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Electric Energy T&D MAGAZINE

MAY-JUNE 2009 Issue 3 • Volume 13

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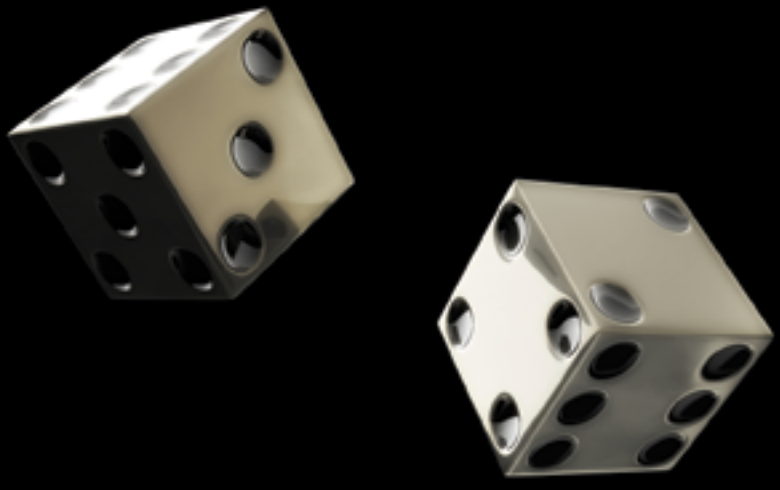
Optimizing Billing and Payment to Deepen Customer Relationships

Confident in your Smart Grid Strategy?



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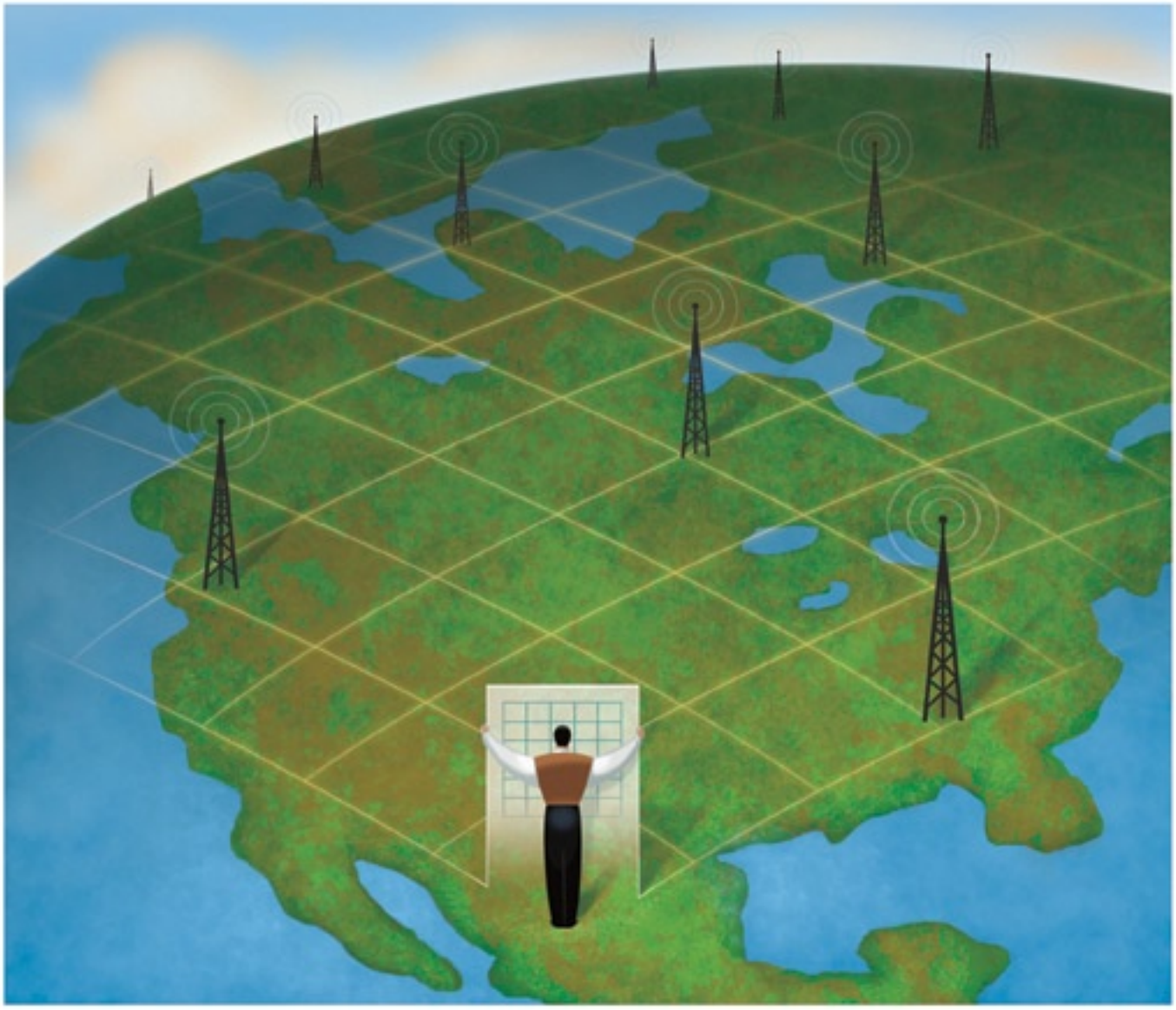

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SENSUS

Michael A. Marullo, Editor in Chief

WELCOME
TO THE MAY/JUNE 2009 ISSUE OF ELECTRIC ENERGY T & D

As most of our regular readers know, May-June is our annual Customer Service & Support issue. Therefore, the Automation/IT Leadership Series interview is with the executive team of one of the most prominent – and arguably, the most unusual – suppliers serving the CIS (Customer Information Systems) marketplace. That company is Harris Computer Systems of Ottawa, Ontario. Why do I say unusual? Well, how many companies do you know that actually compete with themselves… intentionally?!

Jeff Bender, Harris' CEO, prefers to call it *Customer Choice*, and thanks to a string of synergistic acquisitions over the past few years, his company provides a breadth and depth of product offerings that might legitimately challenge the notion that you can't be everything to everyone. In any case, I think you'll be intrigued by the way Harris has woven together a network of companies into one of the most successful companies in the automation/IT business. We think you'll enjoy taking this brief tour of the inner sanctum of this interesting company and learning more about their unique business model.

This issue also contains the second installment of 2009 in our *Executive Directions* series. My interview is with Elliott Boardman, Executive Director of the Peak Load Management Alliance (PLMA), an organization dedicated to the principles of Demand Response (DR). These days, DR is one of the fastest growing areas in the marketplace as the whole notion of broad-based demand reduction as both a cost saving and environmentally conscious set of conservation initiatives takes hold.

The LightsOn feature in this issue is similarly – and we think, appropriately – focused on DR, illustrating just how creative suppliers and utilities can be when they focus their ideas and innovation squarely on saving energy. The system makes use of Southern California Edison's existing SCADA network, comprising two communications channels: A satellite network and a separate radio network with events capable of being scheduled through either network, independent of one another.

