

Offshore Wind, the North Sea and Climate Protection.

Press Briefing by Greenpeace International, November 2000

North Sea Offshore Wind: A Power-House for Europe is a report by the Wind Energy Institute of Germany (DEWI), commissioned by Greenpeace. The report provides an insight into the massive offshore wind resources that are ready for exploitation with today's technology, economics and expertise. It also addresses fundamental questions concerning development of this key sector with minimum impact on the local environment. This briefing outlines the major contribution offshore wind can make to reducing greenhouse gas pollution which threatens to disrupt world weather patterns causing social and economic dislocation on an unprecedented scale.

Summary

1. The North Sea Wind Resource

The offshore wind resource that can be harnessed by the 5 North Sea countries covered in the DEWI report - Germany, UK, Netherlands, Belgium and Denmark - is more than **three times** their total combined electricity consumption.

Just 1% of the offshore potential of the 5 North Sea countries identified would supply the energy demand of 6.4 million homes¹ & allow the closure of 5 conventional power stations²!

2. Technology and Economics

The wind technology is now of sufficient size, reliability and efficiency to make the step offshore. Several manufacturers already produce multi-megawatt wind turbines designed for offshore conditions – a 2MW machine produces enough electricity for 2,000 homes!

In the North Sea region the wind resource is especially high, with up to 40% more energy available than for coastal onshore sites. Turbine life increases offshore due to less turbulence than on land. Together these effects can balance the higher costs of installation offshore.³

3. Employment Creation

If each year 1% of the offshore wind potential of the 5 North Sea countries identified were to be utilised it would sustain approximately 160,000 jobs⁴.

The DEWI report shows that wind industry has become a major employer. For instance Germany already employs 10,000 people making wind turbines, and another 20,000 are employed in ancillary industries. With offshore wind energy offshore engineering companies will also be a key player.

4. Environment

The offshore resource of these 5 North Sea countries can deliver real climate protection. If 1% a year of their offshore resources were unlocked and used to replace coal fired generation, by 2012 offshore wind would be avoiding the emission of 186 million tonnes of CO₂ per year. This is equal to 10.3% of their current CO₂ emission rates⁵ by 2012, the end of the Kyoto Protocol 1st commitment period (the overall EU target is an 8% reduction)

DEWI conclude that offshore wind energy can be developed in a way that is environmentally sound. Covering possible impacts on birds, marine mammals, fish and smaller marine organisms, the study lays out detailed criteria for Environmental Impact Assessment (EIA) that would ensure proper protection of the local environment as well as deliver global climate protection.

¹ Based on 1933 TWh/a total offshore technical potential for UK, Germany, Netherlands, Belgium and Denmark and 3000 kWh/a average consumption per household.

² Based on 750MW installed capacity of each plant, running at 60% capacity factor.

³ www.windpower.dk

⁴ Based on 1933 TWh/a total offshore technical potential for UK, Germany, Netherlands, Belgium and Denmark, with ~30% capacity factor & 22 job years created per MW wind installed (Wind Force 10, 1999)

⁵ Installation of 1% over 12 years (12%) of technical potential 1933TWh (Matthies et al, quoted in DEWI report), avoiding 800 tonnes CO₂ per GWh from coal plant (Wind Force 10, BTM consult, 1999). Gives 186 million tonnes CO₂ avoided per year. Total CO₂ emissions of 5 countries is 1808 million tonnes per year in 1999 (IEA Key World Energy Stats). Therefore 10.3% of current emissions are avoided.

Introduction

For millennia, the North Sea has been a seaway connecting ancient civilisations. It has been a rich source of food and more recently it has become an important source of energy. Every year, hundreds of millions of tonnes of fossil fuel are produced from 400 oil and gas platforms. These fuels release large amounts of the greenhouse gas carbon dioxide. As a result of these and other greenhouse gas emissions, the earth is getting warmer. Record temperatures, catastrophic floods and forest fires across the world are real life indicators of a nearing climatic disaster. Alternatives to fossil fuels must be found

Nuclear energy provides no solution to the climate problem. The nuclear power industry is polluting European seas by pumping radioactive waste from reprocessing plants at Sellafield and La Hague. There is still no final disposal sites adequate for the highly radioactive waste and the industry has been plagued by its poor safety record. Furthermore, its by-product plutonium can be made into weapons, making nuclear expansion a threat to world peace.

Meanwhile, the North Sea holds a vast, but unseen, energy supply that is clean, safe and sustainable. If used wisely, offshore wind power is one of nature's answers to climate change, right on our doorstep.

Why go offshore?

1. The wind blows harder.
2. The technology and economics are ready.
3. Offshore wind parks will be larger, simpler and subject to fewer land use constraints.
4. Offshore wind is a sustainable alternative for today's North Sea oil and gas industry.

