

BUILDING THE SMART GRID

PROMISE, CHALLENGE AND TRANSFORMATION



BY MICHAEL RONEY

Politicians talk about it. Business leaders develop product and service strategies around it. Consumers eagerly await its benefits. *The smart grid.*

This new power ecosystem—an intelligent information network that will stretch from power plants to millions of smart nodes and devices in homes and businesses—will revolutionize electric power distribution. No part of our global society will remain untouched by the smart grid, and already it is creating huge opportunities for businesses and consumers.

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Demand Creates Opportunity

The worldwide demand for power will grow 44% over the next two decades, according to the U.S. Energy Information Administration. Power companies are faced with supplying society's needs using an aging energy infrastructure while they try to control costs, integrate sustainable energy resources, curb carbon emissions and reduce dependence on foreign energy sources.

The smart grid will address this massive challenge via an intelligent network infrastructure, which optimizes energy distribution through interconnected networks of always-on, two-way data systems between power providers and users. Through sensors and distributed automation, the smart grid will dynamically manage power supply by constant evaluation of usage information and needs.

This has created new business opportunities for technology companies and established power-systems suppliers, with \$200 billion in global smart-grid investment expected by 2015—almost \$53 billion of that in the U.S. alone—according to Pike Research. Industries involved in developing and managing smart-grid technologies range from telecom, IT, semiconductors and equipment manufacturers to traditional energy suppliers. For example:

- Siemens Energy plans to double its current growth rate in the smart-grid sector to capture \$8.48 billion in global business over the next five years, and has developed an open platform to manage the wholesale delivery of power between utilities and grid operators.

- Cisco is focusing on grid management, substation automation and energy management systems, and is expecting \$15 billion to \$20 billion in global opportunities over the next seven years by joining electrical infrastructure with information technology.

- Alcatel-Lucent is using its experience in energy-utility telecom and data networks to build and manage the sophisticated, mission-critical IP communication networks required by smart grids, and is driving a great deal of research on the topic.

"The smart grid is our focus point," says Kamal Ballout, vice president of Alcatel-

Smart Grid Benefits

The smart grid offers numerous benefits for consumers, operators and the community as a whole.

FOR CONSUMERS:

The smart grid will help consumers moderate their energy usage to reduce waste, lower their monthly bill and use power in a more sustainable way.

FOR INDUSTRY:

The smart grid will help prevent outages, shorten the response time to problems, reduce cost and increase efficiency, and allow operators to resolve issues remotely. It also will integrate renewable energy and reduce carbon emissions on a macro and micro level.

FOR THE COUNTRY:

The smart grid will be a safer, more secure, more reliable grid, and will reduce dependency on foreign energy supplies. It also will reduce carbon emissions and combat global warming.

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Katherine Hamilton, President,
GridWise Alliance

Lucent's Energy System Integration Division. "We see this as something that is going to transform the way we live, so we're applying innovation, investments and resources to make sure that we are part of this transformation."

"Smart grid will enable choices and control by everyone on the grid, from power plant to consumer, so that the grid can become a more dynamic, balanced system," adds Katherine Hamilton, president of the GridWise Alliance, which represents a broad range of utilities, tech companies, manufacturers and companies from other industries. "Smart grid also will create a new manufacturing base and add jobs in both industry and utilities that are more sustainable and require additional skills."

Investment and Other Challenges

As with any transformational opportunity, there is some heavy lifting involved in implementing the smart grid. Some of the major hurdles include:

- **Regulatory Policy:** Government regulation can be a significant challenge because regulators tend to move cautiously, which can take time and slows down innovation in the U.S. and North America. "Regulators need to be aware of the benefits of smart grid, along with the risk assessment, so that they can make decisions more comfortably," notes Ballout.

- **Technology:** The lack of interoperability and an aging, centralized distribution infrastructure is creating significant

issues for migrating toward the smart grid. Industry players see promise in the move toward standard IT architectures and vertically integrated solutions where utilities are no longer isolated islands, but part of a single, end-to-end delivery network.

- **Consumer Awareness:** This is where government and industry—along with consumer groups—can collaborate effectively. Smart grid will provide the information and tools to empower consumers while changing their behavior. Government can ensure that any knowledge or technical gaps are closed with research and development programs.

“The greatest challenge is quantifying all the benefits of smart grid and then putting them into the business model so that utilities, regulators and consumers can understand how each of them gains from smart grid deployment,” Hamilton states.

Investment is also key among these challenges: Utilities need to prepare a budget that will fund comprehensive smart-grid programs, so they are deploying pilot projects in order to test the water and assess the financial impact.

Support for smart grids became federal policy in the U.S. with passage of the Energy Independence and Security Act of 2007, which allocated \$100 million in funding per fiscal year from 2008-2012 and established a matching program for states, utilities and consumers to build smart grid capabilities.

Smart grids received further support with the passage of the American Recovery and Reinvestment Act of 2009, which set aside \$11 billion for the initiative. “The stimulus funding has deployed many smart-grid projects faster than originally planned, and we are beginning to see quantifiable results,” Hamilton notes. “With each project we learn more and can build that knowledge back into the process to the advantage of the next project.”

Smart Metering

Smart metering is the tool through which regulators and network operators will be able to shape electricity-demand patterns in the future, since they will educate and financially incentivize consumers to



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**Kamal Ballout, Vice President,
Alcatel-Lucent Energy System Integration Division**

be more aware of their energy usage.