Our featured article in this issue by Fiserv (formerly CheckFree) examines the growing acceptance of Electronic Bill Payment & Presentment (EBPP). EBPP is not a new concept, but rather one that is now rapidly gaining momentum, especially with Internet usage on the rise and becoming more of a basic necessity with each passing day.

Indeed, a 2008 study by Javelin Strategy & Research focusing on electronic payments predicted that 83 million households would be banking online by 2013, with 45 million paying bills through banks and credit unions. Among other things, the Fiserv article delves into both the challenges and opportunities associated with the projected rise in EBPP as well as tips for motivating customers to develop their online experience with utilities through various forms of electronic payment acceptance.

Javelin also forecasts that 56 million consumers will view bills at the billing organization websites, while 54 million will pay bills there, which strongly suggests that EBPP is at the very least, a way – if not the way – of the future.

Two utility case studies – one at Nevada Power (one of America's largest and most progressive utilities), and another at Blue Water Power (a Canadian distribution utility in Sarnia, Ontario, located about 65 miles northeast of Detroit and the result of a merger of six local utilities in the year 2000) provide intimate assessments of how automation and technology have been harnessed to address the daunting challenges of rapid growth and organizational expansion.

Fault isolation, detection and restoration (FDIR) is a topic that we're hearing more and more about as utilities, consumers and suppliers alike wrestle with the looming issues surrounding grid reliability and integrity. The article by three of ABB's top power engineering specialists walks us through the methods and technologies associated with reducing customer outage duration, improving service reliability and taking a major step toward achieving the self-healing distribution network we increasingly associate with Smart Grid initiatives.

As we navigate the uncertain waters of a volatile economy, we eagerly await the promise contained in a massive economic stimulus package intended to provide funding for the huge backlog of projects long overdue to repair, restore and modernize our aging infrastructure and help stem the decline in power engineering staffers. Trying to understand exactly how these dollars will affect the power industry, however, can be a very difficult task for even the most knowledgeable individuals.

To that point, the article from Gregory K. Lawrence – a partner in the Energy and Derivatives Markets Group of global law firm McDermott Will & Emery – offers up-to-date guidance and insights relative to recent FERC actions and a glimpse into the role that standards will likely play in the implementation of FERC's Smart Grid plans. Perhaps even more interesting, however, is the rate recovery component of the overall plan – a topic that has remained on most utility agendas ever since talk of grid transformation and the term "Smart Grid" first became part of our industry vernacular.

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Echelon and T-Mobile Announce Alliance to Reduce the Cost of a Secure Smart Grid Network for Utilities

San Jose, Calif., & Bellevue, Wash.- Echelon Corp. (NASDAQ: ELON) and T-Mobile USA, Inc., announced an alliance to accelerate the adoption of the smart grid in the North American market by reducing the communications cost of smart meters through the deployment of Echelon's Networked Energy Services (NES) system over T-Mobile's GSM cellular network. As part of the agreement, Echelon will utilize a first-of-its-kind embedded T-Mobile SIM within a cellular radio module to enable all the Echelon smart meters on a given low voltage transformer to communicate back to the utility over the smart grid, and T-Mobile will offer users of Echelon's NES system innovative and cost-effective pricing plans for data usage.

Many advanced metering infrastructure (AMI) systems in the North American market require utilities to deploy their own wireless communications infrastructure, encumbering the utility with the initial cost of building the network and with the ongoing maintenance costs required to keep it operating reliably. Public wireless telecommunications networks have been built to sustain the high-traffic needs of the consumer market and are very reliable. This joint announcement allows electric utilities using Echelon's NES system to take advantage of the enormous investment that T-Mobile has made in its network and to leverage the 24/7 maintenance commitment of T-Mobile to keep its network operating at maximum efficiency.

Echelon's NES advanced metering infrastructure is leading the worldwide transformation of the electricity grid into a smart energy network, and T-Mobile USA's nationwide network serves more than 32 million customers with reliable wireless voice and data services.

"We believe the initiative we have announced today with T-Mobile should fundamentally change the way utilities in North America think about deploying AMI systems," said Jim Andrus, Echelon vice president of NES Sales Americas. "While the investment in coverage, reliability and security of carriers such as T-Mobile is unmatched by what a utility could do on their own, the operating costs of public networks have traditionally limited their use in the North American market. In contrast, aggressive pricing plans have made the use of the public cellular networks as the backhaul of smart grid systems the norm in Europe. We believe the programs we have put in place with T-Mobile can have the same impact on the North American market."

John Horn, national director for M2M, T-Mobile USA, said, "Utilizing T-Mobile's robust wireless network allows Echelon and its clients to focus on smart grid solutions rather than on building and maintaining a costly and complex private communications infrastructure. Through this agreement and the exciting introduction of our new pricing plans and embedded SIM — which will deliver a very small, durable solution built to withstand challenging environmental factors such as temperature and humidity — we expect innovation and adoption of smart grid solutions to accelerate."

"T-Mobile is excited to play a meaningful role in providing the communications infrastructure for these innovative services to flourish," Horn added.

About the Solution

The NES advanced metering infrastructure from Echelon consists of a family of highly integrated, advanced electronic electricity meters accessed via a Web services based network operating system over an IP networking infrastructure. More than a simple AMI system focused on billing related services, the NES system enables the backbone of the smart grid, providing utilities with a wealth of information about the status, operation and health of the grid that enables them to reduce operating costs while increasing service quality.

Unlike systems with a dedicated, proprietary radio per metering point, multiple NES meters can share a single IP connection among all the meters on a given low voltage transformer, driving down the per-point connection cost and eliminating the need for the utility to build and maintain a dedicated private wireless network for their meters. When used on the T-Mobile network, one point per transformer will be equipped with T-Mobile's innovative new embedded SIM card, eliminating the need for the utility to build and maintain a private network for backhaul communications.

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By bringing the wide area network connection point down to the neighborhood transformer, this architecture allows a utility to pinpoint problems in its network at a very precise location, eliminating cost and time affiliated with outage detection and improving customer service.
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NERC Launches Key Initiative to Address Leading Cause of Electric Outages

Princeton, NJ - Performance of automated systems designed to protect infrastructure from damage during severe system conditions must be addressed to limit the scope and severity of bulk power system disturbances in North America, said the North American Electric Reliability Corporation in a letter to its stakeholders. Known as "system protection," these systems were a causal factor in nearly 45% of category two and higher system disturbances in 2007 and have contributed to every major system disturbance since 1965.

In the letter, NERC announces a new initiative designed to align a number of ongoing efforts to better address this reliability issue. The initiative prioritizes efforts of most concern, focusing on relay loadability, protection system redundancy, protection system coordination, generator frequency and voltage protective relay coordination, transmission and generation protection system misoperations, and protection system maintenance.

"Widespread outages on the power system are rarely the result of a single factor," commented Rick Sergel, NERC President and CEO. "Grid operators are faced with many unavoidable reliability risks on a daily basis – from severe weather to unexpected, simultaneous equipment failure. It is therefore critical that we reduce those risks under our control," he continued. "System protection performance is one such area, along with vegetation management, operator training, and visualization tools – all of which contributed to the August 14, 2003 blackout. The electric industry has made significant strides in each of these areas over the past five years. This initiative seeks to continue those efforts to ensure reliability in the months and years to come."

