



New push to tap the oceans for electricity

By Kate Galbraith

NEW YORK: For years, technological visionaries have painted a seductive vision of using ocean tides and waves to produce power. They foresaw large installations off coastlines and in tidal estuaries that could provide as much as 10 percent of U.S. electricity needs.

But the technical difficulties of making such systems work are proving formidable. Last year, a wave-power machine sank off the Oregon coast. Blades have broken off experimental tidal turbines in the turbulent East River in New York. Problems with offshore moorings have slowed the deployment of snakelike generating machines in the Atlantic off Portugal.

Years of such problems have discouraged ocean-power visionaries, but have not stopped them. Lately, spurred by rising costs for electricity and for the coal and other fossil fuels used to produce it, they are making a new push to overcome the barriers blocking this type of renewable energy.

The Scottish company Pelamis Wave Power plans to turn on a small wave-energy farm — the world's first — off the coast of Portugal by year's end, after fixing the broken moorings. Finavera Renewables, a Canadian company that recently salvaged its sunken, \$2.5 million Oregon wave-power machine, has signed an agreement with Pacific Gas & Electric to produce power off the California coast by 2012. And in the East River, just off the New York City borough of Manhattan, two newly placed turbines with tougher blades and rotors are feeding electricity into a grocery store and parking garage on Roosevelt Island.

"It's frustrating sometimes as an ocean energy company to say, 'yeah, your device sank,'" said Jason Bak, chief executive of Finavera. "But that is technology development."

Roughly 100 small companies around the world are working on converting the ocean's power to electricity. Many operate in Europe, where governments have pumped money into the industry. Companies and governments alike are betting that over time, costs will come down. Right now, however, little electricity is being generated from the ocean except at scattered test sites around the world.

Ocean-power technology splits into



Verdant Power

Tidal turbines, made by Verdant Power, being installed in the East River in New York.

two broad categories, tidal and wave power. Wave power, of the sort Finavera is pursuing, entails using the up and down motions of the waves to generate electricity.

Tidal power involves harnessing the action of the tides with underwater turbines, which swirl like wind machines. Decades-old tidal technologies in France and Canada use barrage systems that trap water at high tide; they are far larger and more obtrusive than the new, below-waterline technologies.

A third type of power, called ocean thermal, aims to exploit temperature differences between the surface and deep ocean, and is mainly applicable in the tropics.

Ocean power has more potential than wind power because water is about 850 times denser than air, and therefore packs far more energy. The ocean's waves, tides and currents are also more predictable than the wind.

The drawback is that seawater can batter and corrode machinery, and costly undersea cables may be needed to bring the power to shore. And the machines are expensive to build: Pelamis has had to raise £42 million, or \$77.8 million.

Many solar start-ups, by contrast, need as little as \$5 million to build a prototype, said Martin Lagod, a co-founder of Firelake Capital Management, an investment firm in Silicon Valley. Lagod looked at investing in ocean power a few years ago and decided against it because of the long time horizons and large capital requirements.

General Electric, which builds wind turbines, solar panels and other equipment for virtually every other type of energy, has stayed clear of ocean energy. "At this time, these sources do not appear to be competitive with more scalable alternatives like wind and solar,"

Daniel Nelson, a GE spokesman, said in an e-mail message. An arm of GE has made a small investment in Pelamis.

Worldwide, venture capital going to ocean-power companies has risen to \$82 million last year from \$8 million in 2005, according to the Cleantech Group, a research firm. That, however, is a tiny fraction of the money pouring into solar energy and biofuels.

Assuming that commercial ocean-power farms are eventually built, the power is likely to be costly, especially in the near term. A recent study commissioned by the San Francisco Public Utility Commission put the cost of harnessing the Golden Gate's tides at 85 cents to \$1.40 a kilowatt-hour, or roughly 10 times the cost of wind power. San Francisco plans to forge ahead regardless.

Other hurdles abound, including sticky environmental and aesthetic questions. In Oregon, crabbers worry that the wave farm proposed by Ocean Power Technologies would interfere with their prime crabbing grounds.

The soft, sandy bottoms offshore are "right where every year we deploy 115,000 to 120,000 crab pots off the coast for an eight-month period to harvest crab," said Nick Furman, executive director of the Oregon Dungeness Crab Commission. "We're kind of struggling with that."

George Taylor, chief executive of Ocean Power Technologies, said he did not expect "there will be a problem with the crabs."

In Washington State, where a utility is studying the possibility of installing tidal power at the Admiralty Inlet entrance to Puget Sound, scuba divers are worried, even as they recognize the need for clean power.

As Mike Racine, president of the Washington Scuba Alliance, put it, "We don't want to be dodging turbine blades, right?"