



Offshore Wind Energy

Offshore wind energy has great potential to help address the United States' growing energy needs and make significant contributions to the domestic renewable energy supply. It provides a number of advantages over land-based wind, and is the primary renewable energy option for many regions of the country. The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy has directed PNNL to support the responsible development of US commercial offshore wind through several multi-year tasks focused on several key issues.

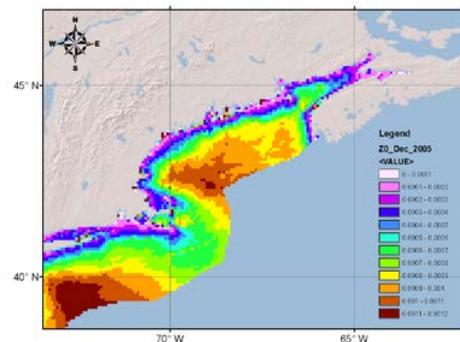
Offshore Wind Research at PNNL includes:

- Improving wind resource characterization to optimize siting and system design
- Organizing and compiling environmental and project data into a knowledge management system to provide open-source information to industry and regulators
- Prioritizing potential adverse environmental effects using the Environmental Risk Evaluation System tool to focus research and shorten the permitting process.
- Assessing turbine noise propagation and developing monitoring protocols that support deployment and testing of floating offshore wind platforms.
- Modeling effects of energy removal and wind/wave interactions.
- Assessing alternative environmental monitoring technologies to guide selection of effective, efficient systems.

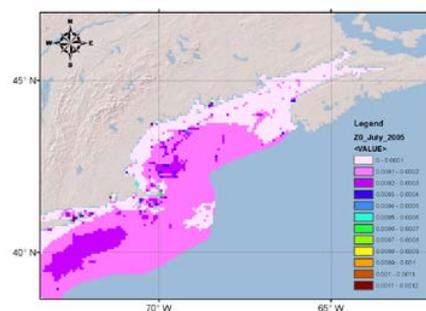
Resource Characterization

Accurate estimates and forecasts of offshore wind speeds at hub height are essential for siting and operating wind farms, however few data or forecasting tools exist. PNNL researchers are developing 3D models to predict hub height wind speed in the coastal region, linking wind-wave interactions into the process. Using an open-source coupled modeling approach, PNNL researchers are investigating the sensitivity of wind speed profiles on sea roughness and other attributes.

Sea Surface Roughness – Dec.



Sea Surface Roughness - July



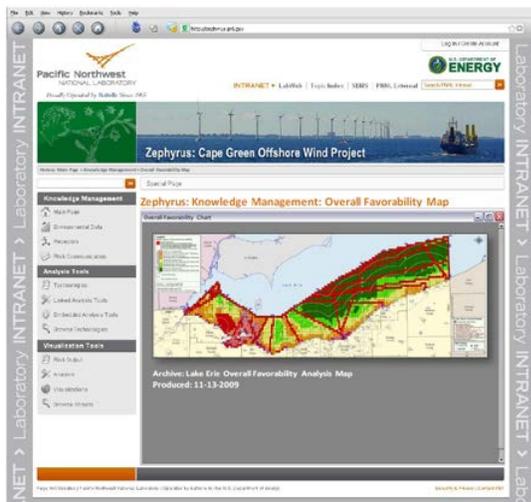
3D modeling outputs for sea surface roughness for the Atlantic coast during typical winter (December) and summer months (July).

Offshore Wind Risk Assessment

The Environmental Risk Evaluation System (ERES) will evaluate risk of offshore wind projects by examining features of:

- Technology components
- Waterbodies
- Site Characteristics
- Receptors (marine animals, habitats, and ecosystem response)

ERES uses planned offshore wind projects as cases to compile risk-relevant attributes. Multiple cases are used to “span the analytical space” and accumulate predictive power. Risk will be assigned to attributes of cases using expert opinion initially and experimental, monitoring, and modeling data as they become available.



Display of overall favorability for offshore wind development in Lake Erie, displayed in a mockup of the knowledge management system Tethys.

Pacific Northwest National Laboratory's Marine Sciences Laboratory

Pacific Northwest National Laboratory's (PNNL) Marine Sciences Laboratory (MSL) is located in Sequim on Washington State's Olympic Peninsula, with supporting facilities in Seattle and Portland. MSL is the Department of Energy's only marine research laboratory. This unique facility and the capabilities of its researchers deliver science and technology that is critical to the nation's energy, environmental and security future.



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About Pacific Northwest National Laboratory

The Pacific Northwest National Laboratory, located in southeastern Washington State, is a U.S. Department of Energy Office of Science laboratory that solves complex problems in energy, national security and the environment, and advances scientific frontiers in the chemical, biological, materials, environmental and computational sciences. PNNL currently has approximately 4,900 staff members and a business volume of more than \$1.1 billion. The Laboratory has been managed by Ohio-based Battelle since 1965.

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