

FIERCE INNOVATION AWARDS 2013

A UTILITY-REVIEWED AWARDS PROGRAM FROM THE PUBLISHERS OF:

FierceEnergy FierceSmartGrid

INNOVATION REPORT

ENERGY EDITION



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STATE OF THE INDUSTRY



Without a doubt, innovation has been one of the most fundamental and driving forces throughout the history of power delivery. Innovators are constantly designing more efficient ways to deliver electricity to consumers and, more than anyone else, these leading thinkers understand how our power grids function and where their strengths and weaknesses lie. But times and technology change, and the power system of today is no exception. The world of power delivery is on the verge of one of its greatest evolutionary changes: widespread self-healing systems are imminently within reach and high resolution data is beginning to reveal unseen levels of information about our power systems. Engineers, industry leaders and even government agencies are starting to see the potential value in more resilient power grids that take advantage of these new technologies. But how do we apply them and further evolve our electrical infrastructures?

There are a number of relatively new advances that have the potential to revolutionize the power industry. Smart meters are minimizing meter reading drive times and operational meter reading activities, but they are also generating large quantities of data that utilities are not used to dealing with. Not only can meter data management solutions help deal with the data onslaught but they can also help utilities detect usage patterns and act on them. Automation control is enabling utilities to continue improving reliability, which leads to happy customers and regulators, which further parlays into increased revenue and consumer confidence in utilities.

With the smart grid's time in the federal limelight past and the president's political capital tied up in global and congressional issues, investors and manufacturers are realizing that they can't rely on subsidies for the time being. That's where innovation once again steps in: products that prove their worth in practice and functionality, evolving the industry into new, efficient arenas. Breakthroughs in battery chemistry; advances in data applications; energy management software that enables remote and evolved customer control. These are technologies that show their inherent worth without a lot of hand-waving and technical jargon. It's not easy to introduce new technology into a field that looks with suspicion at anything with less than ten years of in-field service. But when an obvious game changer comes along, the decision makers start paying attention.

This special report, a supplement to the Fierce Innovation Awards program, is designed to highlight the new and exciting advances that are taking place in the field of power delivery. These products are testaments to the spirit of innovation and progress that are an integral part of the history of the industry. In slow times we look to the innovators as the sparks that will restart the fire of progress. In the pages that follow you will find the brightest of these sparks, crucial to moving the industry forward and our economies that rely on them, powering everything from their motors and furnaces to their compressors, lights and computers. These are the innovators of today, striving to make the world brighter and better than ever before.

This report also provides a forum for you to learn more about the winners of the Fierce Innovation Awards program, as well as some of our other applicants. I hope you enjoy reading about their innovative technologies and solutions.

Finally, I'd like to offer special thanks to our judges and everyone who applied. You've further proven an innovative spirit is alive and well in our industry. ●

Jason Nelson
 Publisher, *FierceEnergy & FierceSmartGrid*



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JUDGES



ROBERT HANCE
President & CEO
Midwest Energy Cooperative

Robert Hance is President/CEO of Midwest Energy Cooperative, a distribution cooperative serving 35,000 customers in 11 counties in southern Michigan and northern Indiana and Ohio. He is a highly-regarded business and community leader and known champion for co-op members, actively representing their interests through leadership roles with RESCO, the Michigan Electric Cooperative Association, National Rural Telecommunications Cooperative (NRTC), Spartan Renewable Energy and Utilities Telecom Council (UTC), where he chairs the Rural Issues Committee. He is also a founding member and current vice chairman of the Rural Broadband Council, an independent operating unit of UTC.



TED REGULY
Director of Customer Programs & Projects
San Diego Gas & Electric

Ted Reguly is the director of customer programs and projects for Sempra Energy's regulated public utility San Diego Gas & Electric (SDG&E). He is responsible for overseeing the development, implementation and integration of comprehensive customer offerings related to energy efficiency and demand response, while overseeing customer facing projects and privacy. He was recently named one of the Top 15 Smart Grid leaders in the electric industry by FierceSmartGrid. Reguly was previously director of SDG&E's smart meter program where he was responsible for the development of SDG&E's smart meter business case, regulatory approval and program implementation.



