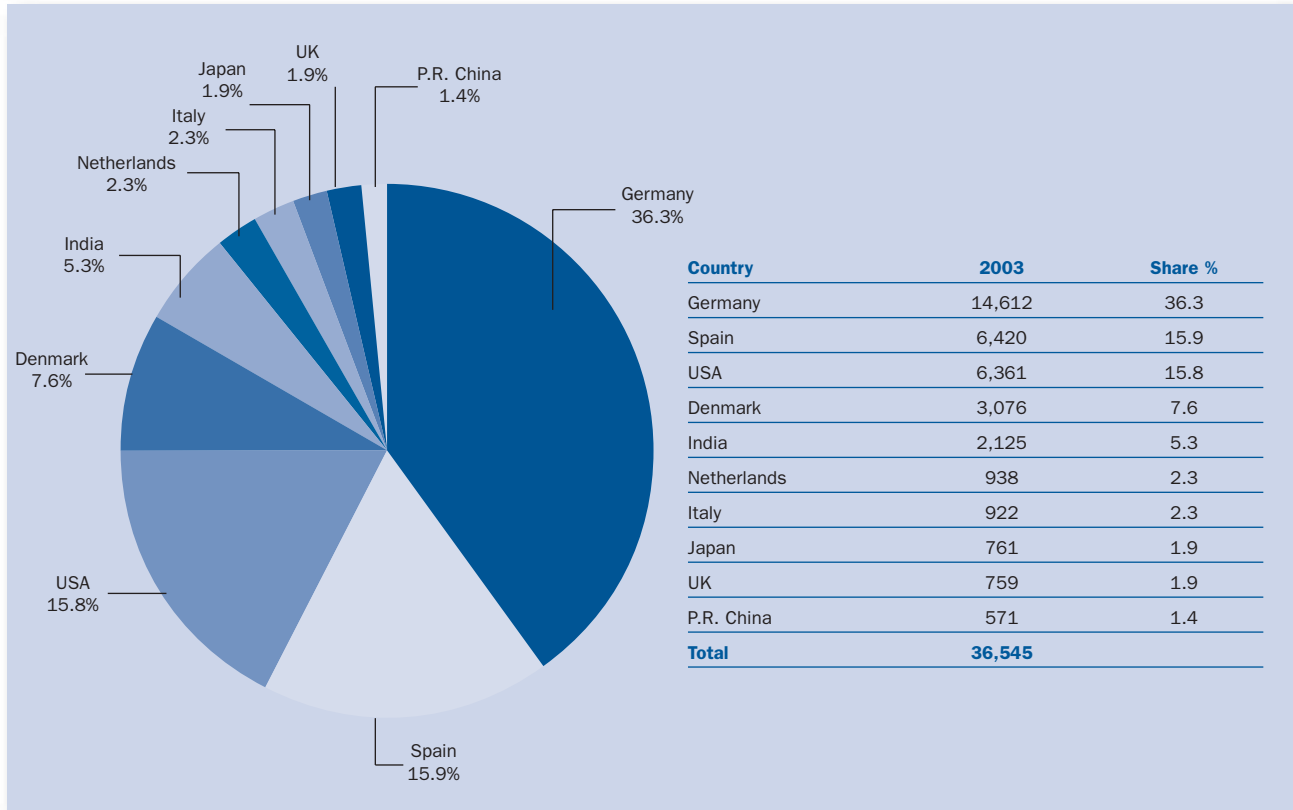


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Top 10 Cumulative Global Market Shares in 2002 (MW)



Source: BTM Consult ApS - March 2004

Direct and Indirect Employment in Danish Turbine Manufacture



Source: Danish Wind Industry Association (2002).

