



The NEXT Generation

The rapid evolution of communications and information technology is catapulting the electric-power delivery system into the 21st century.

platts

IT'S TIME FOR business leaders, politicians, and consumers to plug into a trend that is going to change the landscape of America: the modernization of the \$350 billion electric-power delivery system. The upgrade, known as the smart grid, is long overdue, and necessary to ensure that the U.S. economy is prepared for the digital and energy demands of the 21st century. The emerging industry has captured the imagination of innovators. Since launched around four years ago the market has transitioned from Smart Grid 1.0, largely centered on the addition of smart meters and the private data networks to support them,

to Smart Grid 2.0, which is developing a more sophisticated electricity delivery infrastructure that requires embedding intelligence and communications at every node on the electric-power delivery system.

As a result, the market for smart grid software, next-gen hardware, and expanded grid communications is primed to experience phenomenal growth. According to projections from GreenTech Media, the combined market for these technologies should reach \$10 billion by 2015, up from \$5 billion in 2010. Further driving this market will be the continued exponential growth of the U.S. and global solar market, the expected rollout of several million electric vehicles, and the emergence of consumer energy management systems.

This has largely been made possible due to the ongoing large-scale investments in our nation's advanced metering infrastructure (AMI) networks, which have put utility-to-consumer two-way communication networks in place for the first time. This is key, since they are able to monitor and con-

trol all critical distribution grid devices—not just smart meters—as well as introduce and support a host of new applications and technologies.

The next step is the maturation of a submarket known as distribution automation—which will utilize the expanding communications platform, as well as grid optimization and performance algorithms, to automate control of grid protection devices, voltage regulators, capacitor banks, transformers, and community energy storage—ensuring that grids are more reliable, energy-efficient, resilient, and secure. Using such technology, we can operate an intelligent grid, capable of analyzing and self-correcting voltage spikes and sags, power quality, and load-balancing issues in real time. GTM Research has forecast that the market for distribution automation in the U.S. will almost double to nearly \$6 billion in 2015.

The growth of distribution automation represents a game-changing moment for the electric utility industry, although

Refashioning America: a voltage regulator (left); a house with solar roof panels.



A Vision of the Energy Internet

Trilliant's technology will enable two-way communications throughout the smart electric grid.

THE BENEFITS OF a next-generation power grid—increased reliability, integration of renewable sources, improved energy efficiency—depend on robust end-to-end communications. This will let intelligent devices, from smart meters at the home to controls deployed across the grid, speak to one another, to utilities, and to consumers. It will give energy providers visibility into the way electricity is flowing, letting them fix problems fast. It will give customers data on how they use power, so they can use it more wisely. Among the leading companies creating this energy future is Trilliant, which builds wireless technology that links devices throughout the smart electric grid. We spoke with Andy White, Trilliant's chairman and CEO, to find out how the smart grid is progressing around the world.

So where are we in the development of the smart grid?

Utilities worldwide are starting to deploy smart meters—devices that can track and report energy use in real time. This is great stuff, but it's the tip of the iceberg. The next step is to extend that intelligence further into the grid, and into the home. You're going to see a series of game-changing applications. On the grid side, you're going to see distribution automation, voltage control and monitoring, and other grid applications. On the consumer side, more home-area applications are coming. Picture, for example, a charger for electric cars that automatically turns on when rates are at their lowest. Imagine having solar panels on your rooftop that not only power your house but also feed any excess electricity produced back into the grid. Trilliant is at the forefront of this transformation, working together with

major utilities globally. For example, in North America, we are working with Hydro One Networks and Iberdrola USA's Central Maine Power to deploy our multi-tier IP, RF mesh networks. In Europe, Trilliant is working with Centrica's British Gas, Britain's leading energy provider, to deploy our cellular IP smart grid solutions, making Trilliant one of the largest public wireless meter communications providers worldwide.

How far off are applications like these?

The good news is that we're not that far off from making the Smart Grid 2.0 a reality. At Trilliant, we're working with partners and standards bodies to ensure interoperability of our smart grid solutions. We are also seeing forward-looking utilities leveraging their smart grid networks to offer programs that help their customers. At Hydro One, for example, already more than one million smart meters are up and running, enabling the utility to launch "time-of-use" prices to help customers manage electricity use and costs, reduce strain on the system, and help the environment. This is part of the Ontario government's policy of creating a culture of energy conservation.

But how can a utility be sure that the communications network it installs today can handle the devices of tomorrow?

Utilities understand that they're not just installing a network to link smart meters, but an "energy Internet"—a network linking any device we want to put on it: solar panels, electric car chargers, devices that control and monitor the grid, surveillance that helps secure substations. This is where Trilliant is focusing. It is build-

ing powerful, standards-based wireless networks that can handle any device or application that comes down the road. This is essential. Because just like its namesake, the energy Internet can transform the world. Trilliant's goal is to help make that happen.



Andy White,
Trilliant's
chairman
and CEO



An array of
solar collectors

its importance is still not widely understood. Historically, while electric utilities have had extensive control over transmission-level equipment, they have had very little communications with or remote control over equipment on the lower-voltage distribution grids, where 90% of outages begin. These days it is commonplace for politicians and other business leaders to preach the virtues of renewable energy, but very few have understood the destabilizing impacts of distributed generation—such as rooftop solar—on a grid that was designed for power to move in only one direction.

