



Locking up greenhouse gases. PNNL researchers are studying basalts to determine whether carbon dioxide can be converted to a stable mineral form for safe, permanent storage in these deep underground rock formations.

*A sustainable, diverse portfolio
for America's energy future*

Clean Electricity Generation

PNNL is addressing the challenge by accelerating the timeframe from discovery to deployment. PNNL is pursuing a market-driven, diverse portfolio of energy sources with reduced emissions that are

- ▶ Cost-competitive based on a system-level understanding of the nation's infrastructure
- ▶ Environmentally neutral
- ▶ Infrastructure-ready, for rapid market deployment.

Partners

Our partners include Bonneville Power Administration, Environmental Protection Agency, public utilities, universities, industrial partners, and major Chinese research institutions.

PNNL'S SCIENCE AND TECHNOLOGY IMPACT

- ▶ **Hydro.** New approaches to improve fish passage and decrease mortality on the Columbia River system, including a new, fish-friendly turbine design that increases electricity generation by 10%
- ▶ **Wind.** Improved wind resource predictions to inform wind farm site selection and operations, and enable better use of clean but variable wind power

*With U.S. electricity demand projected to grow more than 20% by 2035,
the nation must increase supply while reducing the environmental impact of additional capacity.*

- ▶ **New coastal renewable sources.** Safe and sustainable development of coastal energy—wave, tidal, and offshore wind—through science-based environmental assessments and improved technology
- ▶ **Clean coal.** Cost-effective materials to capture greenhouse gases; computer simulation tools to support licensing and public acceptance of geological sequestration
- ▶ **Nuclear.** Real-time, predictive performance measurements of fuels and structural materials, as well as licensing support, enabling new construction and safe operational extension of existing reactors that currently provide 20% of America’s energy

TECHNOLOGY SPOTLIGHT

Tidal power—an emerging resource. Harnessing energy from the natural movement of tides and waves is promising, but potential environmental impacts must be identified, understood, and addressed. In Sequim, Wash., at DOE’s only marine sciences laboratory, PNNL is supporting the Snohomish County Public Utility District in the deployment, operation, monitoring, and evaluation of two tidal turbines in the Puget Sound. PNNL scientists also are developing the first ever marine mammal warning system that is being used to protect orcas from energy systems in the Puget Sound.



ABOUT PNNL

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. The Laboratory employs more than 4,900 staff members, has a \$1.1 billion annual budget, and has been managed by Ohio-based Battelle since 1965.

For more information about PNNL’s R&D related to Clean Electricity Generation, contact:

Terry Walton, Director
 Energy and Environmental Programs
 Pacific Northwest National Laboratory
 P.O. Box 999
 Richland, WA 99352
 (509) 375-4548
 terry.walton@pnnl.gov

www.pnnl.gov



Proudly Operated by **Battelle** Since 1965