

Firms see tidal energy as wave of future

November 25 2010, By Bob Drogen

Moored in the channel, the little gray barge strains against a raging morning tide. The torrent soon will drain nearby rocky inlets and fishing harbors by 20 feet - as high as a two-story house - only to flood them again six hours later.

Tucked under the stern, horizontal turbines spin in the swirling current. The huge mechanism looks like an old lawnmower reel, but it is America's most ambitious effort yet to produce electricity by harnessing the [gravitational pull](#) of the moon and sun on the sea.

"This is cutting-edge," Ryan Beaumont, an engineer, said as he monitored the turbines from a control room on the barge. "No one has done tidal energy like this before."

"We call this the Kitty Hawk of tidal energy," said John Ferland, vice president at Ocean Renewable Power Co., owner of the project.

The start-up company aims to link a larger turbine system to eastern Maine's power grid next fall in the country's first small-scale commercial use of [tidal energy](#).

Tapping the tides is the latest niche in the search for affordable, renewable energy. Widespread use may be years off, but advocates say tides and other hydrokinetic systems, from [ocean waves](#) to free-flowing rivers, ultimately could meet up to 10 percent of America's electric power needs - more than hydropower dams now supply.

Pilot projects or studies are under way in Washington's Puget Sound, in Alaska's Cook Inlet, off the coasts of Florida, California, Oregon and Hawaii, in New York City's East River, along the [Mississippi River](#) and elsewhere.

"These are coastal resources, and most people live along the coasts," said Hoyt Battey, a water power expert at the U.S. Energy Department.

"When you're talking about providing half the power of Alaska or Hawaii, or half the power of New York, that's significant."

For now, the technology for marine and hydrokinetic power remains in its infancy, and costs are prohibitively high. Ireland, Denmark, Portugal, South Korea, China, Australia and other nations have been testing the waters for years. Commercial operations are rare.

"Basically, it's much more difficult to do things underwater than on dry land," said Robert Thresher, research fellow at the National Renewable Energy Laboratory, a federal facility in Golden, Colo. "The water tears stuff apart. There's fish, rust, fouling ... all kinds of problems."

Canada may be closest to finding solutions. It is investing \$75 million for three pilot projects in the upper Bay of Fundy, home to the world's highest tides. The first test turbine weighs 400 tons, has a peak capacity of one megawatt and looks like a sunken windmill.

"I believe if we can do it in Fundy, you can do it anywhere," said John Woods, who heads the authority that runs the projects. He hopes to gather enough data by 2015 to determine whether tidal power is technically feasible, environmentally safe and economically viable.

In theory, the U.S. resource is immense. Waves and currents are relatively reliable in some areas, and tides ebb and flood twice a day like

clockwork. They thus are more predictable resources than wind or solar power.

Unlike wind, however, tides with sufficient range and velocity run only in the nation's northeastern and northwestern corners, mostly Maine and Washington, plus Alaska. Waves are consistently high only on the Pacific coast north of Point Conception, Calif., and in Hawaii.

Several developments suggest a surge of U.S. interest, however.

The Federal Energy Regulatory Commission reported this month that it has issued 140 hydrokinetic preliminary permits for proposals to tap tides, waves or river currents, up from a handful a few years ago. In many cases, officials said, applicants are staking claims in case the technology takes off.

In September, the Energy Department awarded \$37 million in matching grants for the first time to companies with the most promising prototypes or that appeared close to commercial service. Several states and the military also have provided support.

Working with the Navy, for example, Ocean Power Technologies last month connected a small test buoy in the swells off Oahu to the power grid that serves the Marine Corps Base Hawaii, marking a first for a wave energy device in U.S. waters.

"We have demonstrated that our technology works, that it can survive in harsh ocean conditions and can deliver high-quality power to the grid," said Robert Lurie, a vice president of Ocean Power, which is based in Pennington, N.J.

Next spring, the company plans to anchor a larger power buoy in the waves off Reedsport, Ore., for further tests. The ultimate goal, Lurie

said, is to build "multi-buoy wave farms" generating enough power to light 50,000 homes.

In Washington state, the Snohomish County Public Utility District plans to install two large turbines to gather tidal data half a mile offshore and 200 feet deep in Admiralty Inlet in Puget Sound.

"We would hope to operate for three years and then make a decision on whether to expand," said Craig Collar, project manager.

The industry has struggled so far to gain a foothold in California. Last month, Pacific Gas & Electric Co. suspended a proposed \$50 million pilot project for wave energy near Eureka, citing the difficulty of obtaining permits and the high cost of development.

"It was a substantial investment for an unproven technology," said PG&E spokesman Brian Swanson.

He said the utility still was considering a 100-megawatt project in the seas off Vandenberg Air Force Base, near Santa Barbara.

"We are very committed to wave energy," Swanson said.

Proposals to exploit the colossal currents under the Golden Gate Bridge have hit the rocks, however.

"There is a great dispute over whether it's feasible because of the huge vortexes and turbulence," said Roger Bedard, former head of ocean energy at the Electric Power Research Institute, an industry think tank in Palo Alto. "The whole watershed of Northern California flows through this one-mile gap."

Tides in Maine's rugged Cobscook Bay, at the mouth of the Bay of

Fundy, flow as fast as the average man can run. Fishing boats in Eastport, the easternmost town in the United States, rise and fall like toys in a bathtub. The currents create a giant whirlpool, called the Old Sow, that is treacherous for small boats. Vast tidal flats and seaweed-draped boulders emerge or vanish every few hours.

In 1935, at the height of the Depression, President Franklin D. Roosevelt backed a plan to build tidal dikes here to impound the seas for electric power. Roosevelt had spent summers on nearby Campobello Island in Canada.

But Congress soon canceled the project. All that remains is a tabletop model in the town museum, and an old March of Time newsreel with grainy footage of what the announcer called "a monument to disappointment."

Ocean Renewable Power Co., based in Portland, Maine, launched its first cross-flow turbine at Eastport in 2007. The helix-shaped design, with foils modeled like twisted airplane wings, was small and tethered to a former fish farm barge. But it worked.

The company built a bigger unit, with two sets of foils, and a high-tech barge, for \$2.5 million. Both went in the water last spring, then came out for more tweaking. Testing resumed Oct. 1 in a fast-flowing channel flanked by wooded hills and rocky cliffs.

"They've put Maine on the map for tidal power," said Betsy Biemann, president of the nonprofit Maine Technology Institute, which supports emerging technologies that can benefit the state.

The environmental impact still isn't clear. University of Maine researchers are trying to assess the risk to fish, diving seabirds, seals and other creatures in a pristine ecosystem.

"We still have to show the turbines aren't a fish chopper or whale thumper," said Bob Lewis, who heads Ocean Renewable Power's onsite operations.

The goal is to deploy a turbine unit twice as big on the seafloor next fall. It will have a rated capacity of 150 kilowatts, enough to light 50 to 75 homes, and feed into the Bangor Hydro Electric grid.

If all goes well, four more turbines will be added a year later. The total estimated cost: \$21 million, half from federal and state grants, the rest from private investors. The company hopes the turning tides can supply most of the region's electricity in six years.

"We're not going to replace nuclear [power](#) plants," Lewis said. "But we can help. We can be part of the solution."

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