Energy companies already have installed 2 million smart meters in residences and businesses across the country. As a result, these users will collectively save an estimated \$20.4 billion annually through the year 2030, according to the Electric Power Research Institute.

Cisco says one customer, NetApp Inc., a storage and data management provider, reported \$2 million in savings in less than one year from using its building

mediator, a middleware product that lets facilities managers set energy-use policies for multiple sites. Cisco is currently deploying its home energy management solution for consumers, via pilots with several large utilities throughout the U.S., including Duke Energy.

“Our Connected Grid portfolio represents the foundation of this innovative energy platform, which will improve the electrical grid’s efficiency and create exciting opportunities for utilities as



Smart meters, which enable two-way communications between power companies and consumers, are an essential component of the smart grid.

well as new consumer energy services,” says Laura Ipsen, senior vice president and general manager of Cisco’s Smart Grid business unit.

“From an operational perspective, power utilities must have the ability to look at their service from end to end, right down to intelligent devices at the end points,” adds Alcatel-Lucent’s Ballout. “So we’re working with them to deploy always-on dynamic communication solutions that will help them achieve superior power delivery and quality, improved operational efficiency and the ability to readily integrate renewable energy sources while empowering consumers.”

Smart Grid Is Happening Now

The smart grid is being deployed today, evolving from the purely conceptual to fully functioning services that are generating quantifiable results.

- Siemens is combining grid sensors and control systems with communications and back-end software for regional power companies such as Texas’ Oncor, New York’s Consolidated Edison and New England’s Northeast Utilities. It has also partnered with startup company eMeter on several large-scale contracts to help utilities such as the Wabash Val-

ley Power Association manage smart meters. “We’re pleased to assist these companies in their transition to the smart grid, ultimately providing more effective and efficient service for their end customers,” says Paul Camuti, president, Siemens Smart Grid Applications.

- Alcatel-Lucent is involved in a number of projects to test and industrialize the smart grid technology, including Pennsylvania Power and Light, Oklahoma Gas and Electric, Electric Power Board Chattanooga, and Altalink in North America, in addition to several in EMEA and APAC.

- Cisco and Itron, a meter provider, have teamed up to create standardized IP-based communications reference design for the smart grid market, serving customers such as Southern California Edison Co., San Diego Gas & Electric, Center-Point Energy in Texas and Detroit Edison Co., with millions of meters on order.

Industry and Governments: Looking Ahead

Industry groups such as the GridWise Alliance and the Global Smart Grid Federation are essential to moving the smart grid forward. They bring together stakeholders; engage local, state and federal governments to create policies and regulations that will support the effort; and ensure that all parties move collectively and confidently to a common end point.

The Global Smart Grid Federation is engendering cooperation and progress internationally. It launched earlier this year with the convergence of smart grid alliances in the U.S., Australia, Canada, India, Ireland, Japan and Korea. "More alignment between key stakeholders in a complex ecosystem like the energy industry is critical to move us toward effective policy and standards," says Chairperson Guido Bartels. "The Federation is a quickly growing collective of organizations around the world that promote open sharing of best practices, thereby readying all economies to achieve the same goal of energy transformation."

Innovation, Collaboration, Audacity

Three dominant themes emerged from the last day of discussions at the GridWise Global Forum held in Washington, DC, in September: Innovation, both to bring down the costs of breakthrough technologies and to preserve national competitiveness; collaboration on an international scale to facilitate knowledge sharing; and the audacity to take risks and pursue a more ambitious vision for the future energy system.

"The GridWise Alliance membership has companies from a wide range of sectors—utility, manufacturing, information and communications, telecom,

ECCO2: Leveraging the Smart Grid Further

Energy conservation and atmospheric carbon emission reduction are both huge imperatives driving the smart grid revolution. Additional help in addressing these issues is coming from innovative new companies such as Texas-based ECCO2 Corp, a nonprofit sister company to DBS Distributors, Inc., which manufactures and distributes a fuel efficiency product line for fossil-fuel engines and generators, thus enabling it to mass produce carbon emissions offsets (or carbon credits) for businesses and governments.

"With a global carbon footprint of over 30 billion metric tons a year, we need to initiate the type of projects that will achieve the goals that the Kyoto Protocol put forth over a decade ago," says Cary Lee Peterson, the company's president-chairman.

DBS-ECCO2 has begun plans for going public on NASDAQ and has expanded the deployment of carbon offset projects beyond the U.S. to regions such as Africa, India and Latin America that are projected to generate several billions of carbon credits over the next 10 years. "Countries like Haiti do not have sufficient funding to pay for products and services for reducing carbon emissions," Peterson notes. "So they enter into an agreement with ECCO2 so that the carbon credits that generate money in the market are exchanged for those products and services. ECCO2 brings in the funding and hires local labor to complete each project, and it's a win-win for everyone while addressing global carbon-reduction goals."

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Guido Bartels, Chairperson,
The Global Smart Grid Federation,
Former Chairman, GridWise Alliance

automotive, buildings, investors—all of which have found that smart grid holds enormous opportunity for economic growth and manufacturing competitiveness," says Hamilton. "As smart grid

becomes ubiquitous in the electric grid, we will take those lessons learned to the water, gas, transportation and built environment, transforming our energy infrastructure into a system of systems." ■

Web Directory

Alcatel-Lucent / alcatel-lucent.com/smartgrid

Cisco / cisco.com

ECCO2 / ecco2usa.com

Global Smart Grid Federation / globalsmartgridfederation.org

GridWise Alliance / gridwise.org

Siemens / energy.siemens.com