
National Wave Energy Center (NWEC)

Project Name:	National Wave Energy Center
Amount Requested:	\$5,000,000
Funding Source:	Department of Energy/Energy Efficiency and Renewable Energy Programs

Summary:

The solutions to today's energy challenges need to be explored through alternative, renewable and clean energy sources to enable a diverse national energy resource plan. The earth's oceans provide an extremely abundant and promising source of energy. Ocean energy exists in the forms of wave, tidal, marine current, thermal (temperature gradient) and salinity. Among these forms, significant opportunities and benefits have been identified in the area of wave energy extraction. According to a recent Electric Power Research Institute (EPRI) report, the Oregon coast is an ideal place for demonstrating and analyzing the potential for wave energy.

Wave energy has several advantages over other forms of renewable energy such as wind and solar. Because the density of water is more than 800 times that of air, wave energy devices can extract more power from a smaller volume at a lower cost and reduced visual impact. In addition, waves are more "available," between 80-90% of the time, compared to wind availability that is in the 30-45% range, depending on location. Wave energy is also more predictable than wind. By placing sensors off the coast, generation can be accurately predicted up to 10 hours in advance of waves hitting the coast, enabling more reliable integration into the electric utility grid.

A multidisciplinary wave energy team at Oregon State University (OSU) has been pursuing wave energy developments in five focus areas: 1) researching first-of-its-kind direct-drive wave energy generators; 2) developing an action plan for a National Wave Energy Center in Oregon; 3) working closely with the Oregon Department of Energy (ODOE) and a variety of stakeholders to promote Oregon as the optimal location for the nation's first commercial wave parks; 4) examining the biological and ecosystem effects of wave energy systems; and 5) outreach and engagement with coastal communities. The Oregon State Wave Energy team's research and development goals seek to develop high quality wave energy generation systems that are efficient, durable in hazardous ocean conditions, reliable and can be easily maintained. OSU is a prime location to conduct ocean wave energy research:

- OSU is the home of the nation's highest power university-based energy systems laboratory, the Wallace Energy Systems & Renewables Facility (WESRF), co-directed by Drs. Annette von Jouanne and Ted Brekken. WESRF has a 750kVA dedicated power supply and can regenerate electricity back onto the grid. The lab also includes the nation's only wave energy linear test bed.
- OSU is the home of the O. H. Hinsdale Wave Research Lab with world-class wave tank facilities, including a 342 ft. wave flume, directed by Dr. Dan Cox.
- OSU is the home of the Hatfield Marine Science Center (HMSC) with a 40-year history of marine research, education and outreach from a 49-acre site on Yaquina Bay in Newport. HMSC also has the ability to rapidly access the coastal ocean for instrument deployment and retrieval. HMSC scientists are acknowledged national experts on marine ecology and biology, capable of analyzing the potential impacts of wave energy on the marine environment.

The combination of key facilities and scientists, ongoing successful wave energy research and collaboration, the tremendous wave potentials and the well-suited coastline off the Oregon coast has led the OSU Wave Energy team to propose a National Wave Energy Center (NWEC). This Center is strategically positioned to enable the U.S. to successfully develop renewable wave energy resources in what is projected to become a rapidly developing new set of industries.

Oregon is poised to lead the nation and the world in wave energy research, development and production. We have the wave resource, the expertise through collaboration including tremendous university, industry, utility and community support, as well as the utility infrastructure along the coast to deliver this clean, renewable power into the grid.

The Oregon State Legislature has followed through with the governor's proposal to make crucial investments in wave energy. In 2007, the legislature invested \$4.2 million in state funds to establish the Oregon Wave Energy Trust (OWET). OWET will support needed research and development, streamline permitting and provide needed incentives for industry investment. In addition to OWET, the 2007 Legislature appropriated \$3 million in capital funds to help establish the National Wave Energy Center, specifically for design of offshore testing berths and associated infrastructure.

The proposed federal funding for NWECC will:

1. Establish a National Wave Energy Center, co-located at OSU and in Lincoln County, near Newport, Oregon with the purpose of providing an in-water infrastructure of up to five test berths approximately two miles offshore. The NWECC will be managed by Oregon State University and will be available to industry and public entities in need of a location to test wave energy generating devices.
2. Help Oregon to establish the nation's first commercial wave parks—note: several preliminary applications have been filed for off the Oregon Coast.
3. Analyze the potential impacts of wave energy infrastructure and devices on marine ecosystems.

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