Protection system relays are installed on nearly every element of power system infrastructure – from substations to transmission lines to generation plants. Like the circuit breakers or fuses in a home, protection system relays are designed detect problems and open breakers to isolate system components from service during faults (short circuits) and other system conditions to avoid physical damage to the equipment. When they misoperate, these controls can isolate equipment from service unexpectedly or may not isolate equipment when they should. Such misoperations can cause or significantly worsen system disturbances.

"We look forward to working with the electric industry and System Protection and Controls Subcommittee to address these recurring issues, improve protection system performance, and, thereby, limit the scope and severity of future system disturbances," commented Bob Cummings, Director of Event Analysis and Information Exchange at NERC.

NOTE: Despite similarity in names, "system protection" does not refer to devices, systems, or schemes specifically designed to improve physical or cyber security.
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Hydro One invests more than $10 million for 230 kV wood pole structure replacements in Northwestern Ontario

Toronto - Hydro One has completed more than half of the pole and arm replacements scheduled on its 230 kV wood pole transmission structures in Northwestern Ontario for this year.

Forty Hydro One workers, with the help of about 15 apprentices, replaced poles and arms on 176 structures on the 230 kV power line from Atikokan to Manitoba. An additional 120 wood pole structures located between Kenora, Dryden and Fort Frances are also scheduled for replacement later this year.

Hydro One will invest approximately $10 million this year on the upgrades. This investment is just a portion of the replacements planned in Northwestern Ontario over the next five years.

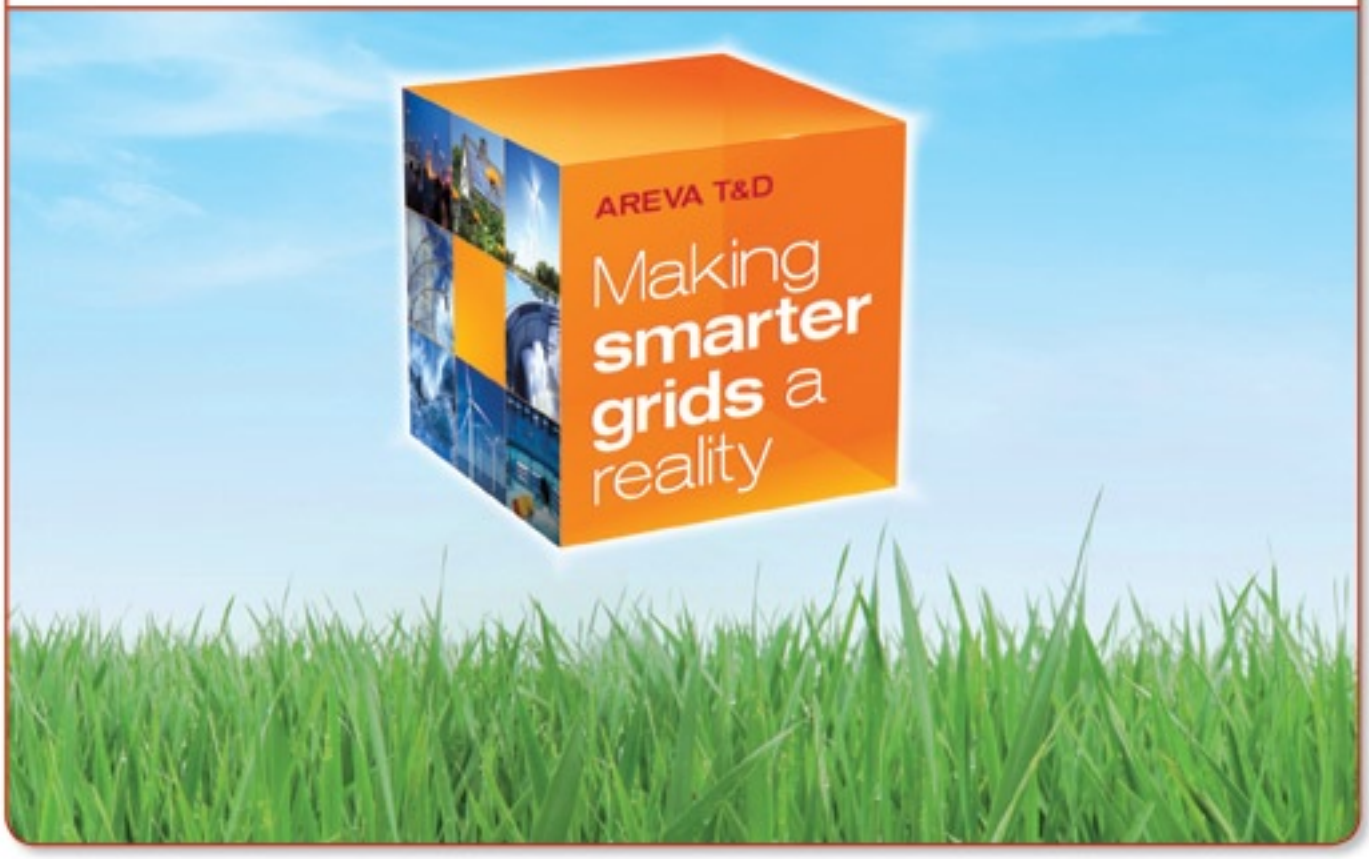
"This project is part of an ongoing program to continually assess the condition of our power system and make significant upgrades to improve overall reliability," said Carmine Marcello, VP, Asset Management, Hydro One. "This work is a reflection of Hydro One's proactive approach to monitoring and improving the transmission system in the Province."

For this project, a new technique is being used to determine if replacement of the structure is necessary. Each pole is tested by drilling into an arm on the structure from a helicopter. A helicopter equipped with an Airstair, a framework that attaches to the undercarriage of the helicopter and allows for safe access to the transmission lines, is used to test and replace poles.

Work on the line from Atikokan to Manitoba started on January 26, 2009 and finished on March 9, 2009. Across the province, approximately $25 million is invested annually into replacing 115 and 230 kV wood pole power line structures. Two Ontario-based companies are supplying the wood poles and steel arms for this project.

KEY QUESTION FOR THE FUTURE

Can we make the grid **greener** and **more efficient**? Yes.



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Hydro One delivers electricity safely, reliably and responsibly to homes and businesses across the province of Ontario and owns and operates Ontario's 29,000 km high-voltage transmission network that delivers electricity to large industrial customers and municipal utilities, and a 122,000 km low-voltage distribution system that serves about 1.3 million end-use customers and smaller municipal utilities in the province. Hydro One is wholly owned by the Province of Ontario.

