

Smart Grid: Empowering smarter energy choices now

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Imagine a world powered by clean energy, a world where consumers are empowered to save energy and money, and a world where plug-in electric vehicles are commonplace. All of these scenarios contribute to reducing our dependence on foreign fuels, slashing carbon emissions, and improving energy security. This is a more sustainable world—a world made possible by a “smarter grid.” Now, imagine a world where rolling blackouts regularly plague everyday life, and where increased dependence on limited natural resources means soaring costs and compromised energy security. While it’s unlikely we’ll get to this point, this world might become a reality if our nation does not implement a smarter electrical infrastructure, enabling greater use of renewable power.

But why now? Currently, energy consumption is predicted to triple by 2050 worldwide¹. Power outages and interruptions cost the U.S. economy \$100 billion annually². In the U.S., we spend \$200,000 per minute, or \$13 million an hour, on foreign fuels³, and are producing less than 10 percent of our energy domestically from renewable sources⁴. Moreover, our increasingly overburdened electrical infrastructure is quickly aging, with the rate of reinvestment trailing load growth for the past 25 years.

Today, we operate in a 21st century society, built on a 19th century electrical infrastructure, which functions with little integrated intelligence. It might be surprising to learn that utilities typically hear about power outages only through consumer telephone calls. The smart grid, however, will enable utilities to be more responsive, reliable and efficient.

Simply put, the smart grid marries IT with our current electrical infrastructure, helping us support our 21st century energy needs. The smart grid is essentially an “energy Internet,” delivering real-time information and knowledge—empowering smarter energy choices and delivering significant benefits:

- Optimizing renewable energy sources and enabling broader penetration.
- Empowering consumers to manage their energy usage and save money without compromising their lifestyle.
- Delivering increased energy efficiencies and decreased carbon emissions.
- Increasing power reliability and operational efficiencies, delivering greater productivity.

Doing more with less

With world energy consumption forecasted to triple by 2050, we need to find a way to do more with less—and quickly. Smart grid technologies can help us get there through increased energy efficiencies and better utilization of our existing electrical infrastructure. It would take only a five percent increase in grid efficiency to eliminate the need for building 42 additional large coal-fired power plants, a savings of 42 GW of power⁵.

What most people don’t know is that there’s inherent waste in the way our power is currently delivered. Without intelligent devices sensing how much voltage consumers need, utilities will often deliver too much.

Smart grid, on the other hand, delivers just what’s needed. If installed on 10 percent of the distribution feeders in the U.S., GE’s grid efficiency technology (i.e., GE’s Coordinated Volt-VAr Control) is designed to reduce electricity consumption by approximately 9.3 billion kWh per year, avoiding annual CO₂ emissions equivalent to the emissions of 1.1 million cars on U.S. roads. Pretty impressive.

Rethink and reduce - Empowering consumers to manage energy usage and save money

Today, most consumers are in the dark when it comes to energy consumption and costs. Yet, with electricity rates rising, consumers might be comforted to know that smart energy tools—such as smart meters and home energy panels—provide real-time information to help manage energy usage and save money.

The utility’s cost of producing electricity varies throughout the day. Yet the majority of residential electricity customers pay one set price—*all day long*. Smart meter technologies and demand response programs can change that by enabling “time of use” (TOU) pricing, a method by which consumers pay lower prices for electrical power during off-peak periods.

Empowering consumers with this knowledge can help save them money by encouraging off-peak usage of higher consumption devices, like washers, dryers, air conditioners, and plug-in hybrid electric vehicles (PHEVs). In addition to putting consumers in control of their energy spend, these technologies will help utilities manage peak demand from the source side. In a yearlong study by the U.S. Department of Energy, smart grid customers reduced peak consumption by up to 15 percent, and overall consumption by up to 10 percent.

With smart-grid-enabled net metering, consumers will also be able to sell excess power from on-site renewable generation back to the grid, offsetting rising power bills—especially during peak hours.

¹ US Army Corps of Engineers, 2005

² EPRI, “Electricity Technology Roadmap: 2003 Summary and Synthesis. Power Delivery and Markets.” 2003.

³ NRDC. “Safe, Strong and Secure: Reducing America’s Oil Dependence.” <http://www.nrdc.org/air/transportation/aoilpolicy2.asp>. 2004. Referenced 18 February 2009.

⁴ U.S. Energy Information Administration, 2008. “Renewable Energy Tops 10% of U.S. Energy Production.” <http://www.renewableenergyworld.com/rea/news/infocus/story?id=53684>

⁵ Commissioner Wellinghof, U.S. Federal Energy Regulatory Commission testifying to U.S. Congress, May 2007.



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Fueling the nation with cleaner, renewable power just got easier

Developing “homegrown” renewable energy is critical to reducing our dependence on foreign oil, putting the U.S. on the path to energy independence. However, once significant levels of alternative energy sources are integrated into the power system, further deployments will not be as simple as just “plugging them in.” One of the greatest challenges with renewables—like wind and solar—is that their power output is inherently variable. Fortunately, smart grid technologies can help manage the variability of wind and solar to help alleviate reliability issues caused by power fluctuations.

Automated demand response technologies will act as a lever that utilities can pull to help lower demand in the event there is a gap in renewable power generation—for instance, if the wind stops blowing. To address such contingencies, a utility may incentivize consumers to opt into programs that allow certain devices (i.e., water heaters) to be temporarily switched off during peak times. In the future, storage technologies could also help utilities manage the short term imbalances in the supply and demand of energy, sometimes caused by the fluctuations of renewable energy.

Keeping your lights on just got easier

Power outages and interruptions cost the U.S. economy more than \$100 billion per year. Today, utility companies are not quick to learn of outages and often rely on customer calls to notify them of problems on the network. Imagine a smarter grid that could detect and correct outages within minutes, by switching around the problem area.

Smart grid technologies can provide real-time knowledge of grid status, enabling utilities to prevent trouble before it occurs, or, in the event of an outage, react quickly to reduce the impact. Ultimately, utilities will move from “estimating” to “knowing” with a technology that automatically senses faults and operates controls to isolate problems in seconds. Smart meters will also help pinpoint exactly which customers are being impacted. Ultimately, smart grid technology can help reduce power disturbances by over 75 percent by 2020, thus saving the economy in excess of \$50 billion from a reduction in outages⁶.

...and Electricity for All

“Smart grid” will help turn our greatest energy challenges into lasting solutions. Empowering consumers with choice and control will make them part of the solution. Technological investments can make the grid more capable of integrating renewable energy, “at-home” generation, and PHEVs. And improved efficiency will help us do more with less.

The energy challenges facing us today will not be solved by one company, one politician, or one individual. The solutions will be brought about by the commitment and collaboration of utilities, regulators, and energy providers united around a common energy vision. Together, we can create a smarter, sustainable power infrastructure, while protecting the environmental future of the planet.

⁶ EPRI, “Electricity Technology Roadmap: 2003 Summary and Synthesis. Power Delivery and Markets.” 2003.



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