Project Bids to Harness the Energy of Waves

Thomas Patterson for The New York Times

A computer-equipped buoy, 103 feet long and ultimately weighing 260 tons, being assembled and tested in Vancouver, Wash.

By KIRK JOHNSON
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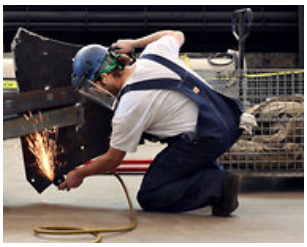
PORTLAND, Ore. — About 15 years ago, this environmentally conscious state with a fir tree on its license plates began pushing the idea of making renewable energy from the ocean waves that bob and swell on the Pacific horizon. But then one of the first test-buoy generators, launched with great fanfare, promptly sank. It was not a good start.

But time and technology turned the page, and now the first commercially licensed grid-connected wave-energy device in the nation, designed by a New Jersey company, Ocean Power Technologies, is in its final weeks of testing before a planned launch in October. The federal permit for up to 10 generators came last month, enough, the company says, to power about 1,000 homes. When engineers are satisfied that everything is ready, a barge will



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Jonathan Redman deburrs a steel installation stand for the cap of the buoy, which is behind him.

carry the 260-ton pioneer to its anchoring spot about two and a half miles offshore near the city of Reedsport, on the central coast.

"All eyes are on the O.P.T. buoy," said Jason Busch, the executive director of the Oregon Wave Energy Trust, a nonprofit state-financed group that has spent $10 million in the last six years on scientific wave-energy research and grants, including more than $430,000 to Ocean Power Technologies alone. Making lots of electricity on the buoy and getting it to shore to turn on lights would be great, Mr. Busch said. Riding out the storm-tossed seas through winter? Priceless. "It has to survive," he said.

Adding to the breath-holding nature of the moment, energy experts and state officials said, is that Oregon is also in the final stages of a long-term coastal mapping and planning project that is aiming to produce, by late this year or early next, a blueprint for where wave energy could be encouraged or discouraged based on potential conflicts with fishing, crabbing and other marine uses.

The project's leader, Paul Klarin, said wave technology is so new, compared to, say, wind energy, that the designs are like a curiosity shop — all over the place in creative thinking about how to get the energy contained in a wave into a wire in a way that is cost-effective and efficient.

"Some are on the seabed on the ocean floor, some are in the water column, some are sitting on the surface, some project up from the surface into the atmosphere, like wind — many different sizes, many different forms, many different footprints," said Mr. Klarin, the marine program coordinator at the Oregon Department of Land Conservation and Development. "There's no one-size-fits-all kind of plan."

Energy development groups around the world are closely watching what happens here, because success or failure with the first United States commercial license could affect the flow of private investment by bigger companies that have mostly stayed on the shore while smaller entrepreneurs struggled in the surf. Ocean Power Technologies also will be seeking money to build more generators.

"Wave energy is very expensive to develop, and they need to see that there is a potential worldwide," said António Sarmento, a professor at Lisbon Technical University and the director of the Wave Energy Centre, a private nonprofit group based in Portugal. "In that sense, having the first commercial deployment in the U.S. is very, very positive."

Here in Oregon, the momentum of research appears to be increasing. Last month, the Northwest National Marine Renewable Energy Center — financed by the United States Department of Energy in collaboration with Oregon State University and the University of Washington — deployed one of the first public wave energy testing systems in the nation, called Ocean Sentinel, about two and a half hours from Portland, in Newport. The first device tested was a half-scale prototype from a New Zealand company.

Fishing industry lobbyists and lawyers worry that a surge of wave energy could repeat what happened when hydroelectricity came to the Pacific Northwest in a big way starting in the 1930s. Builders then did not think through the dense ecological web that nature had devised around the tens of millions of salmon — suddenly blocked from their inland spawning routes — that had over millenniums become a cornerstone species for everything from bears to birds.


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"Our greatest concern is that they don't do what they did with dams — put a lot of them in the ocean and then just stand back and see what happens," said John Holloway, the secretary of Oregon Anglers, a political action committee for recreational fishing. "We're advocating a go-slow approach."

What has not changed is that the Pacific Northwest still has a siren song for wave-energy dreamers in the big, consistent rolling ocean swells that define offshore waters — and make many a boater seasick — from Northern California through Washington State.

"Wave energy is essentially an accumulation of wind energy," Charles F. Dunleavy, the chief executive at Ocean Power Technologies, said in a telephone interview. In the northern Pacific, he said, consistent winds fuel consistent waves, and the distance they travel in their rolling line creates a huge area of wave energy, or fetch, that a bobbing buoy can capture. Other places with good fetch include some areas off the coasts of Western Europe and South America.

But the project also hinges on squeezing out the tiniest of incremental efficiencies in tapping the waves as they come. On the Ocean Power Technologies buoy, which looks like a giant cannon stuffed with electronics, company engineers pursued an insight that sailors have known in their sea legs since the days of Odysseus: every wave is different.

The onboard computer in each buoy, in communication with an array of small devices called wave riders that float farther out in the ocean, adapts, or "tunes" to each incoming wave, adjusting the way the giant internal shaft rides up and down as the swell passes through. The up-and-down motion of the shaft creates the electricity, which goes to shore through a seabed cable.

In a nod to environmental concerns, the buoy was redesigned to remove all hydraulic fluids, which some critics feared could contaminate the water in the event of an accident; rack-and-pinion gears now drive the mechanics. The three anchoring tethers, said Michael G. Kelly, the vice president of operations at Ocean Power Technologies, were also built to withstand a 100-year storm, but also with enough redundancies that even if two anchors failed the third would be enough to keep the buoy in place.

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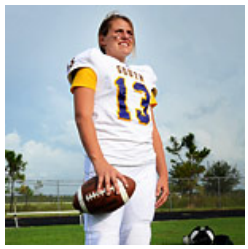

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