Our oral and written public communications, including this document, often contain forward-looking statements that are based on current expectations, estimates, forecasts and projections about our business and the industry in which we operate and include beliefs and assumptions made by the management of our company. Such statements include, but are not limited to: expectations regarding developments in the statutory and operating framework for electricity distribution and transmission in Ontario including changes to codes, licenses, rates, rate orders, cost recovery, rates of return, rate structures and revenue requirements in both our transmission and distribution businesses and the timing of decisions from the OEB; expectations regarding our financing activities; statements regarding the pension asset transfer; statements regarding future capital expenditures and our investment plans; expectations regarding the results of our projects; statements regarding future pension contributions; the estimated impact of changes in the forecast long-term Government of Canada bond yield (used in determining our regulated rate of return) on our results of operations; and statements about IFRS. Words such as "expect," "anticipate," "intend," "attempt," "may," "plan," "will", "believe," "seek," "estimate," and variations of such words and similar expressions are intended to identify such forward-looking statements. These statements are not guarantees of future performance and involve assumptions and risks and uncertainties that are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed, implied or forecasted in such forward-looking statements. We do not intend, and we disclaim any obligation to update any forward-looking statements, except as required by law.

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Engineer Shortage Puts Green Economy and Smart Grid at Risk
Collaborative Develops Strategy for Change

- As a cornerstone of his energy, environment and economic plans, President Barack Obama urges the country to transform its energy system to make it greener and smarter. But a growing shortage of electric power and energy engineers will make the path to reaching that vision rocky. Due to the aging electrical engineering workforce and educators, there may not be enough engineering support to design, build, operate and maintain the kind of reliable electric energy system that is required in the future.

"The current graduation rate from U.S. university electric power engineering programs is not sufficient to meet our nation's current and future needs," commented Wanda Reder, President, IEEE Power & Energy Society, and chair, Executive Council, U.S. Power and Energy Engineering Collaborative. "As an industry, we are working to build a new generation of electric energy resources, transmission lines and distribution infrastructure. At the same time, we want to help customers use energy wisely, reliably integrate renewable generation, secure the grid from cyber attacks, reduce carbon emissions, and make the grid smarter. Steps need to be taken today to develop the electric power engineering workforce for all of this to become possible."

In response to critical concerns about the power and energy engineering workforce and the education system that supports it, the U.S. Power and Energy Engineering Workforce Collaborative, led by the IEEE Power & Energy Society, has developed a sweeping and detailed action plan. The plan is published in a 14-page report entitled Preparing the U.S. Foundation for Future Electric Energy Systems: A Strong Power and Energy Engineering Workforce. It calls upon industry, government and educational institutions to take specific, reasonable and immediate actions to attract more young people to electric power engineering and to support the education system that will make them highly-qualified engineers.

The Problem

Within the next five years, an estimated 45 percent of engineers in U.S. electrical utilities will be eligible for retirement or will leave for other reasons, according to a 2008 survey by the Center for Energy Workforce Development. That percentage translates into some 7,000 power engineers that will be needed in the electric utility industry alone. But the problem doesn't stop there. According to the report, two to three times as many electric power engineers may be needed to fulfill the needs of the entire economy.

The Collaborative analyzed university survey data and concluded that the current graduation rate from university electric power engineering programs is not sufficient to meet the need. The good news is that enrollments in electric power and engineering programs are increasing. The bad news is that they are not rising fast enough, and interest in science, math and technology is low in K-12 students. Enrollments are declining in electrical engineering in general. Among students, teachers, guidance counselors and parents, engineering is ranked low on the list of interesting and attainable professions. Furthermore, women are especially underrepresented in the industry and as students.

Even if universities and colleges were teeming with engineering students, the educational institutions may not be well equipped to handle the demand. The Collaborative estimated that within the next five years, 40 percent of full-time senior engineering faculty will be eligible for retirement and that 27 percent may actually do so. A number of historically strong power engineering programs have ended or are close to doing so. Emerging programs provide hope for the future, but more support is needed. "Besides educating the next generation of power engineers, universities are sources of technology innovations needed for our nation's energy future," Reder says.

The Solution

The shortage may be dire, but a turnaround is possible, as long as stakeholders in the industry, government, and education take concrete steps to recruit more bright minds to the power engineering field and provide top-notch educational opportunities.

In its report, the U.S. Power and Energy Engineering Workforce Collaborative outlines measurable goals that a range of stakeholders can take.

The report advocates immediate action to:

1. Double the number of graduate and undergraduate students completing electric power and energy engineering degrees.
2. Provide $4 million in funding annually for undergraduate power engineering scholarships.
3. Create 2,000 internship and cooperative opportunities for electrical engineering students.
4. Hire 80 new faculty members over the next five years to replace retiring faculty, to meet increased enrollments, and to broaden educational offerings.
5. Raise annual research funding of university power engineering research by up to $50 million per year over the next five to eight years.
6. Create five University Centers of Excellence to conduct research and education, while also working to increase interest and advance expertise in the power and energy engineering field.

In easy-to-reference lists, the Collaborative's report outlines specific steps that stakeholders can take to meet these goals. For example, state and federal regulators are encouraged to consider how regulatory policies and practices might help industry and the educational community respond to engineering workforce challenges.

The complete report can be downloaded at *www.ieee.org/go/pes-collaborative*.

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PHI Showcases Shovel Ready Smart Grid Projects on Capitol Hill - Pepco Holdings, Inc, Participates in AMI Presentation to US Senate Staff

Washington - On Monday, April 20, Pepco Holdings, Inc. (PHI), participated in a wide reaching presentation of Advanced Metering Infrastructure (AMI) projects to US Senate staff. The event held in the Hart Senate Office Building also featured major AMI vendors and PJM Interconnection, the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.

William Gausman, PHI Senior Vice President for Asset Management and Planning, delivered the presentation that showcased the AMI shovel ready projects of the corporation's three electric distribution companies Pepco, Delmarva Power and Atlantic City Electric. "We wanted the Senate staff to have a clear visual concept of how PHI's AMI/Smart Grid technology will increase the reliability of the electric system by providing early detection of outages and the ability to automatically isolate damage so that power is restored quickly and safely," explained Gausman.

To that end, PHI has selected Silver Spring Networks (SSN) to provide the networking products and services necessary to build its Smart Grid network. PHI has also contracted with GE Energy and Landis+Gyr to provide the first of what could be nearly two million smart meters for installation in the homes and businesses of its customers in New Jersey, Delaware, Maryland and the District of Columbia over the next five years.

Smart meters record electricity usage in more detail than conventional meters and customers will be able to access and use this information to better manage their energy bills.

PHI is one of the largest energy delivery companies in the Mid-Atlantic region, serving about 1.9 million customers in Delaware, the District of Columbia, Maryland and New Jersey. PHI subsidiaries Pepco, Delmarva Power and Atlantic City Electric provide regulated electricity service; Delmarva Power also provides natural gas service.

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PHI provides competitive wholesale generation services through Conectiv Energy and retail energy products and services through Pepco Energy Services.
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Oracle Buys Sun

Redwood Shores, CA - Oracle Corporation (NASDAQ: ORCL) and Sun Microsystems (NASDAQ: JAVA) announced they have entered into a definitive agreement under which Oracle will acquire Sun common stock for $9.50 per share in cash. The transaction is valued at approximately $7.4 billion, or $5.6 billion net of Sun's cash and debt. "We expect this acquisition to be accretive to Oracle's earnings by at least 15 cents on a non-GAAP basis in the first full year after closing. We estimate that the acquired business will contribute over $1.5 billion to Oracle's non-GAAP operating profit in the first year, increasing to over $2 billion in the second year. This would make the Sun acquisition more profitable in per share contribution in the first year than we had planned for the acquisitions of BEA, PeopleSoft and Siebel combined," said Oracle President Safra Catz.

