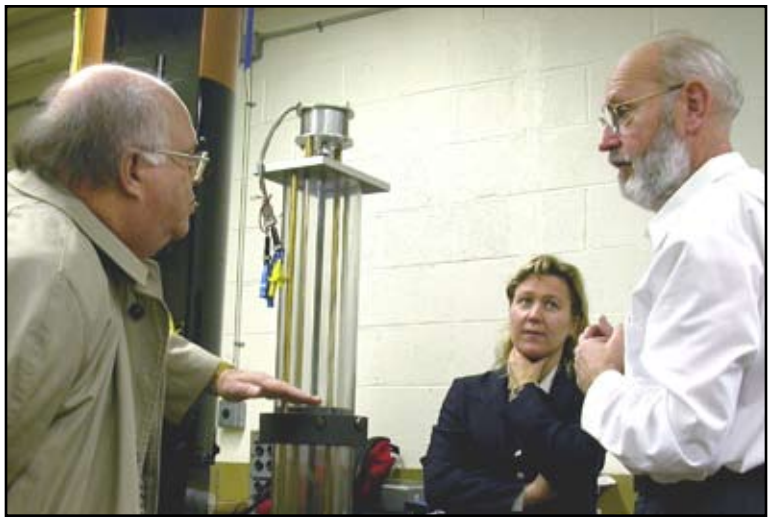
Electrical experts plot ways to use waves' potential

Researchers say a site near Reedsport is ideal for testing emerging technologies for power generation.

The enormous power of the ocean may one day be lighting coastal homes under an ambitious plan to bring emerging wave energy technology to Oregon.

A site off Reedsport on the southern Oregon coast already is being eyed as a potential site for a pilot plant and test facility that would harness ocean waves for electricity.

The feasibility for developing the wave technology will be explored in a meeting in Portland today [Feb. 2, 2005]. Representatives from nearly two dozen government agencies, utilities, businesses and nonprofit organizations will discuss what hurdles—especially money—need to be addressed. The session is sponsored by the Oregon Department of Energy and the California-based Electric Power Research Institute.



Oregon Sea Grant Director Bob Malouf (left) talks with Annette von Jouanne and Alan Wallace about the wave energy extraction devices they've developed with the help of a grant from Sea Grant.

The technology is in its infancy worldwide, but Europe has taken the early lead in deploying prototype devices.

"Wave energy seems to have great potential," said Justin Klure, senior policy analyst for the state energy department. "But this has never been done before here, so we want to get all of the issues and options out on the table so that we can start pursuing this." He said the meeting will examine the challenges—especially funding and permits—in setting up a facility on the coast.

Alan Wallace and Annette von Jouanne, electrical engineering professors at Oregon State University, want to play a key role in the research and development of the technology. They are proposing that a national ocean energy center be set up that would be headquartered at the university.

They have been developing wave energy extraction devices for the past two years with a $270,000 grant from the National Science Foundation and additional money from Oregon Sea Grant.

"We have a real opportunity to be the country's leader in this new, clean, renewable energy source," von Jouanne said. "Oregon is a prime location to move ahead on this."

She said two OSU labs—the O.H. Hinsdale Wave Research Laboratory and the Motor Systems Resource Facility—could help develop test devices to convert wave energy into electrical power.

Von Jouanne and Wallace are working on three prototypes of buoys that use magnets to generate electricity. Waves would move a buoy up and down, causing electrical coils to move through a magnetic field, generating a voltage to produce electricity.

A study last year by the Electric Power Research Institute found that a site at Gardiner, just north

Note: Alan Wallace died in 2006. The work he helped pioneer goes on.

of Reedsport, would be good for a pilot wave power plant.

Wave energy devices would be anchored to the seafloor about one to two miles from Gardiner. The site is attractive because some features that served a decommissioned International Paper Co. mill are already in place. Electricity would flow through a cable on the seafloor that would connect to a power substation near the old mill. The mill also had an effluent pipe that stretches onto the ocean floor where the electric cables could come ashore.

Success in Scotland

A recently deployed device being tested off Scotland is a good candidate for a demonstration project off the Oregon coast, said Roger Bedard, ocean energy project manager with the Electric Power Research Institute.

The nearly 400-foot-long, 11.5-foot-wide device—about the size of four train cars—is the first commercial-scale floating wave energy converter and is generating electricity for Great Britain's power grid. When floating on the sea, hinged joints between its articulated cylindrical sections move with the waves, powering hydraulic motors that generate electricity.

The advantage of that system for a demonstration project would be its record of success and commercial availability, unlike the experimental prototypes OSU is developing. "We want to be sure that whatever we put off Oregon is reliable and would work as expected," Bedard said. "But there are a lot of issues to be worked out first. That's why we are holding this meeting."

A floating wave-energy system would require consistent, gently rolling waves, not breaking waves that could damage the device.

The OSU engineers envision a buoy with a sensor that would measure wave heights. If storms produce waves that are too high, a winch would automatically pull the buoy below the surface.

They calculate that a network of about 200 buoys—each about 12 feet wide and 12 feet tall—could provide enough energy to power the equivalent of Portland's business district.

The Central Lincoln County PUD board of directors has said the utility would be willing to use the power from an offshore pilot plant.

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Wallace and von Jouanne estimate that it would cost about $5 million to launch the research center. They said federal money would be the most likely source, but utilities and state and local agencies could contribute.

Water columns

In addition to developing offshore devices, von Jouanne and Wallace may study an oscillating water column, which would be embedded in jetties or cliffs. A device would generate electricity in a two-step process. As waves enter a chamber, the water forces compression of the air through the blades of a turbine. As the waves retreat, they draw the air past the turbine again, driving it in the same direction.

The oscillating water column technology is used in Scotland on the island of Islay, the first commercial wave-power station that began operating four years ago. It feeds up to 500 kilowatts of electricity into the island's power grid, enough to run about 400 homes.

Several other nations are looking at wave energy technology, including Japan, Australia, China, Sweden, India, Portugal, Ireland and Norway. In addition to Oregon, other coastal states looking into wave power include Maine, Rhode Island, Massachusetts, Connecticut, Hawaii and California.

AquaEnergy Group in Washington state has proposed a wave energy pilot plant that will use buoys about three miles off the Olympic Peninsula to generate electricity.

As each buoy rides the waves, the motion will operate an internal hose pump mechanism that will pump water within the buoy to turn a small turbine. The turbine will drive a generator, with electricity brought ashore by an ocean-floor cable.

"We are 15 to 20 years behind wind energy, but with the advancing technology I think wave energy will catch up quickly," Wallace said. "The initial capital cost of building these things is high, but then the fuel is free and plentiful."

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Oregon Sea Grant ■ http://seagrant.oregonstate.edu ■ 541-737-2716

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