



**Charged up.** PNNL is advancing technologies to enable widespread adoption of plug-in hybrid vehicles. The Grid Friendly™ Charger Controller receives and responds to price signals to develop a cost-effective charging schedule. It also can sense grid conditions and defer charging to help balance the system. The technology has been licensed to Zap Jonway, a U.S.-China company specializing in advanced vehicles.

*Efficient, secure electricity management  
for America's energy future*

## Smart Energy Grid

PNNL is addressing the challenge by

- ▶ Delivering advanced tools that provide a wide-area, near-real time view of the system to enhance reliability and optimize use of existing assets, avoiding billions of dollars in capital investment
- ▶ Reducing emissions and dependence on imported oil through accelerating the deployment of renewable electricity generation and electric vehicles
- ▶ Enabling real-time data transactions in an inherently secure environment, ensuring the grid is resilient to advanced persistent threats.

### Partners

Our partners include Bonneville Power Administration, regional utilities, Washington State University, University of Washington, Battelle, and industry partners such as Alstom Grid and Avista.

## PNNL'S SCIENCE AND TECHNOLOGY IMPACT

### Grid Operation and Management

- ▶ Innovative simulation, modeling, and visual decision tools that help operators monitor and manage grid conditions over wide areas
- ▶ Technologies that enable consumer response to changes in electricity availability or price

*Transforming management of America's electricity infrastructure from generation to end use,  
ensuring highly reliable and affordable electricity.*

- ▶ Electricity Infrastructure Operations Center—a fully functional grid operations control center for research and development, training, and regional and national emergency response

### Addressing Emerging Needs

- ▶ Storage and charging technologies for widespread deployment of electric vehicles
- ▶ Requirements assessment and new energy storage concepts to integrate intermittent renewable resources into the grid

### Cyber Security for the Grid

- ▶ Real-time, predictive cyber monitoring to protect the grid's critical components: control systems, telecommunication, and communication infrastructure

## TECHNOLOGY SPOTLIGHT

The Pacific Northwest is paving the way. PNNL and regional collaborators are building upon Northwest activities to define the grid of the future, including:

- ▶ Groundbreaking demand response demonstration on Washington's Olympic Peninsula
- ▶ Pacific Northwest Smart Grid Demonstration Project, led by Battelle; includes 11 utilities in five states
- ▶ Workforce training programs with regional utilities and reliability entities
- ▶ Deployment of 1,000 new phasor measurement units in the Northwest to gather grid data



## 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 Smart Energy Grid, contact:

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