The Resource

The North Sea has a fearsome reputation for its weather. Now, the energy that drives that weather can finally be put to use. With today's wind turbine technology the resource available to North Sea countries hugely exceeds their combined electricity demand.

To install wind turbines on the seabed, the DEWI report identifies that sites of up to 50m depth, within 70km of land are suitable with today's technology. This opens up a vast area in the North Sea from which to select wind park sites

The table below shows that the total offshore energy available is more than triple the total power consumption of these 5 countries. The DEWI report indicates that these estimates may soon increase dramatically as new floating structures become available. Unlocking just a fraction of this will have a dramatic effect on CO₂ emissions.

	Max. offshore potential	Annual consumption	Rel. contribution to national consumption
	TWh/a	TWh/a	%
UK	986	321	307
Belgium	24	63.2	38
The Netherlands	136	75.5	180
Germany	237	431.5	55
Denmark	550	32.2	1708
Total	1933	605	320

Table 1: Offshore potential relative to national electricity consumption (Matthies, et. al., 1995)

Turbine Technology

The wind energy industry today is the fastest growing energy industry in the world and in terms of delivered price of power can now compete with coal, nuclear and oil fired power plants. Machines have sizes that range up to 2.5 MW rated power. That means one machine can supply 2500 households a year! Most of the current designs have 3 bladed rotors with diameters of 70 to 80 meters, on towers up to 100 meters high.

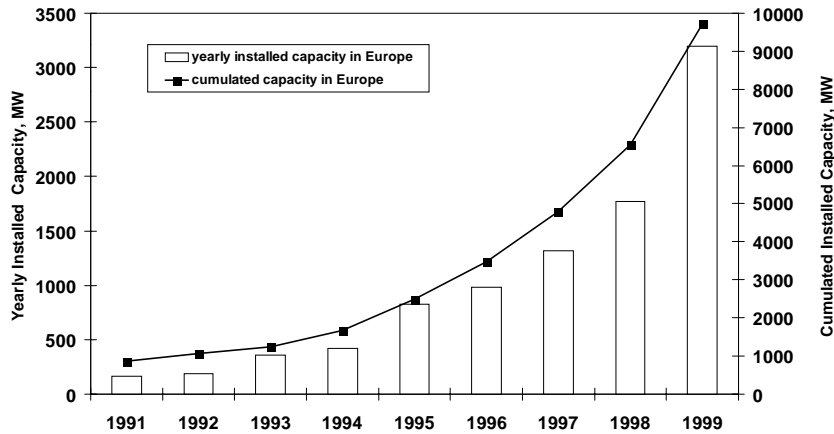


Figure 1: The explosive growth of European wind power.

Offshore tower heights will be lower than on land due to a different wind speed profile. However, offshore wind turbines need stronger support structures. In shallow waters these can be a gravity-based foundations of concrete. Monopile and tripod bases driven into the seafloor are suitable for differing seabed conditions. Floating support structures are now being considered for deep-water locations. Offshore wind generated electricity is brought to land using submarine cables.

Offshore Economics

Offshore winds not only provide 40% more energy but they are also less turbulent which substantially increases the lifetime of the turbines. Together these effects will balance the higher costs of installing offshore⁶ - up to 60% depending on the distance from shore.

Greenpeace believes that as part of licensing sections of the sea-bed for offshore wind, the cost of grid extension must be covered by government infrastructure investment or by the transmission operator as part of its own transition to sustainability. Conventional power plants have enjoyed this arrangement for years and so should renewable energy plants. With this cost removed offshore wind will be an aggressively competitive source of electricity!

Employment and Industry

Research has shown that for every megawatt of wind power installed, 22 job-years are created⁷.

If the offshore wind potential of the five North Sea countries (1933TWh/yr) identified in the DEWI report were to be unlocked at 1% per year this would create 160,000 jobs.

If the offshore wind potential of the European Union (3028TWh/yr)⁸ were to be unlocked at 1% per year this would create 250,000 jobs!

⁶ www.windpower.dk

⁷ Wind Force 10, BTM Consult, 1999, Commissioned by Greenpeace International.

⁸ Garrad Hassan et al, 1995. Commissioned by European Union Joule Programme.



Figure 2: In countries that have embraced renewable energy, wind power is already a huge employer and for every direct job in a wind turbine company there are another two indirect jobs in supply or service companies, as shown here for Germany.

Going offshore also requires the specialist skills in civil engineering, mechanical engineering and installation expertise which have been built up over the past 30 years in the North Sea. Offshore wind power could be the perfect next step for today's offshore oil and gas workers.

