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# A NEW TWIST FOR OFFSHORE WIND

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Energy: Floating wind-turbines are being developed that can be used at sea in deep water, and do not need to be permanently fixed in place

WINDS sweeping across New England, in the north-east of the United States, blow at an average of about four metres a 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 generate electricity from offshore wind--mounting them on towers pounded deep into the seabed, or anchored by massive blocks of sunken concrete--they can do so only in waters up to about 40 metres deep.

Now wind power could be taken into deeper waters. Building offshore wind farms is expensive: each turbine costs at least 50% more than one built on land. But the stronger winds out at sea can generate more electricity, and hence more revenue: wind blowing at 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 laboratory in Boulder, Colorado. Yet just 300-400 offshore wind turbines have been built worldwide, most of them in British or Danish waters. There are none in America. People think they ruin the view and harm the offshore environment.

Take, for instance, a project known as Cape Wind, based on plans by Energy Management, an American company, to build 130 turbines 10km (six
miles) offshore in Nantucket Sound, Massachusetts. Although it is backed by a number of green groups, local opposition (not least from the allegedly verdant Kennedy family) 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? Many experts say new technology now makes floating turbines feasible. These 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 funding from ConocoPhillips, Mr Sclavounos is developing a turbine floater for the windy North Sea. He expects an industry making floating wind-turbines to flourish in about five years. Others think it may take longer, but few doubt it will happen. Building turbines on land can be just as controversial, suitable locations for fixed-base shallow-water turbines are limited and a new generation of big turbines will need lots of
space: only a couple can be placed in each square kilometre.

SWAY, a company based in Bergen, Norway, is developing turbine floaters that can operate 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 to about 100 metres underwater. 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 in the Netherlands, placed a half-size prototype turbine about 20km off the coast of southern Italy in water 108 metres deep. It uses a flotation framework known as a "tension-leg platform", 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. That presents difficulties, but it also provides opportunities.