

## Wind Energy on the Rise in Europe

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Environmental concerns about CO<sub>2</sub> emissions, as well as technological advances in the use of renewable energy sources, are driving forces of a growing interest in wind energy in Europe. Another impetus is provided by the regulatory framework that allows "green power" to gain a foothold in an energy market dominated by fossil fuels and nuclear power. Next to hydro energy, wind energy is the most developed alternative source of electricity. Forecasts indicate that about 10% of the total electricity consumption in Europe will be met by wind energy by the year 2020. In Denmark, wind turbines already cover 20% of the country's present electricity demand.

In Germany, the respective figure is only 2%, although Germany has the highest number of wind turbines of any European country. By the beginning of the year 2001, the total wind energy capacity installed in Germany reached almost 6,400 MW. This makes up 46% of the total capacity installed in the European Union. Germany's present Minister of the Environment, Jürgen Trittin, is aiming for a figure of 15,000 MW by the year 2010. As nuclear power is to be phased out and as climate damaging greenhouse gases have to be reduced, alternative sources of energy are being fostered. According to a study by Greenpeace, more than half of Germany's electricity consumption could be covered by offshore wind energy. Up to now, only coastal installations seem to be competitive. But although costs for offshore projects are much higher, they can harvest about 40% more energy than those on land, since winds are stronger and blow more regularly. The cost of wind energy amounts to 3–5 cents/kWh compared to 3 cents/kWh for gas-fired electricity. The German government presently supports the production of wind power.

In addition, special legislation has been passed in Germany to encourage a sustainable energy system. The reform of the legal framework regulating the energy sector was initiated by a European act liberalizing the

energy markets so far dominated by monopoly structures. This act forced the member states of the European Union to take steps toward deregulation. Electricity generation, grid operation and commerce were divided into separate operational entities and competitors were allowed access to the grid. Against this background further legislation aiming to increase the share of renewable energy has been adopted. It grants all producers of electricity from renewable sources the right to feed the energy generated into the grid at any place and at any time, while guaranteeing a minimum price. The law had been contested before the European Court for being a covert subsidy and thus a barrier to free trade in the European Union. However, the Court recently ruled otherwise, paving the way for investors who had until then been reluctant to make a commitment. This has already led to a rise in wind power generation of more than 50% within the first three months of 2001, compared to last year's total production. More than 90% of the installations are operated by individuals, private cooperatives, and developers. It is not wind energy alone that profits from this legislation. The increase in the production of electricity from solar photovoltaic cells has tripled. And on several farms, plants which run on bio gas have been installed.

An analysis examining wind conditions identified more than 45,000 potential sites for wind plants in Germany. However, although there are benefits to using wind energy rather than burning fossil fuels, there are also some drawbacks that will curb this theoretical growth in installations. The efficiency of some of the 200-foot-high windmills has been questioned. It has also been pointed out that in a densely populated area, noise pollution poses a problem, and people who live within the range of the shadow of the moving rotor blades complain about the changes in light. The rotor blades have also been identified as a permanent risk to birds. Windmills may not only scare them away, but the blades could simply kill them. Recently, the construction of a wind park on sand banks in the North Sea was postponed for environmental reasons. There seems to be evidence that the coastal ecosystem, a haven to migrant birds

that stop to forage there during low tide, may be severely damaged. Certain species that pass the winter in these areas will be disturbed. Oil and chemical pollution caused by a possible increase in averages related to wind parks would pose yet another threat to marine life.

Nonetheless, there are ambitious plans for expanding the number of wind parks in the North Sea and the Baltic Sea. More than 30 applications have been filed with the pertinent agencies of the states (Länder) bordering the German coast line who are in charge of a 12 sea mile-zone offshore. Another fifteen requests concerning areas beyond this zone are being examined by the federal agency for navigation and hydrography. The planned capacities of the latter applications, comprising 2000 turbines, amount to about 9,000 MW, a figure approximately equivalent to four nuclear power plants. In order to have a chance of being granted a permit, sites have to be located outside fishing grounds, sea routes, military zones, nature reserves, and tidelands. The construction of offshore turbines also presents technical challenges. They have to withstand storms, ice floes and high waves. Electronics have to be resistant to salt-water, and maintenance has to be ensured.

Therefore, another approach to using wind energy concentrates on small, decentralized units (200 W to 5 kW) that do not have the disadvantages of large installations. These small-scale systems address the needs of homeowners, who are encouraged to put up their own windmill to run water pumps, etc. A concept based on decentralized generation of electricity may also be the way to go in developing countries, where energy demands are only starting to increase.

Wind energy has also developed into an important economic factor. In Germany, at least 30,000 people make a living in this emerging sector, which had a turnover of almost \$2 billion last year (2000). In Denmark, the wind energy industry is the third largest exporter, having exceeded even the traditional fishing industry. The job-creating effect in this field is estimated to be 10 times higher than in the nuclear power sector. Wind farms may also provide eco-

conomic options for rural areas with otherwise decreasing job opportunities.

To augment their effectiveness, champions of wind energy have joined forces and formed the German Wind Energy Association, a non-profit organization comprising more than 9,200 individual and corporate members representing turbine operators, planners, manufacturers, developers, and simply individuals who support alternative energy sources. Their long term goal is to replace the existing centralized power generation structures by promoting an energy policy based on the decentralized use of renewable energies while eliminating or reducing the use of nuclear and fossil fuels.

On an international level, wind associations founded the World Wind Energy As-

sociation, WWEA ([www.wwindea.org](http://www.wwindea.org)), in July of this year (2001) in Copenhagen. One of the goals of the Brussels-based association is to support the foundation of national and regional wind energy associations and encourage national governments to create political frameworks in favor of a fast and sustainable development of renewable energies. On a more hands-on level, the WWEA provides a platform for exchange on experiences gained from successful implementation strategies and tries to involve local and rural communities. The association comprises members from Europe, Australia, Asia, Africa, and South America; a North American organization, however, has not yet joined. Presently, the WWEA is promoting the first World Wind Energy Conference and Exhibition, which

is to take place in Berlin from July 4–8, 2002. So far, the event is being internationally supported by more than 40 wind energy organizations and associations. Its aim is to disseminate information on wind energy world wide, as well as to encourage its actual use. Technical, political, economical, and educational issues will be on the agenda, and there will be a special focus on the use of wind energy in developing countries. The conference should provide ample opportunity for networking.

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