"The acquisition of Sun transforms the IT industry, combining best-in-class enterprise software and mission-critical computing systems," said Oracle CEO Larry Ellison. "Oracle will be the only company that can engineer an integrated system – applications to disk – where all the pieces fit and work together so customers do not have to do it themselves. Our customers benefit as their systems integration costs go down while system performance, reliability and security go up."

There are substantial long-term strategic customer advantages to Oracle owning two key Sun software assets: Java and Solaris. Java is one of the computer industry's best-known brands and most widely deployed technologies, and it is the most important software Oracle has ever acquired. Oracle Fusion Middleware, Oracle's fastest growing business, is built on top of Sun's Java language and software. Oracle can now ensure continued innovation and investment in Java technology for the benefit of customers and the Java community.

The Sun Solaris operating system is the leading platform for the Oracle database, Oracle's largest business, and has been for a long time. With the acquisition of Sun, Oracle can optimize the Oracle database for some of the unique, high-end features of Solaris. Oracle is as committed as ever to Linux and other open platforms and will continue to support and enhance our strong industry partnerships.

"Oracle and Sun have been industry pioneers and close partners for more than 20 years," said Sun Chairman Scott McNealy. "This combination is a natural evolution of our relationship and will be an industry-defining event."

"This is a fantastic day for Sun's customers, developers, partners and employees across the globe, joining forces with the global leader in enterprise software to drive innovation and value across every aspect of the technology marketplace," said Jonathan Schwartz, Sun's CEO, "From the Java platform touching nearly every business system on earth, powering billions of consumers on mobile handsets and consumer electronics, to the convergence of storage, networking and computing driven by the Solaris operating system and Sun's SPARC and x64 systems. Together with Oracle, we'll drive the innovation pipeline to create compelling value to our customer base and the marketplace."

"Sun is a pioneer in enterprise computing, and this combination recognizes the innovation and customer success the company has achieved. Our largest customers have been asking us to step up to a broader role to reduce complexity, risk and cost by delivering a highly optimized stack based on standards," said Oracle President Charles Phillips. "This transaction will preserve and enhance investments made by our customers, while we continue to work with our partners to provide customers with choice."

The Board of Directors of Sun Microsystems has unanimously approved the transaction. It is anticipated to close this summer, subject to Sun stockholder approval, certain regulatory approvals and customary closing conditions.

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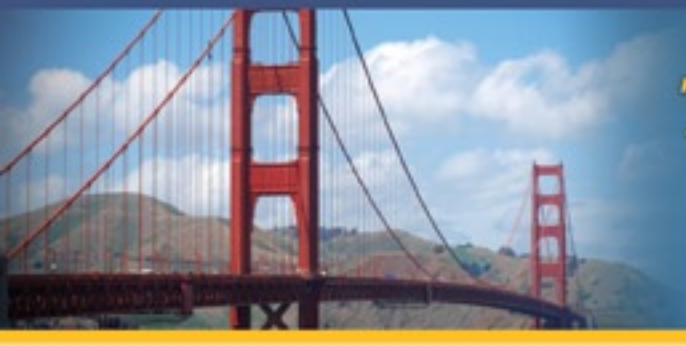

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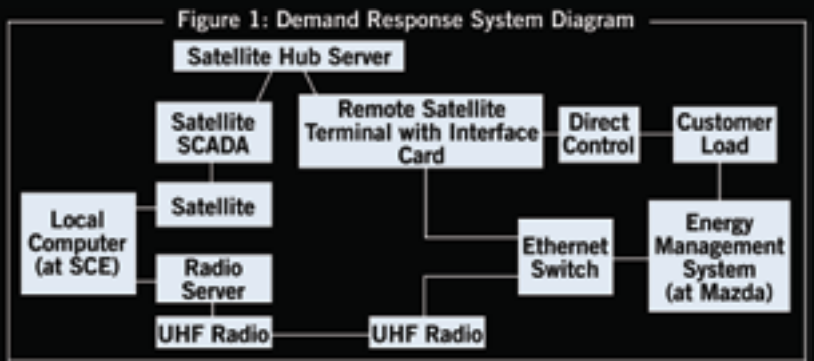
LightsOn

Widespread Use of Satellite-Based Demand Response System Would Save Energy, Reduce Emissions, Enhance Security

As we make greater use of information technology in developing the Smart Grid of the Future, careful consideration should be given to the substantial savings in energy and reductions in CO_2 emissions – potentially thousands of tons per day – that can be realized with systems capable of shedding loads in a matter of seconds. These systems can be used in place of the generators that are currently kept online to meet spinning reserve requirements and can also be used to smooth the intermittence of renewable energy sources. Moreover, when properly designed, grid security can actually be enhanced using the methods described here.

Figure 1: Demand Response System Diagram



Last year – as a demonstration project – Southern California Edison (SCE) asked Visionary Electronics to design a Demand Response system that would allow them to monitor the load at remote customer sites and schedule curtailment events during peak loading emergencies when SCE needed the customers to use less energy. The customer selected for this demonstration was the Mazda Corporate headquarters and Mazda R&D facilities in Irvine, California. Mazda agreed to participate in order to help SCE develop technologies that would lead to greater energy efficiency.

The resultant system uses SCE's existing SCADA network. There were two communication channels that were used for the demonstration. The first was a K-Band satellite network and the second was a UHF radio network. Events could be independently scheduled through either network. A block diagram of the system is shown in **Figure 1**.

Demand Response System Operating Modes…

Three (3) Modes of Operation:

Event Type	Event Description	Approximate Time
Schedule Future Event	Send Start Time, Hour; Start Time, Minute; Duration; Demand Level, and Event ON	48 Seconds
Change Demand Level	Send Demand Level	15 Seconds
Direct Control	Toggle Customer Load Off/On	3 Seconds

Figure 2 is a screen shot of the computer program that resides at SCE to control the remote Energy Management System at Mazda.

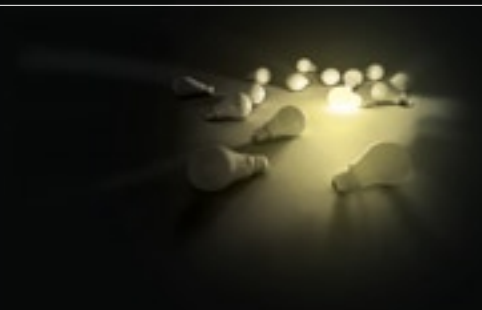


Figure 2: Screen Shot of Mazda's Load Shedding Events (as seen from utility)

The primary function of the program is to define a future event by entering the start time, duration, and demand level, where higher demand levels represent more aggressive load shedding. In this case, the different demand levels are implemented by changing the set-points on the HVAC systems at the two locations. As a matter of policy, however, SCE does not specify how or which loads are to be shed. It is up to the customer to decide how they want to conserve energy during an active event.