CHERI WARREN
Vice President
Asset Management, National Grid

Cheri is currently the vice president of asset management at National Grid. Her portfolio includes not only smart grid, which has been rebranded as Utility of the Future, but also the US Transmission and Distribution (T&D) electric assets (\$1B invested annually). Cheri Warren holds a BSEE ('87) and MSE ('90) from Union College. With over 20 years of experience, she has worked at GE, Central Hudson Gas and Electric, Power Technologies Inc., Navigant Consulting and National Grid. Cheri was elected to the IEEE Board in January of 2012, won the IEEE PES Excellence in Distribution Award in 2007 for her contributions to electric reliability, and was named one of the top 100 movers and shakers in Smart Grid 2012 by Greentech Media.

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THREE FACTORS TO CONSIDER IN SOLVING THE CONSUMER ENGAGEMENT PROBLEM By Chris Black

Consumers today have more power than ever. They use it to engage with companies using any medium at their disposal, be it mobile, social or online. Companies are struggling to meet these new demands while focusing on business fundamentals – deliver value, decrease costs, and improve satisfaction.

Utilities face the same challenge coupled with the added pressure of meeting energy efficiency mandates under severe cost pressure. A multitude of new technologies are cropping up to solve these problems by engaging the consumer. Software solutions that give consumers greater access to their energy can lead to many benefits. With such a variety of choices that promise to meet energy efficiency targets, deliver customer satisfaction, or reduce costs, utilities should consider three factors.

1. FLEXIBILITY

Each utility has a unique set of needs – diverse customers, diverse homes, different energy sources, and a variety of geographic regions. So, the search is on for a software solution that solves a specific organizational need. Like giving customers the ability to compare their bills to previous months, or years. Modifying this feature should

be possible. And the flexibility shouldn't stop there. It should extend to all reports, web interfaces, email templates, and more. Utilities should leverage software that's tailored to its business goals – not be satisfied with simply applying their logo and color palette to another's design.

2. ANALYTICS

These days, data is THE critical component of customer engagement. Consumers today revel in and take advantage of the scores of information available at their fingertips. Utilities can do the same. With superior analytics, utilities can segment their customers to target and personalize communications that address their business goals. Goals to lower operating costs, increase revenue opportunities, improve customer satisfaction, or optimize energy use.

Armed with actionable data insights generated from customer engagement applications, utilities can formulate smarter, better ways to engage. Identifying the ideal customer segments for cross-channel revenue opportunities, for targeted pricing, or for forward-thinking demonstration programs, just a few benefits of a data-driven customer engagement solution.

3. OPEN PLATFORM

Never underestimate the power of innovation. Innovation brought on by the coming wave of applications in the energy and utility industry. Remember when telephones were used only for completing calls? How about when people purchased a GPS unit for navigation, or when emails could be sent only from a computer? Today, apps power all these functions on one device.

Utilities should look to solutions built on a platform that will breed countless applications spanning across all its business units. One platform should support applications that not only enable customer engagement, but also analytical capabilities, customer service operations, detailed reporting, self-service capabilities, the list goes on. With open platforms like Android, consumers have more power to engage than ever. The adoption rate of devices powered by these open platforms illustrates this power. Utilities should expect the same. On an open platform utilities can adapt. On an open platform, utilities can thrive. ●



MAKING INNOVATION A PRIORITY - SECURING THE FUTURE GRID *By FierceSmartGrid*

As high-profile terrorism and cyberattacks take place seemingly daily around the world, energy industry experts and professionals have rightly begun to worry about the possibility of attacks on the power grid. President Obama has tasked the National Institute of Standards and Technology with more tightly defining critical infrastructures and assisting owners and operators of these critical points when potential threats arise, pointing to growing concern at the federal level. Many analysts say that it is a matter of when, not if, an attack will occur, and there is an industry debate currently taking place on how best to tackle this issue. These debates often focus on the power grid and its two major security weak points.

In light of all of the recent challenges surrounding the power industry, cybersecurity may currently have the most potential of all of the innovation arenas.

The physical infrastructure of the grid, its first major weak spot, is impossible to completely secure due to its size and geographic diversity. Experts tend to rank the critical nodes in the physical infrastructure in order of their importance to system stability, and each node should ostensibly have a level of protection that is determined by this ranking.

