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Creating Value Through Consumer-Centered Technology and Pricing: The GridWise™ Olympic Peninsula Project

By Lynne Kiesling

In Olympia, Washington, power companies, consumers and the federal government came together to test smart technologies that can be part of a much-needed upgrade of our electricity grid. This test involved giving consumers the ability to pay for power in real time, rather than at the average rates used by most power companies, and to use price-responsive appliances to adjust demand automatically. These options reduced consumer costs by 10 percent, and peak demand fell by 15 percent during the year.

Current forecasts indicate that the demand for electricity—as well as the cost of generating it—is likely to rise over the next several years.¹ Traditionally, rising electricity demand has been met by building more power plants and transmission and distribution lines. But these improvements are difficult to site and can cost up to \$2000/kW, and even more as construction costs increase.² An alternative to this approach is to implement “smart grid” technologies that improve efficiency and give customers the tools to reduce their own electricity demand. Smart grid technologies such as advanced meters and price-responsive thermostats make it possible for the electricity grid to inform consumers about the costs of electricity in real time. Customers can then choose to use certain appliances and devices when prices are lowest, rather than paying the same flat rate all day long the way most do today. Furthermore, smart grid technologies enable homes and businesses to generate their own power during peak hours when capacity is strained.

In Washington state, the GridWise Olympic Peninsula Project tested smart grid technologies in more than a hundred homes as well as with several commercial and municipal partners. The project, which was managed by the Pacific Northwest National Laboratory and funded by the U.S. Department of Energy, lasted from March 2006 through March 2007.

The GridWise Olympic Peninsula Project examined how residential customers respond to real-time electricity pricing, leading to insights into how consumers change their purchasing behavior in response to price changes. Residential

¹ Federal Energy Regulatory Commission, “Increasing Costs in Electric Markets,” June 19, 2008, p. 2. Available at <http://www.ferc.gov/legal/staff-reports/06-19-08-cost-electric.pdf>.

² Federal Energy Regulatory Commission, *ibid.*, p. 6.



customers chose from contract types ranging from today's fixed-price contracts to real-time prices that could change as frequently as every five minutes.

The 112 households in the study were equipped with technology that allowed them to automate their responses to price changes via the Internet. This technology included smart appliances such as communicating thermostats, water heaters, and clothes dryers. These appliances were programmed to respond to price changes that could turn them up or down based on the price of electricity at any given time. Consumers also had the ability to change their settings (and override them) to reflect their preferences and lessons learned during the project lifecycle.

The project also included cash incentives that reflected the actual costs of producing and delivering electricity, which motivated consumers to reduce their electricity consumption precisely when that reduction was most valuable—at times of peak demand. This behavior resulted in increased grid reliability and efficiency through decentralized coordination among the consumers and generators in the market, without the need for centralized utility control.

Results

On average, consumers saved approximately 10 percent on electricity bills over the prior year despite the fact the electricity prices generally rise from one year to the next. Customers who participated in the real-time market saved even more. At the same time, peak demand—a time when the most people are using electricity—was reduced by 15 percent. The significance of these two findings alone show that upgrading today's electricity grid can delay or even eliminate the need for future power plants, transmission lines, and so on.

Current regulatory approaches prohibit most residential customers from choosing a real-time price contract from among a portfolio of retail products and services. Unless customers can choose from a variety of pricing options, the peak reductions, reduced energy use, and reduced need to invest in infrastructure that these technologies make possible cannot happen. A market-based network of consumers and local generation is feasible using existing price-responsive digital technologies. The primary barriers to widespread adoption of such an approach are regulatory, not technological.

What the GridWise Project Means for You

Although the project involved 112 homes, it shows that smart grid technology enhances electric grid reliability and reduces outages by reducing peak demand. As a result, smart grid technologies could lead to smaller electricity bills for consumers, while at the same time helping to alleviate the need for additional infrastructure. Some estimate that if consumers across the country had similar smart grid technology available to them, electricity prices would be substantially lower. In fact, using smart grid technologies to improve efficiency is less expensive and more environmentally friendly than increasing and decreasing electricity production to handle peak and off-peak demand. Finally, because smart grid technologies allow consumers to change their use based on pricing, they make it easier for power companies to incorporate renewable resources like wind and solar power.

Resources

GridWise at PNL website: gridwise.pnl.gov

GridWise Demonstration Project Fast Facts:

http://gridwise.pnl.gov/docs/pnnl_gridwiseoverview.pdf

GridWise Olympic Peninsula Project final report:

http://gridwise.pnl.gov/docs/op_project_final_report_pnnl17167.pdf