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Going deep: Ocean to power grid, recharge fuel cells

R. Colin Johnson
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PORTLAND, Ore. — Harnessing ocean power to generate electricity, hydrogen to fuel cars and heat exchangers to cool buildings is the aim of a $13.75 million effort at Florida Atlantic University's Center for Ocean Energy Technology.

COET has already built a fleet of acoustic doppler current-profiler platforms to be anchored later this year off Florida's Atlantic coast. By 2009, the Center hopes to have permanent mooring sites picked for underwater adaptations of wind turbines. The ocean turbines would be mated to on-shore hydrogen storage facilities that could recharge fuel cells and generate electricity. The moorings will also house pumping facilities to pipe frigid deep ocean water coming from the Arctic Circle into buildings' heat exchangers for cooling.

"The Gulf Stream works 365 days a year, allowing electricity generated from its current to be available 24/7, compared with solar or wind resources. Plus there is a the possibility of using the thermal difference between the warm waters nearer the surface, and the very cold water at the bottom which comes from the Arctic Circle," said Sue Skemp, COET's executive director.

The Center's original $5 million seed funding came from the Florida Technology, Research and Scholarship Board. Earlier this year, the Florida legislature selected COET to collaborate with four other Florida universities in the Florida Energy Systems Consortium.

Greater resources are being committed to harnessing ocean power. The Energy Department recently revived funding for ocean power research, and is seeking proposals for assessing the potential of harnessing ocean power. Contracts are expected to be awarded by 2009.

COET has also signed agreements with Heriot-Watt University (Edinburgh, Scotland) and the University Edinburgh to collaborate on ocean energy research.

Ocean turbines would be installed where currents are naturally funneled in areas like underwater canyons or between underwater mountains. By redesigning wind turbines, the Center hopes to stimulate their adaptation for use in ocean currents. According to Skemp, the ocean is full of geological features capable of generating electricity from ocean currents.

"There are a number of sites around the world where extracting energy from the ocean current is potentially viable," said Skemp. For instance, "about 20 percent of the Gulf Stream is entrained between the Florida coast and the Bahamas. There, the topography of the ocean shelf acts like a funnel, guiding the current."

Added Skemp: "We are taking a systems approach--not just what is funded, but looking at the bigger picture." That includes "research that needs to be pursued both in the power plant system but also in the environment and the ecology and the resource itself, the Gulf Stream."

Because the electricity generated by ocean floor turbines will be produced at a relatively constant rate, the Florida Energy Systems Consortium will also evaluate methods for storing energy generated at night as hydrogen. It will use electrolysis to split water into hydrogen and oxygen. The hydrogen could then be used to recharge auto fuel cells as well as to generate electricity for the grid during times of peak energy demand.