Once an event is defined, it can be posted through either the radio link or over the satellite network. For the radio link, the system supports posting a new event, canceling a pending or active event, changing the demand level on a pending or active event, or reading the meters in real time. Communication from the program to the remote site goes through the corporate LAN to the radio server, over the radio link to the remote station, and through the Ethernet switch at the customer's site to the customer's Energy Management System. For this link, the XML commands that are native to the customer's EMS are generated by the program and sent (as is) over the radio network.

While the event is active, the program reports the baseline KW, the KW drop that is expected, the actual average KW, and the actual kWh reduction that is occurring to date. Event details can also be viewed for past events. Using the spinner wheel in the upper left-hand corner of the Event Details box can bring up a past event, and the data for a particular time of the event can be selected with the tracker bar in the lower right-hand corner.

The satellite link also supports posting, changing, or canceling events and reading the meters in real time. Communication over the satellite link goes from the program over the corporate LAN to the satellite hub server. Electronics inside the satellite hub server translate the commands received into commands that are in the protocol native to the satellite terminal (bitwise CDC Type-1 commands). The commands are then transmitted over the satellite network to the remote satellite terminal.

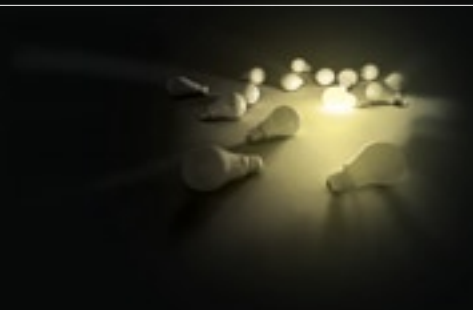
The remote satellite terminal has a specially designed interface card, which is installed inside the terminal as shown in **Figure 3**.

This interface card has an Ethernet port that acts as a client to the Ethernet switch at the customer's site. Commands that are received over the satellite network that are meant for the customer's EMS are translated from the CDC Type-1 commands into the XML commands that are native to the customer's EMS.

The interface card also has output relays, so this link also supports direct control of the customer's load. With this control, the load can be shed without the delays associated with the customer's EMS and it can be shed in less than 3 seconds. In California, the footprint for the satellite system covers the entire state, allowing loads to be shed from multiple locations anywhere in the state in less than 3 seconds.

Load shedding is increasingly seen as a valuable resource for managing the grid. And, the faster a load can be shed, the more valuable it becomes. Two areas where load shedding can be valuable are to meet spinning reserve requirements and for regulation.

Figure 3: Special interface module installed inside remote satellite terminal



To meet the spinning reserve requirements, the current practice is to keep generators on line synchronized to the grid in order to deal with any sudden spikes in load or loss of generation. In the western United States, the WECC (Western Electricity Coordinating Council) spinning reserve criterion is that sufficient resources need to be available to be able to deal with the simultaneous outage of the two largest generators in the Western Interconnection – a NERC "Category C" event.

Instead of keeping generators online, the Demand Response system could drop load elsewhere on the grid to meet this criterion. And, since the Demand Response system has zero emissions, a system of this sort would save the CO_2 that is being emitted by the spinning reserve generators.

Such a system would have very little impact on the customers whose load was being dropped. If the event were short lived, the affected customers would be back online in a few minutes. If the load needed to be off for a longer period, the system could cycle through to other customers such that no single customer would experience prolonged down time. It is anticipated that most of the load that would be put on such a system would be HVAC systems. Therefore, the affected customer(s) would typically be completely unaware that their load had been dropped, resulting in little or no customer inconvenience.

To get a rough estimate of the amount of CO_2 that would be saved, we can conservatively say that the savings in energy would be in the 1-2% range or even as high as 3-4%.

We can use the state of California as an example of what the actual savings might be. If we use the most conservative (1%) value and take a statewide estimate of load to be 25,000 MW for 20 hours on a typical day, the estimated potential savings would be:

25,000 MW x .01 = 250 MW x 20 hrs/day = 5,000 MWh/day

It is generally accepted that 1 ton of CO_2 is generated for every 1,200 kWh of electricity. Thus, our conservative (1%) estimate of CO_2 savings is:

5,000 MWh/day x 1 ton CO_2 / 1.2 MWh ≅ 4,200 tons CO_2 / day

If the actual savings were in the 3-4% range the savings would climb to 12,000 or 16,000 tons of CO_2 per day. Remember that these are the savings that would be realized in just one state; expanded use would increase these savings substantially.

There are also other advantages of such a system. First, since it would replace the need for peaking power plants, fewer power plants would need to be built which would save money and lower pollution levels.

A satellite-based demand response system would also be useful in dealing with the intermittence of the renewable energy sources that will play an increasingly important role in future energy strategies. It could be used to store energy while the sun is shining and the wind is blowing and decrease the load when the opposite is true. Two areas where the energy can be stored are in the batteries of the coming fleet of plug-in hybrid cars and as thermal energy in HVAC systems and refrigerators.

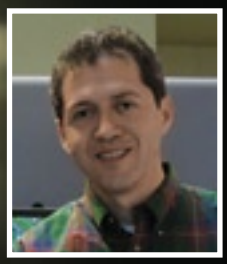
While installing such a system will be labor intensive, demand response systems create jobs and ultimately result in significant economic benefits. The cost of the hardware itself is dropping, further improving economically feasibility. At today's prices, the cost of a satellite system would be under $2,000 per remote terminal, including amortizing the cost of the hub. Then, once a satellite terminal is in place, it can communicate with numerous sites via less expensive radio links.

Radios with a range of a mile currently sell for less than $100 each. As the number of radios hosted by a particular satellite terminal surpasses 50-100 units, the cost of the satellite terminal component becomes increasingly insignificant in relation to the overall cost per site.

Demand response systems need not create a security risk. In fact, if properly designed, the security and system integrity of a system like the one described here can be very high since the system can be completely segregated from the Internet, and there are no wires to cut. Also, there could be any number of completely redundant, overlapping hubs, any or all of which could be placed in secret locations, if warranted. And finally, because the redundant hubs are always in continuous communication with the main hubs, the redundant hub can take over in a few seconds should any of the mains fail. Thus, there would be no disruption in functionality at all, even in the event of a primary failure.

In conclusion, it is technically feasible to build a demand response system that could be used to meet the spinning reserve requirement. It could also be used to smooth out the intermittence of renewable energy sources, would be very secure and would result in substantial savings in money and in CO_2 emissions.

About the Authors



Brad McMillan is President of Visionary Electronics Inc., which designs and manufactures hardware and software solutions for the electric power industry. His interest in alternative energy technology began in the early 1980s when he chaired conferences on the subject at San Francisco State University, testified before the House Subcommittee on Energy Development and Applications and provided a report on the subject for the Appropriate Energy Technology program of the U.S. Department of Energy. McMillan holds an MSEE from the University of California, Berkeley.

