

'Amazing' turbine may be tested off Maine

Officials get a close look at a one-of-a-kind deep-water tower off Norway and line up UMaine for joint research.

By Matt Wickenheiser, Staff Writer
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Habib Dagher of the University of Maine, center, talks Friday about the technology of the Hywind deep-water offshore turbine with Gov. John Baldacci, wearing the hat, and others.

STAVANGER, Norway — The 102-foot catamaran bounced over the 6-foot North Sea waves, getting closer and closer to the speck on the horizon.

As the boat drew closer, the speck took shape, slowly becoming a vertical line, then a massive wind turbine – just over six miles out in the ocean, towering 20 stories above the choppy surface.

And it wasn't moving, wasn't bobbing in the waves, wasn't swaying. It was solid, as if it were sunk into the seabed – not floating in about 650 feet of water.

"It's just amazing to see – see how still it is?" said Habib Dagher, director of the Advanced Structures and Composites Center at the University of Maine. "Having come here today, seen the structure, reinforces even further that we've made the right decision to come here. We have a wonderful opportunity to leapfrog forward."

Norwegian energy giant StatoilHydro's turbine, the 2.3-megawatt Hywind, is the only one of its kind in the world: an offshore, deep-water, power-generating wind turbine.

Maine officials hope that they might see a similar test turbine in the Gulf of Maine in the next five years.

On Friday, the last day of a Maine trade mission, Dagher and Gov. John Baldacci signed a letter of intent with StatoilHydro, which built the turbine, to have the company and UMaine work together on research and development to determine whether a similar project might work in the Gulf of Maine.



The Hywind offshore turbine is seen on the horizon as the boat carrying visitors from Maine heads to shore under the Norwegian flag. The wind whipped up 6-foot waves on the trip.

"If we can start out slow and sure and do it thoroughly, it will move along expeditiously," Baldacci said.

If StatoilHydro and UMaine decide to continue after completing an initial feasibility study, there could be similar test turbines miles off the Maine coast, in state or federal waters, in the 2012-2014 time frame, said Sjur Bratland, asset manager for Hywind, the \$70 million deep-water turbine demonstration project.

If they prove successful – and numerous other market, regulatory and other conditions are met – a full offshore wind farm could be seen in the Gulf of Maine by 2016, with additional farms by 2020.

There are other offshore turbines, but they are in shallow water, anchored into the seabed. This one is tethered to three anchors that keep it in place. The tower shaft is about 525 feet long, with about 200 feet rising above the surface and the rest below, weighted with seawater and rocks for ballast that provides the needed stability.

StatoilHydro is exploring the deep-water technology because it has no shallow waters off Norway. As in Maine, the coastal waters get deep, fast. And the wind farther offshore is more constant, and stronger – a better quality for power generation.

But the floating technology was largely considered unfeasible not long ago.

"They didn't believe in us two, three years ago," Bratland said.

Representatives from U.S. Sen. Susan Collins' office were in Norway with the governor's group. Collins had arranged a prior meeting with Department of Energy Secretary Steven Chu, at which Dagher, Baldacci and others pitched the deep-water project.

Chu suggested getting an agreement to cooperate with StatoilHydro, Dagher said.

Collins has put a \$5 million earmark into next year's budget for the project, and UMaine has applied for Department of Energy grants as well.

In about four hours of meetings Friday morning, Maine officials talked about a vision for Maine that includes deep-water turbine farms to provide the state with tax revenue, economic development opportunities and lower electricity costs. StatoilHydro executives

talked about the Hywind project, and laid out challenges to the Maine-Norway collaboration.

Dagher cited Department of Energy studies that identify deep-water wind as the most abundant offshore wind. And, he said, 8.3 percent of the United States' deep-water winds are off the coast of Maine.

Power generated in Maine is close to the 55 million people in New England, New York, Pennsylvania and New Jersey. That's the region with the highest electricity rates in the continental U.S., Dagher noted.

In addition, UMaine's Advanced Structures and Composites Center is focusing on wind power technology. The university has 50 years of data on the Gulf of Maine, from tides to waves, commercial fishing hot spots to shipping lanes.

And there's a "unique ocean industry infrastructure," said Dagher, mentioning companies like Bath Iron Works and Cianbro Corp. As he talked about Cianbro, Dagher showed a slide of the floating oil rigs that the company built in Portland Harbor, and StatoilHydro executives exchanged impressed glances.

Overall, Maine officials envision developing \$20 billion worth of wind farms far offshore, creating as many as 15,000 jobs and generating 5 gigawatts of power, and \$7 billion worth of land-based wind farms generating 3 gigawatts of power.

During the trip, Baldacci has constantly referred to farm fields in northern Maine as possibly ideal places for land-based wind farms, helping farmers and providing electricity. Throughout Europe, wind turbines can be seen in farm fields.

Bratland talked about the Hywind project, which was conceived in 2001, fully designed in 2003 and tested with models in 2005. In May 2008, the company decided to fund the project.

This summer, the project was completed. The tower was towed in the water to the Amoy Fjord, traveling horizontally through the water like a big, long tube. Ballast was slowly added to one end, and the tube went vertical.

The tower was hauled out to the site, and floating cranes added the cell to the top, then the 138-ton turbine. Each blade on the turbine is about 130 feet long.

It's attached to the seabed by three tether lines, and a power cable runs to the mainland. Because the center of gravity is below the center of buoyancy, the turbine is stable in the water, unaffected by waves.

Bratland talked about lessons learned from StatoilHydro's experiences with Hywind. The first project worked because of full attention to detail, he said, with workers running simulations of the erection of the tower over and over until they were perfect.

"I will warn you, during the process you will probably believe we are the worst company ever," Bratland said. "But at the end, it will change."

Because a Maine project would be the first in the nation, the federal government would need to determine who signs off on the project, he said.

The groups will have to analyze information on shipping, fishing, lobstering and other uses, he said. The supply chain in Maine may become a real bottleneck, Bratland said, raising concerns that not enough companies have the skills to handle such a project.

Baldacci touted Maine companies' ability to tackle the job.

"These people perform, and are excited and interested in the possibility," Baldacci said.

Most importantly, the federal government will need to have some incentive in place so that an eventual wind farm off the coast is financially feasible for the company, said Alexandra Bech Gjordv, StatoilHydro's vice president for renewables.

European countries use a variety of methods to encourage renewable energy and take away some of the risk of investment, such as cap-and-floor agreements, feed-in tariffs, green certificates and others.

"We need to make sure there's an end in sight that has some commercial value for us," she said.

But she said she was "incredibly encouraged" by what she was hearing from the Maine officials.

"This is a fast track," she said.

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