LPRO: Legislative Policy and Research Office

MARINE ENERGY

BACKGROUND BRIEF

MARINE ENERGY POTENTIAL

Oregon has been identified as an ideal location for wave energy conversion based primarily on its wave resource and coastline transmission capacity. According to a 2011 study by the Electric Power Research Institute, Oregon's total annual available wave energy in the inner shelf alone is equal to 143 terawatt-hours per year (TWh/yr), or 143 billion kilowatt-hours per year (KWh/yr) – enough energy to power 28 million homes. Additionally, the Pacific Northwest is well-suited for the development of offshore wind due to its ocean and wind resources and its history of policies that encourage renewable energy projects. According to a 2010 study on offshore wind potential, the National Renewable Energy Laboratory found that offshore wind energy generation Oregon could amount to 340,000 MW.

Oregon's Renewable Portfolio Standard recognizes ocean energy as an eligible resource. In 2007, the Oregon Innovation Council (OIC) selected wave energy as an economic innovation focus. As a result of funding from the OIC, the Oregon Wave Energy Trust (OWET), a nonprofit, public/private partnership, was established with the goal of responsible development of wave energy projects in Oregon.

ENERGY AND TRANSMISSION NEEDS

Most of Oregon's electricity demand is west of the Cascades, while electricity generation is east of the Cascades. Transmission lines that cross the Coast Range are all owned by Bonneville Power Administration and transfer power east-to-west. There is no significant power generation on the coast to bolster those lines. Local generating resources could safeguard the system against problems such as outages and overloads and preserve a local utility's ability to deliver electricity to its customers.

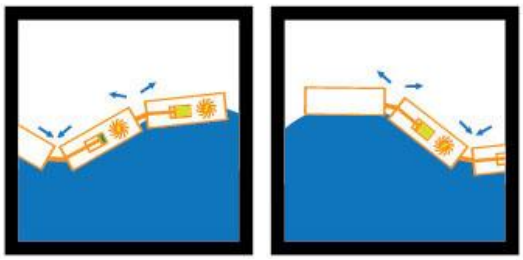
Marine renewable energy projects can provide a more constant power production than solar or wind because they are relatively constant and change seasonally. The potential for generating wave energy off of Oregon's coast is strongest during the winter months, which coincides with peak electricity demand in coastal communities. Wind patterns over the ocean are typically stronger and more consistent than wind patterns on land. These stronger and more consistent offshore winds have the potential of producing steady energy and significantly larger amounts of electricity than land-based wind installations, even with increased wind speeds of only a few miles per hour.

REGULATION

Within three nautical miles of the state coastline is the Oregon Territorial Sea, which is under state jurisdiction. Beyond the Territorial Sea boundary is the Outer Continental Shelf, which is under federal jurisdiction. If a marine energy project is located in Oregon's Territorial Sea, it must follow the regulatory structure laid out in Part 5 of the Territorial Sea Plan, adopted by the state in January 2013, in addition to other state permits and standards. If a project is in federal waters, it must receive a lease from the Bureau of Ocean Energy Management.

EXAMPLES OF MARINE ENERGY DEVICES

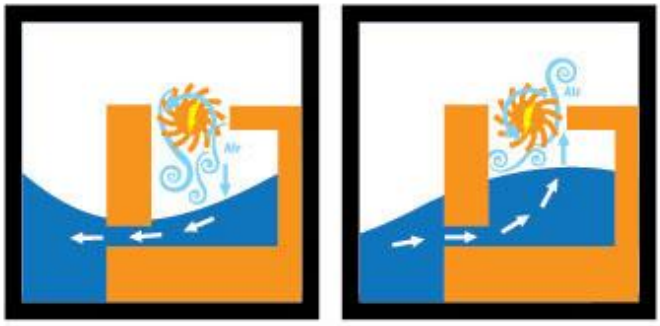
More than 100 conceptual designs of marine energy conversion devices have been developed over time, but only a few have been built as full-scale prototypes or tested. Currently, oscillating water column, attenuator, overtopping, and point absorbers are the main types of devices that generate or convert energy from waves. Off-shore wind turbines can have ocean-floor mounted turbines or floating platforms. Oregon has a deep seafloor, which means offshore wind installations will likely need to be platform-based. Examples of the different technologies are included below.