Edwin Hornquist is Project Manager, Design & Engineering Services at Southern California Edison where his focus has included managing projects related to the utility's Advanced Metering Infrastructure (AMI) initiative, Codes & Standards program, and Demand Response and Energy Efficiency emerging technology assessment projects. Hornquist has over 18 years of experience in the energy industry across a diverse spectrum on companies. He began his career working for municipal and investor-owned utilities focusing on energy efficiency, demand-side-management, supply resource planning, and meter data acquisition systems. He holds a Mechanical Engineering Degree and a Masters Degree in Business Administration.

The 2009 Automation/IT Leadership Series

Harris Computer Systems

By Jeff Bender, CEO - Harris Computer Systems
Ottawa, Ontario Canada


Brad Atchison


Ponder Wright


Steven Hammond


Robert DiMurro


Dave Decker

At first glance, the statement below seems reasonable enough. After all, why wouldn't you want to have your customers get the solution they want and have them involved in the decision process? But wait; what if that decision process is actually the selection of the solution provider? How can a specific supplier be involved in that process? The answer is that most suppliers would not ordinarily be involved at that stage. This is a decision that's usually the exclusive province of the buyer. That is, unless the supplier involved is Harris Computer of Ottawa, Ontario.

Indeed, after a run of several strategic acquisitions over the past several years it has become increasingly obvious that challenging stereotypes and bucking established corporate behavior has proven to be among the things that Harris does best. After you read the interview, I think you'll agree that Harris is anything but your average automation/IT supplier, but they definitely fill the bill when it comes to leadership. Intrigued? So was I... read on!

> "Customer Choice is about the customer. It is about making sure that our customers get the solution that is right for them and doing so by involving them in the decision process." – **Jeff Bender, CEO**

EET&D: I don't think it would make sense for us to begin this interview without talking about your appetite for acquisitions. Since 2004 Harris has acquired several companies, all involved in one way or another in customer information systems. These acquisitions include platforms Cayenta, ImSoftech, Advanced Utility Solutions, and most recently, Systems & Software – pretty much in that order. Were all of these deals part of a grand plan, or did they just sort of come along one at a time?

Bender: That's a really good question. When a significant part of your strategy involves acquisitions – it is more challenging to create a grand plan – because you never really know if you will be successful in acquiring your way there. One thing that we have learned is that predicting the timing of acquisitions is next to impossible due to the variety of factors involved in getting deals done. Having said that we certainly have worked very diligently at understanding the CIS market and building relationships with the players within it – so that we are positioned to be a successful acquirer. There is no question that we do have a grand plan of what we are trying to create at Harris – but that continues to change and evolve based on what we learn from our customers, the companies that we are able to acquire and how the CIS market continues to change.

EET&D: How does a utility decide which solution set is best for them?

Bender: The fact is, it is not really an organization or a utility buying our solutions, but rather a group of individuals and people – all with their own unique preferences, desires, wants and needs.

We believe that users are the best judges of what they need. We engage with our customers to explain the benefits and advantages of each of our solutions and how they link back to their individual business objectives and definition of value, but they know their business better than we ever can. So we empower users to choose whatever solution they believe is best for them by allowing them to make the trade-offs that are most important to them. Often times the vendor will try and convince a prospect what matters and what does not – we have moved this critical role back into the hands of our customers.

EET&D: Given that there is so much diversity across the various utilities, how are you able to satisfy all of those routinely variable requirements?

Bender: Harris has thousands of utility customers and hundreds of utility-focused employees throughout North America. They range from the smallest private water system to large investor-owned utilities and everything in between in the municipal and co-op market. This variety of customers and the corresponding variety of utility solutions we offer allow us to speak to utilities as true business partners – we are the market experts. When you combine our market knowledge, our financial resources and stability with our focus on the long term – we find that many utilities are very interested in what we have to offer. Our business model makes us great owners of CIS solutions and allows us to leverage the strengths of each solution set to the advantage of our customers – especially over the long term.

EET&D: So that our readers can better understand how and where all of these pieces fit, could you give us a brief synopsis of the five business units and what I'd call the 'principal differentiators' of each?

Bender: Let's go ahead and have the GM from each division do that since they are really in the best position to answer that question for their individual solutions.

Brad Atchison (General Manager – Cayenta): Cayenta has been in the utility market for over two decades. We believe we have one of the most comprehensive and fully integrated ERP offerings available in the market today. We combine our Cayenta Utilities CIS suite – which includes a robust Customer Relationship Management (CRM) module – with Financial and Operations Management. The CRM module allows our customers to extensively automate and enhance their business processes, allowing them to benefit from their specific business processes and requirements.

Our Operations Management Suite includes Work Orders, Equipment and Fixed Assets and our full Financial Suite supports both FERC and RUS accounting. The foundation of Cayenta's successful project methodology emphasizes "People, Process & Technology". This pragmatic and consultative approach allows Cayenta to scale implementations to fit the needs and complexity of customers of various sizes. Cayenta serves all utility service types and also has a robust capital credits module designed for our Co-op customers.

Ponder Wright (General Manager – InHance): InHance Utility Solutions serves over 150 customers, providing mid-size to smaller water utilities a single integrated solution. The InHance solution includes CIS, integrated financials as well as service orders (traditional or wireless), inventory and equipment management and backflow tracking. From a technology perspective InHance has standardized on the Microsoft SQL Server platform allowing us to take full advantage of MS-SQL integration for speed, tools, third-party integration and security.

Our scalable implementation model is flexible enough to support the required levels of service for utilities from 4,000 to 80,000 connections. While the majority of our new customers each year accept our standard implementation methodology, each year we also look for one or two larger sized accounts where we can partner – assigning them our most senior staff and delivering a customized implementation that they are not usually able to find elsewhere.

Steven Hammond (General Manager – Advanced): Advanced was founded over a decade ago to provide a Microsoft based solution to the utility market – a need we felt was un-served. Since then Advanced has grown to over 70 customers in six countries. Over this time we have continued to advance our technology evolving to Microsoft's .NET platform. In order to meet the needs of many of our customers and market preferences we have chosen and do support Microsoft SQL as well as Oracle database platforms. Advanced customers span the spectrum of services offered including electric, gas, water, wastewater, Internet and solid waste.

Our unique implementation methodology allows us to install CIS Infinity at small, mid-sized and large utilities with proven scalability. Later this year CIS Infinity will support multiple languages facilitating our continued international expansion. We also offer a portfolio of valued-added products that include solutions that allow utility customers to view and pay bills online, enable mobile service orders, provide customer service

orders, provide customer service kiosks, provide business intelligence and analytics, integrate geographic Information systems data and enable IVR.

Robert DiMurro (General Manager – NorthStar): NorthStar has been serving the utility market for more than 30 years. NorthStar provides utilities with integrated solutions for customer information and billing, financial management and more recently, meter data management. Our more than 200 customers in North America and the Caribbean, benefit from our solutions that let utilities manage their revenues, deliver superior customer service and improve efficiencies while reducing total cost of ownership.

Our flagship NorthStar CIS solution currently manages more than seven million utility accounts. All of our customer relationships combine a focus on long-term relationships, the mission critical nature of our solutions and a drive to exceed our customer's expectations. A seasoned and savvy professional services team resolves any immediate issues, while an active, close-knit, facilitated customer-support community keeps NorthStar clients abreast of new developments.

