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Plans for the world's biggest wind farm

By Erica Gies

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It is not the usual green suspect. But it hopes to build a 5-gigawatt, deep-water wind farm - the largest in the world, equal to the output from five nuclear plants.

"It" is the Ocean Energy Institute, a tiny research organization founded by Matthew Simmons. An energy investment banker who specializes in oil and gas, Simmons was an energy adviser to President George W. Bush. His main partner, George Hart, is a physicist who consults for the Pentagon on the Strategic Defense Initiative, where he uses supercomputers for the mathematical modeling of complex systems. He also co-invented a laser used for eye surgery and semiconductor manufacturing.

Simmons does not believe in climate change, but he believes in peak oil. His book, "Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy," presciently published in 2005, argued that the world was at or near peak oil production, which would limit supply and drive prices skyward.

The International Energy Agency appeared to support that thesis in a report released Nov. 12, saying that, even if demand remained flat, by 2030, the world would need to find new oil production equivalent to four Saudi Arabias, merely to offset oil field decline.

Simmons predicts resource wars if the world fails to change course; and he is particularly concerned with the future of Maine, where he has a home.

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"Understand how dire it is in the state of Maine," said Habib Dagher, an engineering professor at the University of Maine who specializes in composite materials and is working to develop advanced turbines. About 80 percent of Maine residents use oil to heat their homes, and the price of heating oil tracks that of crude. The average family uses about 1,000 gallons, or 3,785 liters a year, so if prices are \$4 a gallon, or \$1.06 a liter, that's about one-tenth of the average family's annual income.

Simmons, referring to the proposed wind farm, said, "If we don't do this, we're going to have to evacuate most of Maine."

The institute's founding mission was to study different forms of ocean energy. But Hart quickly realized that the Gulf of Maine has one of the best wind resources on the planet. The U.S. Department of Energy has rated it up to a Class 6 on a scale of 7.

Gale-force winds there in winter carry as much as eight times more energy than summer breezes. That means more power could be available precisely at periods of greatest demand. "The resource matches the problem the state of Maine faces," Dagher said.

The target generating capacity of 5 gigawatts equals the power required to replace the use of home heating oil in winter, said Simmons. But more could be generated if necessary. The Gulf of Maine has an estimated total wind power potential of 100 gigawatts.

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The farm would likely be split into five sections, each about eight nautical miles, or 9.2 miles, or 14.8 kilometers, square, containing 200 turbines generating 5 megawatts each.

Because the winds are strongest several miles offshore, the turbines would be mostly out of sight of land, built on floating platforms anchored some 12 to 20 miles off the coast in waters 100 to 200 meters, or 330 feet to 660 feet, deep.

That should pose no problem. "The oil industry has been using floating platforms for 20 to 30 years," Dagher said. Two main designs exist - the tension-leg platform and the spar buoy. The platform has horizontal "legs" attached to a buoyant central structure and secured by tensioned cables to gravity anchors - essentially heavy weights - on the ocean floor. "The tension, fighting against the buoyancy of the platform on top, keeps it stable even in storms or heavy waves," Hart said.

A spar buoy "looks like a large pencil floating in the water, point down toward the ocean floor," Hart said. Up to 300 feet long, and mostly submerged, the underwater section acts like a ship's keel to stabilize the structure, which is anchored with mooring lines only "because you don't want it waltzing around the ocean," he said.

Dylan Voorhees, energy director for the Natural Resources Council of Maine, an environmental organization, said: "From our point of view, to take some of those technologies and transform them into renewable power technologies would give us a certain satisfaction. I don't know if I'd call it irony, but justice."

Blue H, a British company based in the Netherlands, and StatoilHydro, of Norway, are experimenting with floating platforms for wind turbines. In 2007 Blue H put a tension-leg prototype in the waters off Italy. StatoilHydro plans to test a spar buoy device off Norway next year.

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