Protocols for access and maintenance are developed that dictate who has access to these nodes, and when. In this way, an approach to securing the physical grid is beginning to evolve in the industry. But an undertaking of this magnitude is slow and expensive, especially since so many disparate yet interconnected systems must be accounted for.

The second major weakness is the growing electronic network that is becoming the de facto nervous system and control center for more of the grid every day. This system is being created from the ground up, and many experts advocate incorporating security integration into industry standards in an effort to build security into the system from the top down instead. As a relatively new field, and one that is notoriously hard to fully secure, those in power grid network protection are still in the process of determining how best to plot its future. IT professionals, power system and telecommunications engineers and system managers at all levels are just within the last decade beginning to understand and debate the extent of the risk and involvement required of securing these massive and critical data and control networks.

The world has already seen a number of cyberattacks strike a chord with the power industry. The Stuxnet worm discovered in Iran a few years ago targeted and sabotaged that country's industrial control systems, a sobering wake-up call to those tasked with managing substations, control centers and other industrial systems. Other attacks, such as Duqu, which gathered system information utilizing a structure

similar to Stuxnet, and Flamer, which used Bluetooth technology to gather private data from remote devices, indicate that cyberattacks are not a passing fad and often employ advanced methodologies. In addition, the fact that a governmental system was targeted in an apparent attempt to destabilize it gives further pause to those who manage native systems that may become targets

of international retaliation. All of this activity tends to strengthen the prevailing industry assumption that system security is quickly becoming one of the most important points of focus for utilities.

These two major weak spots in the power system are closely interrelated, but they must be secured in fundamentally different ways. An additional factor in the complexity of protecting the power grid is the interdependence of power utilities coupled with each utility's individual cybersecurity

policies. If policies across utilities run counter to each other, the interconnectedness of the systems, which is designed to improve reliability, could end up undermining security efforts.

In a move that shows how seriously the federal government is taking this issue, the new Department of Energy head Ernest Moniz recently announced an allocation of nearly \$30 million for projects that will focus on improving the early detection of and responses to cyberattacks on

power and fuel grids. Many of the companies receiving this funding focus on communications integrity around substations and the last mile headend back to the utility server bus, increasing compatibility between legacy and newer devices, and early intrusion-attempt detection. With this new round of funding we should expect to see a strong push forward in the interest in this sector, along with a better level of understanding as to what is required to fully prepare for a cybersecure power infrastructure.



Many analysts say that it is a matter of when, not if, an attack will occur, and there is an industry debate currently taking place on how best to tackle this issue.

In light of all of the recent challenges surrounding the power industry, cybersecurity may currently have the most potential of all of the innovation arenas. The synergy of upgrading the physical power infrastructure and the looming danger of system attacks make cybersecurity one of the most exciting and critical areas of opportunity in the energy field. As C-level executives continue to improve their understanding of the risks involved in lax system security, we can expect to see a lot of scrutiny and investment in this sector. Those companies poised to help utilities prepare for cyberattacks and step in when the big one hits will most certainly prove quite successful. ●

THE DOUBLE EDGED SWORD OF ENVIRONMENTAL REGULATION *By FierceSmartGrid*

Regulatory environments can be complex and difficult for anyone other than specialists to fully understand. These regulatory environments can play large parts in the progress of industries, both in moving industries forward and in stopping evolving industries during critical phases. The power industry is certainly no exception; it may actually be the ultimate example of an industry with a powerful yet convoluted regulatory landscape. While there aren't many industries that have entities that qualify as natural monopolies, the ones that do must deal with strict rules and regulations set forth by the governing regulatory bodies. The evolution of the power industry in particular is strongly influenced by both federal and state regulatory decisions, and these must necessarily be a consideration when attempting to analyze and predict the future of the industry. Many industry analysts seem to be reaching a similar conclusion: The traditional utility business model is changing with the advent of new technologies, and the regulatory environment needs to adapt, too.

Although often seen as a hindrance to the innovation process, regulations can actually have a subtle positive effect on the market. The Porter hypothesis posits that, although environmental regulations may limit certain applications and operations, these same regulations can actually lead to advances in cleantech innovation. This phenomenon occurs when you have firms that pay close attention to environmental regulations affecting them, and have a mature understanding of the industry in which they operate, giving them a distinct advantage

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over less astute competitors. This advantage, coupled with informed insight into short- and long-term future regulatory changes, can give a manufacturer the edge it needs to break out and bring a successful product to the market.

