

Offshore Wind Energy

Eight countries have wind turbines installed offshore providing clean, renewable electricity: Denmark, Belgium, Sweden, Finland, Germany, the United Kingdom, the Netherlands, and Ireland. Additional countries with offshore projects planned by 2015 include France, Italy, Norway, Poland and Spain.

No offshore wind projects have been built in the U.S., although a number of projects are moving through the development process. And in May 2008, the U.S. Department of Energy's report on a 20% wind energy scenario found offshore wind capacity could be 54 GW of the 300 GW envisioned.

Offshore wind energy brings all of the positive economic and environmental benefits of onshore development, as well as some unique characteristics.

**FOR MORE INFORMATION,
PLEASE CONTACT:**

Laurie Jodziewicz
Manager of Siting Policy

ljodziewicz@awea.org
202-383-2516

Access to resource

- Offshore wind turbines generate more power than on-shore turbines because wind speeds are generally higher and the wind is steadier offshore.
- Wind tends to be less turbulent offshore, reducing wear on turbines.
- Larger turbines, which can capture more wind energy, are feasible offshore because transportation is easier via water.
- Allows shorter transmission lines to load centers and avoids some congestion bottlenecks by transmitting power from east to west.
- Offshore wind turbines can generate energy during times of high electricity use because of the "sea breeze effect."

Relationship to customer demand

- Offshore wind farms can generate energy near population centers.
- Offshore power production will alleviate some transmission bottlenecks by transmitting power in closer proximity to demand.

Economic opportunities

- Offshore wind development could spur assembly and transport activities in coastal cities.
- Offshore wind power provides green jobs and contributes to a clean technology economy.

Best option for large-scale renewable energy development in some places

- Some states, especially in the Northeast, enjoy a large and strong offshore wind resource, with very limited opportunities to develop on land.
- Public Policy Benefits – wind energy provides a great way for states to reach their required Renewable Portfolio Standards (RPS).

Impacts are limited

- Compatible with existing uses – an offshore wind park will promote recreational fishing, as it can continue among the turbines.
- Foundations can create artificial reefs.
- Extensive studies at European sites have revealed no significant bird impacts and that, for the most part, birds avoid wind farms.

Demonstrated effectiveness

- 18 years experience – since 1991 - with offshore wind projects in Europe.
- 33 projects operating in 8 countries - more under development.
- 1471 MW of offshore wind turbines in Europe generate electricity 70 – 90% of the time.

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What are the primary challenges for off-shore wind?

Offshore wind power is still in its infancy, compared to land-based wind: out of the more than 120,800 MW of wind generating capacity in operation worldwide at the end of 2008, about 1471 MW of those were offshore, all in Europe. Offshore wind projects must strike a viable balance between technological and economic challenges. Offshore technology has had to adapt to operate successfully in a more challenging environment. Tough weather conditions, which can limit access for routine maintenance, and the saline environment create the need for more robust turbine parts. This in turn means higher costs, which are not always offset by the higher productivity due to the higher offshore winds. Continued operational R&D, and policy support that recognizes the value added from renewable energy projects like offshore and onshore wind, will go a long way toward resolving these challenges.

What new/modified technologies can address them?

A range of technologies have been developed and continue to be refined in order to maximize productivity of offshore wind turbines. Wind turbines, and in particular offshore wind turbines, are growing larger, and this means that both materials and design need to accompany the ramp-up in scale (for example, offshore anchoring systems for ever-larger and heavier turbines; composite materials for blades that are getting longer but also need to be light enough, flexible, and durable, gearboxes that operate successfully in the adverse offshore conditions, etc.).

What are the “lessons learned” from elsewhere?

For offshore wind, as for any other technology that is competing in the energy marketplace, there is a “continuing education” process on the technical and R&D front. That continuing education is occurring thanks to the growing number of projects in operation in Europe and, hopefully sometime soon, in the U.S. In addition, it is clear that “policy matters.” In the U.S., a supportive siting process for offshore wind projects and consistent federal support for renewable energy are key since they provide the certainty that is needed for companies to ramp up investments, including the large investments that are needed for offshore projects. The Minerals Management Service (MMS) of the U.S. Department of the Interior is still working on developing the rules for permitting offshore wind projects. MMS reports that the regulations should be complete in 2009, and the wind industry is looking forward to the successful completion of that process.

What is your outlook for offshore wind?

Offshore wind resources are not only vast, they are often located near to fast-growing demand centers since coastal areas are among the most heavily populated in the country. Offshore wind farms therefore offer something that is extremely valuable for our economy, environment, and energy security: a source of clean, domestic, inexhaustible energy with which to meet fast-growing electricity demand. Wind farms are also likely to be included in areas with large regional power markets that facilitate smooth and cost-effective integration of wind into the overall electric system.

At the same time, offshore wind farms still face a gauntlet of challenges, not least the fact that our policies and price signals do not fully recognize the full value of electricity that is generated with zero-emissions. This disconnect is a challenge for all renewable energy sources today. At a time when the country faces the twin challenges of fast-growing electricity demand and climate change, the nation still lacks a long-term renewable energy policy. Such a policy is urgently needed today to accelerate renewable energy development and meet the nation’s demand for clean energy.