



Demand Response

As building new transmission lines and power generation become more costly, grid operators seek demand response methods that reduce electricity peak demand. To deliver the predictable, reliable, and flexible results that grid operators require, commercial vendors need the latest proven tools for reducing demand. Partner with PNNL, the nation's premier power grid research lab, and get access to field-tested demand response tools that boost grid reliability and effectively enable efficient grid management. The technologies described here incorporate hardware and software applications that seamlessly manage electricity use in residential and commercial settings.

Grid Friendly Appliances: PNNL's Grid Friendly Appliance™ controller, a two by two-and-a-half inch circuit board, makes appliances grid friendly. Installed in refrigerators, air conditioners, water heaters and various other household appliances, this device monitors the power grid and turns appliances off for a few seconds to a few minutes in response to power grid overload. When power plants cannot generate enough power to meet customer needs, Grid Friendly appliances reduce some of the load on the system to balance supply and demand. [See more online.](#)

Transactive Control: Transactive control turns regional and local information about the state of the grid—such as the amount of renewable energy online, the wholesale price of electricity and weather forecasts—into economic signals that communicate the cost of delivering energy to a specific device at a specific location. Mirroring the existing power system infrastructure, the signal flows from generation to transmission to distribution, and onward to end users and their smart grid enabled assets. At every location along the way, the signal's value is updated with information reflecting local conditions, such as congestion or capacity limits. [See more online.](#)

Regulation Services with Demand:

With increased levels of wind and solar power on the electrical grid, utilities are finding it more difficult to predict their power generation capabilities. At the same time, utilities need frequency regulation and load following capacity to counteract the expected minute-to-minute shortages and overages in power generation to meet demand. A regulation tool is available that measures grid frequency directly from a wall outlet while meeting consumer-set objectives, such as charging an electric vehicle's battery by a certain time of day or maintaining a water heater's temperature. The algorithms used in this regulation tool enable reduced generator maintenance costs and fewer emissions from generators. The tool also provides a range of ancillary services, including frequency regulation, load following, and spinning reserve.

[See more online.](#)



PNNL's Grid Friendly Appliance™ Controller successfully reduced energy consumption in the 2006 GridWise Olympic Peninsula Demonstration, the first Smart Grid demonstration of its kind.

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About PNNL

Interdisciplinary teams at Pacific Northwest National Laboratory advance science and technology to understand our world and address America's most pressing problems in energy, the environment, and national security. Founded in 1965, PNNL employs 4,400 staff and has an annual budget of more than \$1 billion. It is managed by Battelle for the U.S. Department of Energy's Office of Science.



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