The Environment

In assessing the environmental impact of an energy development, it is necessary to take a global as well as a local perspective. What does the installation do, and how much more damaging is the alternative? Obviously wind installations avoid CO₂ emissions, acid rain, radio-toxic emissions into the air and sea and so on, all of which must be considered in a comprehensive Environmental Impact Assessment (EIA) or Strategic EIA as they are sometime known.

The overriding conclusion of the DEWI institute research is that offshore wind energy and the local environment can develop in harmony. If sites are chosen wisely and if wind parks are installed and run sensitively then their impact on the local environment will be very small.

The climate protection afforded by offshore wind is beyond question. If 1% a year their offshore resource were unlocked and used to replace coal fired generation, by 2012⁹ the emission of 186 million tonnes of CO₂ per year could be avoided. This is equal to 10.3% of the current CO₂ emission rates¹⁰ of these five countries.

At a local level the DEWI institute has identified and analysed the environmental impacts that must be considered. The DEWI report specifies how EIAs should be constructed to consider all of these impacts, including birds, sea mammals (like whales and dolphins), fish, seafloor flora and fauna and water quality.

The DEWI report also reveals that there is a severe lack of information in many areas of marine biology for the North Sea. If properly addressed by a collaborative government funded research program the efficiency of sound wind development will be much enhanced.

⁹ The end of the Kyoto Protocol 1st commitment period.

¹⁰ Installation of 1% over 12 years (12%) of technical potential 1933TWh (Matthies et al, quoted in DEWI report), avoiding 800 tonnes CO₂ per GWh from coal plant (Wind Force 10, BTM consult, 1999). Gives 186 million tonnes CO₂ avoided per year. Total CO₂ emissions of 5 countries is 1808 million tonnes per year in 1999 (IEA Key World Energy Stats). Avoiding 10.3% of current emissions.

Social Impacts

Some people think wind turbines look great, whilst others dislike them. As we move towards a sustainable energy world it is important that there is broad acceptance and acknowledgement of the need for devices like wind turbines that can supply electricity for our lives in an environmentally sustainable manner. Wind turbines are visual testament to man's ability to work with nature, not against it.

Conclusion

Greenpeace believes that offshore wind energy represents a powerful tool in humanity's arsenal to fight climate change. Protecting the global climate can be achieved without compromise to the local environment and without compromise to people's well-being.

Making it happen.

Greenpeace has drawn up a ten- point plan to get offshore wind energy moving in a way that is swift and at the same time environmentally friendly. Offshore wind energy faces major political and institutional barriers. It will not happen without the political will to clear away the obstacles and assist the offshore industry in making the transition to sustainable energy.

1. The governments of the North Sea region must halt the issuing of new oil and gas licensing in their territorial or economic exclusion waters and immediately commence licensing sea-bed for development of ecologically sound offshore wind parks.
2. The governments of the North Sea region must undertake to extend the national grids to the newly licensed fields. Such costs may best be paid for by government infrastructure investment or be absorbed by the electricity transmission operators as part of a transition to a sustainable energy infrastructure.
3. The governments of the North Sea region must undertake to develop programmes or include offshore wind energy in renewable promotion programmes to encourage investment in and take-up of renewable electricity. Such programs must be assessed on a regular basis for their performance in leveraging investment in the new offshore wind sector.
4. Henceforth all offshore energy installations in the North Sea must be subject to a global as well as a local Environmental Impact Assessment, to acknowledge the total impact of the activity relative to available conventional alternatives (Strategic EIA) – including the decrease or increase in greenhouse gas emissions
5. In parallel to the development of the industry, a North Sea biological marine research programme must be undertaken by the governments of the region, aimed at acquiring reliable data that can be used to assist the sound growth of offshore wind parks.
6. In order to accelerate the implementation of new wind capacity in the North Sea, wind measurement programmes must be undertaken by each of the North Sea governments in their waters.
7. The governments of the North Sea region must undertake to collaborate on offshore wind development so as to optimise infrastructure development (including cable laying) and to oversee the cumulative impacts of multiple developments.
8. The governments of the North Sea region must undertake an economic programme of transition to offshore renewable technology for the existing offshore support industries, including assistance for the retraining of the offshore workforce.
9. Each government in the North Sea region must make renewable energy and energy efficiency the basis of its greenhouse gas mitigation strategy and reject the use of unproven or low cost loopholes within the Kyoto Protocol.
10. The governments of the North Sea region must undertake to promote renewable technology at a regional level, such as the 5th North Sea Conference, at a European level and at an international level such as the UNFCCC Kyoto Protocol negotiations.

Greenpeace believes that the 5th North Sea Conference in March 2002 provides an excellent forum to establish an agreement for collaboration and co-ordination of the transition from fossil fuels to sustainable energy production in the region.

For more information, please contact the North Sea Offshore Wind Team.

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