



Client: A Smart Grid Integrator

Balancing Supply and Demand to Cut Energy Consumption



Solution allows smart grid integrator to remotely control customer appliances, turning them off during peak energy-use hours.

THE BACKGROUND

The client, a smart grid integrator driven by a vision to redefine how the world delivers and consumes energy, specializes in hosted residential and commercial energy management platforms, designed to reduce consumption and optimize supply. Its flagship software service provides modular solutions for smart grid integration and enablement, including energy data aggregation and analytics, command and control, and demand-side management.

THE PROBLEM

To better meet its customers' needs, the client needed to redesign its smart grid management system, which is used to regulate supply and demand of energy for power providers. In particular, the smart grid integrator was interested in its capabilities related to the demand side through curtailment or load shifting, which refers to the shifting of operations of an energy-consuming load from one time to another, such as from high-demand to off-peak periods.

The term *smart grid* generally encompasses technologies that detect and react to local changes in usage in electricity supply networks. One smart grid component, demand-side management (DSM), makes the smart grid more sustainable by allowing customers to make informed decisions about their energy consumption and helps energy providers reduce the peak-load demand and reshape the load profile.

The smart grid doesn't come without a cost, but the potential benefits are far in excess of the investment required.

The Electric Power Research Institute (EPRI) forecasts that a planned modernization of the U.S. national power grid will cost up to \$476 billion over the next 25 to 20 years but will provide up to \$2 trillion in customer benefits over that time, for an anticipated benefit-to-cost ratio of between 2.8 and 6.0 to 1.¹



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The effect of the smart grid on energy use is also expected to be substantial – EPRI estimates that by the year 2050, the average electric bill will probably go up about 50 percent if the smart grid is deployed, compared to an increase of nearly 400 percent if the smart grid is not deployed.²

The client turned to ProKarma, which has extensive experience in the utility industry, to modernize its demand-and-response management product offering.

THE SOLUTION

A ProKarma team of architects, developers and testers worked with the client's existing off-shore development team to redesign, develop and test the new system, which was designed to allow energy providers to find ways to shift demand to avoid having to purchase more at peak-usage times, when prices are higher.

The new system allows the client to shift energy by engaging with its customers, who opt in and agree to be monitored in return for a lower rate overall. To accomplish this, the client provides its customers with smart plugs for their appliances, from ovens to refrigerators and more. For existing buildings, smart controllers are used over ZigBee Mesh Network protocols. With new construction of multi-tenant buildings, built-in specialized smart meters connect to high-energy-consuming appliances, like ovens or heating and air conditioning systems.

The solution also offers the ability to buy back off-grid energy, which allows energy providers to give credit to customers, such as those with solar energy systems or windmill energy systems.

Smart meters send consumption energy to the energy producer, which evaluates the energy supplies currently available. The energy provider can then send a command over smart meters to turn off the appliances, decreasing demand.

Among the major deliverables during the eight-month engagement was the documentation of the architecture in place when the project began. This assessment led to a move away from the client's legacy platform and toward a more modern architecture. The ProKarma team also provided resources for building the client's data warehouse in addition to helping hire and train in-house support teams for the energy solutions.

The project was accomplished using a range of technologies, including Microsoft .NET for middleware and the portal application; Microsoft SQL Server 2008 for data storage; and ZigBee Mesh Network for communications between devices or appliances and smart plugs, controllers and routers. The ProKarma team tied the solution into the Microsoft Dynamics customer relationship management system to allow for billing and used a Microsoft Team Foundation Server for application lifecycle management.

1. *Smart Grid Economic and Environmental Benefits. Smart Grid Consumer Collaborative. October 8, 2013. <http://smartgridcc.org/wp-content/uploads/2013/10/SGCC-Econ-and-Environ-Benefits-Full-Report.pdf>*
2. *EPRI: Smart grid costs/benefits. Carson, Phil. May 25, 2011. <http://www.intelligentutility.com/article/11/05/epri-smart-grid-costsbenefits>*