Technology Monitor

Wind power

Blowing at sea

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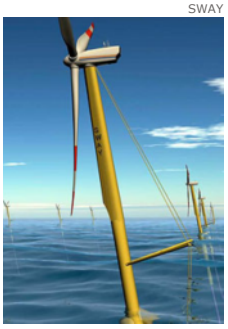
Turbines that can be used out in the deep blue sea

SWAY



WINDS sweeping across New England, in the north-east of the United States, blow at an average of about 4 metres per second (m/s). But a few hundred metres offshore they blow more than twice as fast. This increase in speed is found offshore in much of the world. But although engineers know how to build turbines to turn offshore wind into electricity, they can do that only in waters up to about 40 metres deep. Wind-turbine towers are pounded deep into the seabed, or anchored in massive blocks of sunken concrete.

Now wind power could be taken into deeper waters. Building offshore wind farms is expensive: a turbine can cost at least 50% more than one built on land. But the stronger winds out at sea can generate more revenue: a wind of 10m/s can produce five times as much electricity as wind blowing half as fast, and this greatly favours building more offshore wind farms, says Walter Musial, a senior engineer at the National Wind Technology Centre, a government research lab in Boulder, Colorado. Yet just 300 to 400 offshore wind turbines have been built worldwide, most of them in British or Danish waters. None have been built in America. The main reason why there are so few is that people think they ruin the view and spoil the immediate offshore area.

Typical is a project known as Cape Wind, based on plans by Energy Management, an American company, to build 130 turbines 9.6km offshore in Nantucket Sound, Massachusetts. Although it is backed by a number of green groups, local opposition has been fierce. Jim Gordon, Energy Management's boss, says "visceral" local protests have delayed the project by at least three years and cost his company millions of dollars.

But what if the turbines could be put much farther out to sea? A growing number of experts say new technology now makes floating turbines feasible, which means they could be sited a long way from land. Devices known as "floaters" are already used to support more than two-thirds of the 4,000 or so oil and gas rigs in the Gulf of Mexico, says Paul Sclavounos, a marine engineer at the Massachusetts Institute of Technology. With finance from ConocoPhillips, Mr Sclavounos is developing a turbine floater for the windy North Sea. He says the engineering obstacles have, for the most part, been overcome. The big task left is to keep costs down.

Mr Sclavounos expects an industry making floating wind turbines to flourish in about five years. Many experts think it may take longer, but few doubt it will happen. Sites for more turbines on land can prove just as controversial, suitable locations for fixed-base shallow-water turbines are limited and a new generation of massive turbines need to be placed no closer than a couple every square kilometre.

SWAY, a company based in Bergen, Norway, is developing turbine floaters for installing in 150 metres of water. The firm, partly funded by Statoil, Norway's energy giant, estimates that each will cost about as much as a fixed-base turbine placed in 30 or 40 metres of water. Its design uses a hollow, buoyant cylinder that extends down from the tower for about 100 metres underwater. It is weighted at the bottom to keep the tower from heeling in heavy winds. The cylinder is anchored to gravel ballast on the sea floor. SWAY plans to float a full-scale prototype in 2010.

In December a company called Blue H Technologies, based in Oosterhout, Netherlands, placed a half-size prototype turbine about 20 km off the coast of southern Italy in water 108 metres deep. It uses a broad flotation framework known as a "tension-leg platform", which is similar to that used to float oil rigs. Construction of full-size floating turbines for the site has now begun. The company has had to convince Italy's naval-certification agency that a floating turbine could withstand a "100-year wave"—which in that part of the world amounts to a 9.7 metre wall of water. When it blows at sea, it can blow very hard.

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