In the transmission world, the Federal Energy Regulatory Commission's Order 1000 has threatened to change the way public utilities approach planning by requiring increased interregional coordination and public planning procedures. Utilities are currently pessimistic about how Order 1000 will impact the already lengthy transmission planning phase, but the improvements in planning and communication could lead to a decrease in design redundancy. There are undoubtedly innovative thinkers in the industry watching developments and formulating ways to take advantage of the



big changes in store for the transmission world.

On a different regulatory front, President Obama's "Climate Action Plan" is threatening to upend traditional energy source financing. By targeting coal-fired plants and their carbon dioxide emissions, the plan has the potential to move billions in generation investment money toward more renewable sources. If coal plant emissions are limited to the level that many are predicting, it could effectively halt all new coal plant production, leading to one of the biggest shifts in power generation in the history of the industry. With natural gas as coal's obvious successor, expect to see a spike in gas plant construction — at least until that fuel source is similarly throttled. With any change comes opportunity for subtle evolution to occur, and the industry should also expect to see renewables strongly benefiting from the shift. In addition, regulatory changes for existing plants are slated for the middle of 2014, as directed by the president's action plan. Expect to see both a fight and a big change around this time next year.

As these paradigm shifts are occurring in the power industry, investors and analysts are wondering: Are entrepreneurial firms counting on particular changes in the sector? Who among the innovators is leveraging their research and knowledge to correctly gauge the near-term movements of the industry? Undoubtedly, and according to the Porter hypothesis, some forward thinkers will be prepared for the upcoming shift and will benefit based on their knowledge and foresight. ●



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RELIABILITY IMPROVEMENT GOALS HIGHLIGHT OPPORTUNITIES AND HURDLES *By FierceSmartGrid*

As commercial and industrial customers keep raising expectations for utilities to improve their reliability of service, the power industry should expect to see distribution automation and intelligent electronic devices continue to proliferate. These devices are making their way into distribution substations, rural feeder lines and remote factories, improving power delivery and minimizing outages and costly downtimes. With an expected 1,300 percent growth in smart meters worldwide over the next seven years, reliability numbers should continue to improve significantly as these endpoints feed into distribution automation schemes and keep the power flowing.

On the other hand, some technological advances are

introducing new system disturbances. Variable resources like wind and solar feeding into the system, as well as increasingly frequent and higher-intensity weather storms, tax the electrical infrastructure in new and unprecedented ways. Fortunately, advances in technology are offsetting these disturbances, using fast response circuit reclosing, pre-emptive LIDAR forensics, and other creative solutions to these potentially system-crippling problems. Innovators continue to stay ahead of Mother Nature's slings and arrows — but what disturbances are coming next, and how will the industry deal with them?

With smart meters and intelligent electronic devices acting as the new system input points, operations