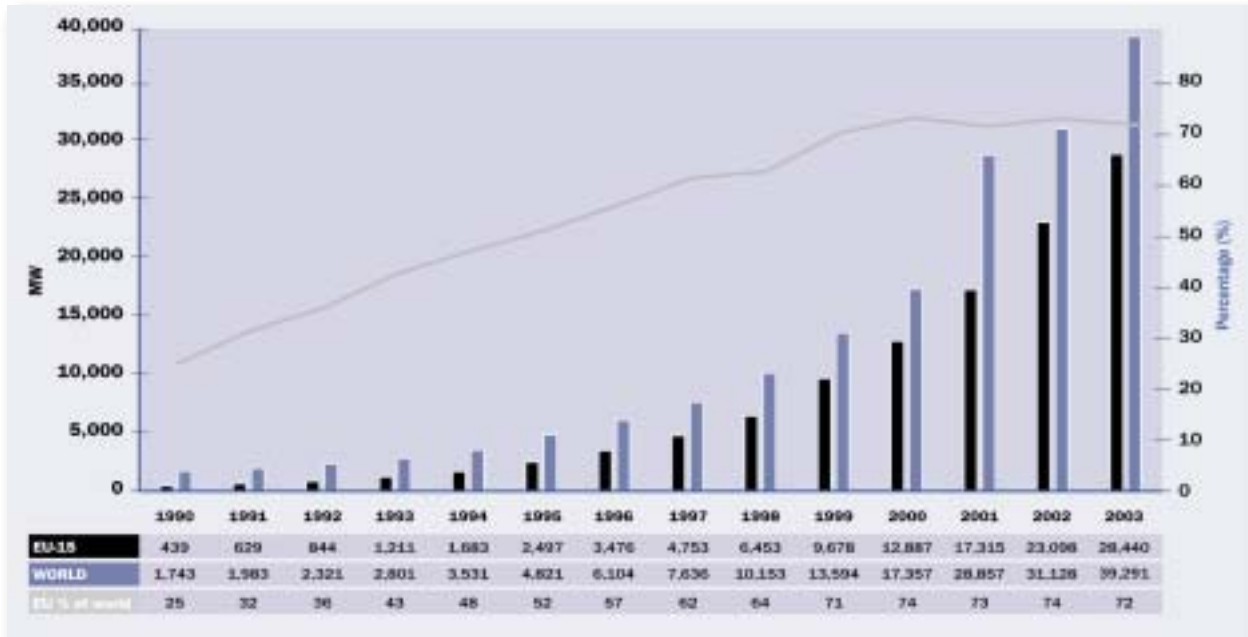




The overall Community target is to increase renewables' share of electricity from 14% in 1997 to 21% in 2010.



EU-15 and Global Cumulative Installed Wind Capacities (MW)



EU Member States' Offshore Wind Energy Plans and Targets

Country	Plan/Target	Year	Notes
United Kingdom	8.7 GW	—	Capacity expected from exploration licences granted
France	0.5 GW	2007	
Denmark	4.5 GW	2030	1997 target
Germany	25 GW	2030	
Ireland	2 GW	—	Capacity expected from exploration licences granted
Netherlands	6 GW	2020	
Sweden	3.3 GW	2014-2019	
Belgium	2 GW	2012	
Total	Up to 52 GW		

Source: Backgrounds paper Offshore Policy Workshop

Total Direct and Indirect Employment Related to WT Manufacture in Europe for 1998-2002

Year	Employment in WT Manufacturing (for Home Market)	Employment in WT Installation	Employment in WT Maintenance	Total Employment
1998	16725	7400	950	25,075
2002	47625	21150	3500	72,275
Growth 1998-2002	185%	185%	268%	188%

Source: Own calculations based on installation of WTs in Europe and Eurostat (2000).





About EWEA

EWEA is the voice of the wind industry - promoting the best interest of the sector in Europe and worldwide.

EWEA members include manufacturers covering 98% of the global wind power market, as well as component suppliers, research institutes, national wind and renewables associations, developers, electricity providers, finance and insurance companies and consultants. The combined strength of more than 200 members from over 40 countries makes EWEA the world's largest renewable energy association.

Located in Brussels, close to key EU institutions and players, the EWEA Secretariat co-ordinate international policy, communications, research and analysis. The first stop for external enquiries about wind power from around the world, EWEA manages European programmes, hosts events and supports the needs of its members.

For further information and details of membership:

www.ewea.org



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More detailed information than this fact sheet can be found in the full version of Wind Energy the Facts