Thankfully, 2011 marks a period where utilities and regulatory commissions are starting to not only recognize the vital importance of distribution automation, but also to begin to prove out the economic benefits related to enhanced reliability, improved system efficiencies, advanced asset management, and the effective integration of electric vehicles and distributed generation. All of these advances are exciting since they will empower businesses and individuals to be better consumers of energy.

In smart grid circles, the investments that President Eisenhower made to create the interstate highways in the 1950s—the economic benefits of which continue to be realized to this day—are often hailed as the type of strategic long-term infrastructure investments that ensure long-term viability and success. In today's world, getting the grid prepared for our energy future is the next super-highway that should fuel innovation. —David Leeds

Mr. Leeds is the managing director of GTM Research.



smart grid 2.0

New applications are being developed to help Americans use energy more efficiently—and at lower cost.

THE SMART money—and lots of it—is on the smart grid. Spurred by nearly \$4 billion in stimulus funds, plus billions more in private investment, a next-generation infrastructure of advanced meters and communications networks is taking shape across the nation. Already utilities have rolled out some 16 million “smart meters,” and projects in 43 states will bring this number to 65 million by 2015, accord-

A meter farm in Oconee, S.C.



ing to the Institute for Electric Efficiency, based in Washington, D.C. That's a smart meter for roughly half of all U.S. homes.

Now the question is: What comes next? The answer is a slew of applications that will help Americans use energy more efficiently and at lower cost. Some are in early stages of development, but others have been launched in pilot programs or even full-scale initiatives. The future of electric power, it turns out, is closer than you think.

“Despite the sour economy of 2008 through 2010, the smart grid and clean energy sector was one of the few areas that did not have much problem raising money,” says Tom Tiernan, editor of electric power publications at Platts, a leading global provider of energy information and intelligence.



Helping to spur that growth was the realization—by utilities, technology providers, and entrepreneurs—that the same innovations and ideas that will make the smart grid a success will also make a lot of companies successful.

For utilities and consumers, that innovation is starting to pay off in a variety of ways.

“Smart meters enable dynamic pricing, where rates vary during the day depending on demand,” says Tiernan. “That means you can save money by doing your laundry late at night instead of in the middle of the day. You also no longer need to call your utility when the power goes out; the utility knows. Two-way communications networks provide real-time data on how the grid is operating. The utilities are no longer flying blind.”

REAL-TIME MONITORING

Better yet, many outages—which cause losses of some \$150 billion each year within the U.S.—can be avoided outright. Communications technology from Massachusetts-based Ambient Corp., for example, is enabling utilities like Duke

Energy to install intelligent sensors and switches across its power distribution systems, providing a level of visibility and control that utilities have never before enjoyed. “By combining our communications platform with software applications we’ve developed, utilities can perform real-time current and voltage sensing,” says John J. Joyce, Ambient’s president and CEO. “That lets them spot spikes or significant decreases in the flow of energy before brownouts or blackouts occur. It means they can act, instead of react. That’s vital, as one of the key ways we’re going to meet the increased demand for energy in coming years is to deliver it more efficiently.”

The smart grid will extend into the home, too, with video

Coming to a neighborhood near you: smart appliances run by smart meters that empower homeowners.

A SHIFT IN THINKING

What will tomorrow say about today? Itron’s software solutions connect consumers with the smart grid, allowing them to actively participate in responsible energy usage. When sustainability becomes second nature to all, Itron will be remembered as an innovator that helped change the way the world manages its resources.

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A good ROI: Individuals and businesses will reap savings from the smart grid.



displays that report real-time energy consumption and smart appliances that turn on when electricity rates drop. The groundwork is already being laid to link products like these to smart meters. Itron Inc., a leading provider of advanced metering systems around the world, integrates an innovative wireless technology—known as ZigBee—into all its OpenWay meters. Small, low-cost, and boasting long battery life, ZigBee chips are ideal for home-appliance networks, and more and more manufacturers are adopting the standard.

“Right out of the box, Itron meters and all kinds of smart appliances—in-home displays, smart thermostats, and so on—will work together,” says Sharelynn Moore, director of corporate marketing and communications at Itron. “It will be seamless and simple, the way any laptop uses WiFi to connect to the Internet.”

Technology, in fact, has been the big success story for the smart grid: Much of the know-how exists or is within our grasp. Public perception, however, has often been another story. A few smart-meter deployments have been met with controversy—users believed

they were tied to higher rates—because utilities didn’t understand that the new grid is as much about customer relations as it is about hardware.

THE VALUE PROPOSITION

“It’s essential to articulate the value propositions of the smart grid,” says Sonita Lontoh, head of marketing at Trilliant, the Silicon Valley–based provider of wireless equipment and management software for smart grid communications networks. “When customers realize the benefits of a next-generation grid—the ability to better manage their energy use—they won’t just want a modern grid. They’ll demand it.”

An example of a utility getting it right, Lontoh says, is Hydro One Networks, a Trilliant customer in Ontario, Canada. “Through interactive animations on the web and well-planned consumer education, they’ve not only built enthusiasm among customers, but also empowered them. Understanding the power of the smart grid is the first step in unleashing it.”

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