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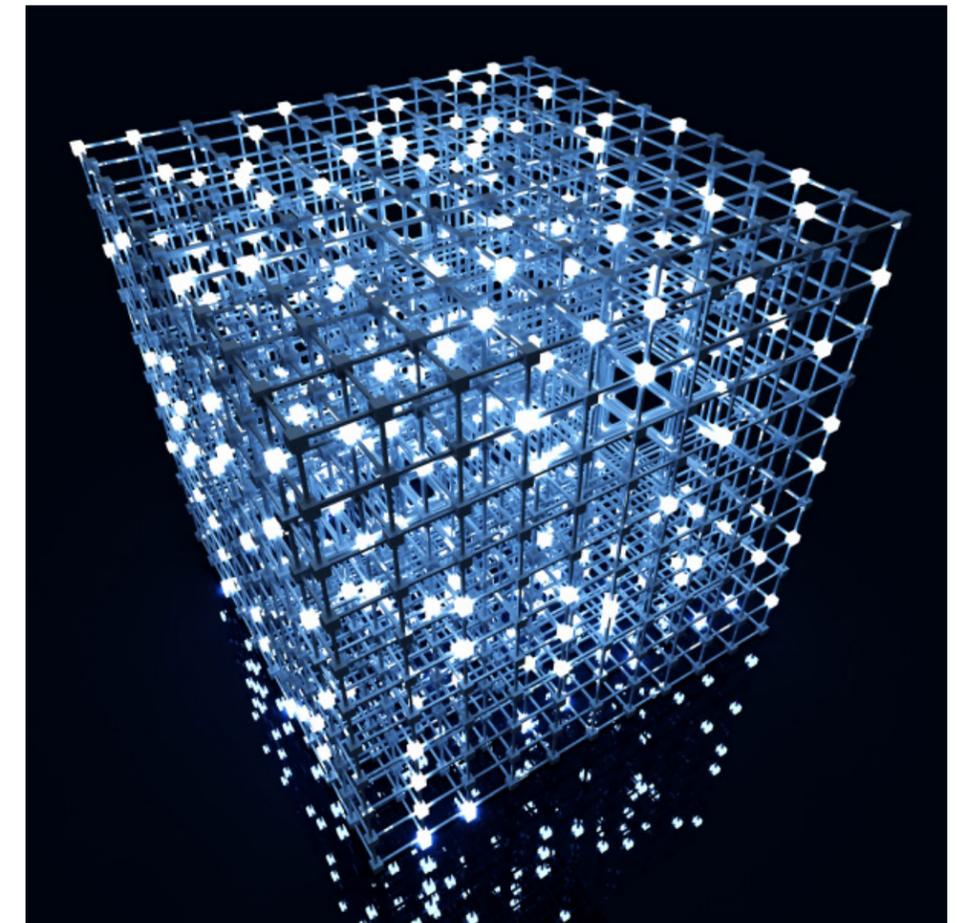
centers fortunate enough to be using an integrated advanced metering infrastructure are now able to respond much more quickly to momentary and extended disturbances. Whereas in the past a call from a disconnected customer was usually the first sign any company had of an outage, utilities with advanced metering infrastructures are now able to leverage their smart meters and distribution automation sensors as fast-acting outage notifiers, and they are sometimes able to get the power back on before anyone notices it was out. Another upside to these powerful new systems is their ability to log momentary disturbances and point engineers and vegetation management teams to areas with latent fault issues so they can be fixed before they cause widespread outages. All of these new benefits have great potential to improve reliability figures for utilities.

As with all new changes in an

industry of this size and complexity, there are going to be growing pains. Initial costs for new technology are always painful; microtechnology isn't cheap, and the components aren't as sturdy as traditional utility hardware. Large-scale deployments can bring cost levels that are hard to swallow. In the current economic environment, that can turn into a hard sell for customers and shareholders — even though the long-term savings often far outweigh the upfront price tag due to decreased maintenance costs and improved reliability. The key for utilities and the manufacturers selling these products is to build airtight business plans that lay out in precise detail the exact costs and benefits of potential projects. For very large utilities this can mean years of integration planning and interdepartmental business development. For smaller utilities a pilot project may help prove out the financials and push a full deployment forward. While each utility is unique, they all can usually benefit from impartial consultants who have experience with smart network design and build-out.

The early adopters of smart grid technologies have often found it to be a double-edged sword. On the upside, many have benefited from government matching-funds programs and newfound efficiencies discovered during roll-out and analysis. But there are, of course, also risks and technological issues with any new application. These are the typical costs and benefits to be weighed when considering a large cleantech investment.

One example of an unfortunate problem that some utilities are experiencing is an initial downward adjustment to their reliability metrics. In the previous paradigm, if no one notified the utility during



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a momentary outage, then the incident could not be cataloged and tracked. With the new smart meter integrated systems, every momentary disturbance that the outage management system detects must be cataloged and reported. This means that most utilities are seeing an initial downward adjustment of their reliability numbers, due to detecting all of these disturbances

that otherwise would have gone unnoticed. This “readjustment” could be a turnoff to a management team with one eye on metrics. Utilities and innovators working with regulatory bodies and standards and reliability groups, such as those found in IEEE and EPRI, are important to helping change the current climate into one that fosters a better understanding of this recalibration phenomenon, and others like it. This work is crucial to helping ensure that utilities are not penalized for implementing solutions that will eventually lead to improvements in their reliability figures. These early adopters, along with the industry groups and manufacturers, are helping the industry identify the hurdles that everyone will have to clear on the path to a truly smart grid. ●



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**CONGRATULATIONS
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& THANK YOU TO ALL WHO APPLIED

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