



MARINE ENERGY

at PNNL

Pacific Northwest National Laboratory (PNNL) partners with the U.S. Department of Energy Water Power Technologies Office (WPTO) to advance marine energy as a clean, renewable energy source for the future. PNNL is working to understand marine energy opportunities and overcome technology, environmental, and operational challenges.

The Blue Economy

PNNL played a leading role in identifying promising new applications for marine energy that could promote economic growth and a sustainable blue economy through WPTO's Powering the Blue Economy initiative. PNNL is looking to build innovation pathways to new markets for marine energy technology developers by researching applications that require power constrained and small devices.

Environmental Monitoring

Scientists are researching acoustic impacts to fish and marine mammals and the effect of electromagnetic fields from power cables and devices. Studies also

investigate the potential for whales and other marine mammals to entangle in mooring lines, and the impact of tidal power turbine blade strike on marine mammals and fish. PNNL leads multiple efforts to gather, evaluate, and disseminate information on the environmental effects of marine energy. These efforts include Tethys, OES-Environmental, and the Triton Initiative.

Marine Biofueling and Corrosion

Researchers are testing multiple coatings and paints under the same environmental conditions to assess performance. PNNL's success in developing antifouling coatings and cleaning processes has cemented the Laboratory's international reputation in biofouling research. As part of a multi-laboratory and university team for WPTO, scientists are working to improve the performance of composite materials for use with marine renewable energy devices. PNNL also explores how to use lasers to pre-treat metal materials and help decrease corrosion, reduce material costs, and increase material lifespan.

Testing for Marine Energy

Scientists are working to lower the environmental risks associated with marine energy. PNNL conducts research related to underwater noise, electromagnetic field and marine organism interaction, benthic habitat mapping techniques, and the environmental impacts of devices on marine animals. Researchers apply a variety of sophisticated instruments to understand these effects, including acoustic doppler current profilers, light detection and ranging sensors, and PNNL's Juvenile Salmon Acoustic Telemetry System.

Marine Energy Characterization

Researchers conduct marine energy resource characterization to study what it takes to develop and deploy marine energy resources by using theoretical analysis, numerical modeling, and field-measurement approaches. PNNL uses wave spectral modeling capabilities to simulate, classify, and predict resources for wave energy in U.S. coastal regions. Scientists have developed an advanced turbine farm model to simulate tidal energy in energetic tidal current systems. PNNL's wave and tidal resource characterization and assessments inform designs for wave energy and tidal current converters, reduce financial risks, and guide device siting to meet energy production goals and commercial development at specific sites.

Marine Energy Projects

- **Tethys:** PNNL developed *Tethys* and *Tethys Engineering*. Both offer a collaborative virtual research space with access to databases and knowledge hubs related to marine energy. PNNL is also part of a team developing the *Portal and Repository for Information on Marine Renewable Energy*—a data repository related to marine energy research and development activities.
- **Triton:** PNNL leads WPTO's *Triton*, which focuses on reducing environmental impacts of marine energy to marine animals and environments. *Triton's* work is done at the MCRL facilities, using PNNL's fleet of vessels and scientific dive team to assist instrument developers and researchers with deploying and testing innovative sensors and devices in different marine settings. As a part of *Triton*, PNNL researchers are examining ways to support commercially available environmental monitoring technologies and to understand the potential risks associated with them.

Marine and Coastal Research Laboratory

The Marine and Coastal Research Laboratory at PNNL-Sequim, is the U.S. Department of Energy's only marine research and development facility. Here, researchers develop tools and make discoveries for harnessing sustainable energy from coastal environments, including renewable power from waves, tidal currents, and offshore wind and create biofuel feedstocks from algae. MCRL is home to more than 15,000 square feet of research laboratories that are connected to Sequim Bay by a supply system that delivers 200 gallons of seawater per minute and returns it to the bay after treatment.



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