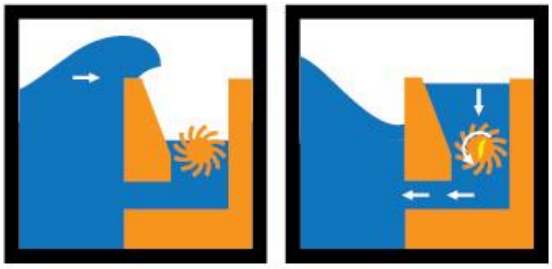
(Northwest National Marine Renewable Energy Center)

Attenuator: These devices are oriented in the direction of incoming waves, which cause articulated components to bend and drive generators. Appearing somewhat like semi-submerged "train cars," they are typically moored to the ocean floor on one end. This device is around 390 feet long and 11 feet wide, with about seven feet above the surface of the water.

Oscillating Water Column: These devices generate power when waves push against a horizontally-hinged flap, or are funneled into a structure that causes a water column to rise and fall. These devices may be fixed to the ocean floor, hung from a floating or shoreline structure, or built into harbor jetties. These devices could be put into 20 to 100 foot depths and as be as much as 65 feet wide.



(Northwest National Marine Renewable Energy Center)



(Northwest National Marine Renewable Energy Center)

Point Absorber: A device that captures energy from the vertical motion of the waves; it can be floating on surface or attached to the bottom.

(Principal Power)

Platform-based offshore wind turbine: Offshore wind turbines are placed on a floating support structure to dampen wave and turbine induced motion, enabling wind turbines to be sited in previously inaccessible locations where water depth exceeds 50m.

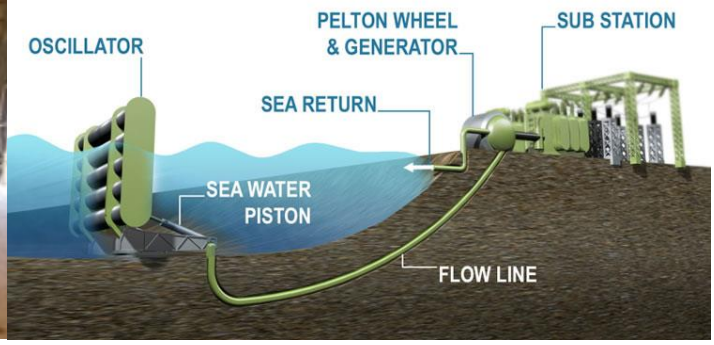
INDUSTRY ACTIVITY

While wave energy has great potential both off the northwest coast of the United States and worldwide, the wave energy industry is in early stages of development. Industry challenges include difficulty capturing the energy in a usable form, the harsh marine environment, deployment costs, and competing uses of sea space.

Oregon State University's Northwest National Marine Renewable Energy Center has become the primary testing center for wave energy device development in the United States. In January 2013, the center selected Newport as the "South Energy Test Site" (SETS) of the Pacific Marine Energy Center. SETS will be located about five miles from shore and will be the second facility in the world where full-scale devices can plug into the electricity grid.

In 2014, the Bureau of Ocean Energy Management (BOEM), a federal agency charged with managing development of the US outer continental shelf's energy and mineral resources in an environmentally and economically responsible way, gave Principle Power, Inc. approval to submit a formal plan to build five, 6-megawatt floating wind turbine devices about 13 miles off the shore of Coos Bay. Known as the WindFloat Pacific project, the 15-square mile proposed lease area was one of a series of leasing efforts being pursued by BOEM.

The Oregon Army National Guard has been exploring options for using marine energy to become energy independent at Camp Rilea near Warrenton. The project proposes to install two oscillating wave-energy converters and rotary pumps, with testing to begin in 2017. The rotary pumps will send pressurized water to a hydroelectric generator on shore and to a desalinization plant. The primary goal will be to power the desalinization plant by wave energy.



In 2016, the Oregon Legislature approved an $800,000 appropriation for another Oregon marine energy project to Oregon State University and the Northwest National Marine Renewable Energy Center. The Northwest National Marine Renewable Energy Center is currently working on plans for an offshore site located near Newport, OR. The Legislature also approved an increase of $200,000 for the Oregon Wave Energy Trust to back the project.