Dave Decker (General Manager – Systems & Software): Systems & Software (S&S) has been dedicated to the electric, gas and water utility industry for over 35 years with a single focus remaining on long-term customer support and relationship management. We focus on larger size utilities – typically those having 100,000 to 500,000 metered services. Close collaboration with our customers provides the basis for continuous significant improvements to our base ERP solution as well as a steady stream of new offerings. We have also integrated a number of partner solutions that include online cashiering, IVR, credit card transaction processing, and document management, just to name a few.

Moreover, proven implementation methodology combines the best traits of a traditional software company delivery model with the implementation rigor of a systems integration firm. Our 4-phase methodology: Initiate, Design, Build and Activate, has resulted in successful implementations at utilities throughout the United States.

EET&D: I must say that's quite a comprehensive array of solutions, but why not just fold it all into one product?

Bender: As you can see each of our CIS solutions are unique and provide a very different value proposition – providing our customers with the ability to decide what makes the most sense for them. Instead of attempting to build out one product to address all the various decision elements Harris has decided to put together a portfolio of solutions and brands that address these elements in different ways. This allows users to select the solution that provides them with the best overall value – both in the short- and long-term. It also allows them to determine what "value" is to them. For some, that may be purely a cost issue, while for others, functionality and features count, for others technology or as is more often the case a unique combination reflective of the people involved in the decision process.

EET&D: Obviously, you have a large footprint in CIS, but how are users dealing with all of the data and application integration that we hear so much about these days?

Bender: There is no question that the quantity of data has increased substantially as has the requirement to link disparate systems to enhance a utilities ability to better service their customers. With the increase in data volumes and requirement for application integration comes increased risk. We are using a combined approach to help our customers succeed. We continue to expand our solution offerings to allow our customers to benefit from the increased data available – to make better and more timely decisions.

We also continue to invest in current technology and employ the most current development standards to support application integration and the free flow of information across and within systems with APIs (application programming interfaces) and with web services. Substantially all buyers of customer information systems – especially enterprise-wide deployments – want to be assured that the solution they select will be supported, enhanced and thrive in the future. And what they fear most is a solution that might disappear sometime in the future. In other words, regardless of how much or how little integration they plan to do, reducing decision risk is of paramount importance because no one wants to fail and no one wants to be associated with a failed implementation – personally or professionally.

EET&D: So once they get past the issues of fear, uncertainty and doubt, how do utilities actually decide which solution set is going to be the best one for them?

Bender: This is what makes our customer choice strategy so interesting and, we believe, effective. There is no single right answer – the answer is: It depends. It depends on what the customer determines is most important. Part of the Harris strategy is to remove the concern surrounding the ability of the solution to survive over the long term from the decision process. Once this is gone users are free to focus on what really matters to them.

EET&D: What else figures into this decision process beyond functionality and sustainable longevity?

Bender: People, relationships and cultural fit. We have a lot of domain knowledge when it comes to CIS solutions and the utility industry. We combine this knowledge with building deep and long-lasting relationships. Each of our CIS solutions is part of a business unit – each with its own employees, experiences and ways of doing things.

This allows users to select which culture fits and aligns best with their own. Gaining a level of comfort and familiarity is a very important element in the overall decision process. The reality is that CIS solutions are just software until you add the human element, which in our case, means dedicated, experienced and committed employees.

EET&D: It's still hard to understand how all of these offerings are able to peacefully co-exist. Can you perhaps explain that a bit more?

Bender: First, you must understand that all of our solutions at one time co-existed in the marketplace as head-to-head competitors – so peaceful may not be the right descriptor. What we require of all of our businesses and employees is mutual respect – for each other and especially for our customers. As the groups work together they realize that many of their pre-conceived notions don't hold much truth and that in fact, there is much that can be learned from one another.

That doesn't mean that there aren't issues that need to be addressed – as they are all competing for business, and each group is very competitive. The truth of the matter is that many of our brands and solutions would still be competing today if we had not put them together. So, what we are doing in effect is continuing the competition that existed previously, albeit under a common umbrella. We believe that competition is healthy and keeps our solutions evolving in ways that will allow us to remain at the forefront of the industry.

EET&D: I can see how that would have some potentially unique advantages and economies that would not be otherwise available to more traditionally structured companies. Is that a valid assessment?

Bender: We are not big believers in synergies. We actually have only focused on creating economies of scale in one area of our business. Our overall business model provides us with the ability to significantly reduce financial and administrative investments across our solutions and brands thereby increasing the amount of direct customer and product resources we have within each of our individual solutions. We refer to this as the real economies of scale. We allow our businesses to maintain or increase their levels of customer facing employees – while leveraging back office systems, processes and support. This is not insignificant as many businesses invest more than 20% of their revenues in this area.

EET&D: Finally, I want to ask about your thoughts on the economy – something that is on everyone's mind these days – and for good reason. Somewhat ironically, the economy is in the tank at precisely the same time that utilities are facing what is arguably their biggest challenge ever: simultaneous grid transformation and infrastructure renewal. What do you see the role being for CIS as the Smart Grid evolves? Is it business as usual, or will we see something entirely different on the other side of this massive period of reconstruction and redefinition?

Bender: Thinking back to the early days of deregulation, utilities and continuous change have gone hand in hand for the past decade – as has their ability to adapt, improve and thrive. The evolution of the Smart Grid has been very interesting to not only watch, but more importantly, to be a part of. CIS remains at the heart of utility customer service operations as it has for decades. The Smart Grid and the current focus on conservation and the heightened awareness of our use of commodities is an opportunity for us to continue to build out the importance of our solutions.

I think it's reasonable to predict that the role and value of the CIS is changing and will continue to change. From the Harris perspective, we are working with our customers to redefine their relationships with their customers – in terms of information, service and benefits provided. In that way, I feel we can keep our finger on the pulse of whatever the Smart Grid and grid transformation may bring and be prepared to deal with it in a meaningful and pro-active way.

Optimizing Billing and Payment to Deepen Customer Relationships

By Michelle Flint, General Manager, Biller Solutions, Fiserv

Today's consumers are writing the rules of how, when and where they want to pay their bills. This "preference-driven" behavior, along with developments in technology, has compelled utility companies to expand the channels through which payments are accepted. As a result, utility companies must offer a broad array of payment options, including check, auto debit, online, walk-in, kiosk and phone via interactive voice response (IVR) or customer service representatives (CSR). When managed properly, these evolving payment options present an opportunity for companies to deepen the customer relationship while reducing costs.

For most customers, decisions involving payment options are almost always tied to convenience, choice and control. They want to pay their bills how they want, when they want and where they want. For utility companies, consumers' increasing use of the online channel has created the opportunity to capitalize on evolving customer behavior to achieve fundamental business goals. Utilities that are in tune with their customers' changing payment preferences can strategically drive customers online for payment, guiding them toward the adoption of electronic bills (e-bills) presented online, then to voluntary suppression of paper bills. In doing so, these utilities will be able to accelerate cash flow and reduce costs.

Every bill received, payment made, or visit to the company website should be used as a valuable opportunity for companies to promote strategic adoption of the online channel. A positive payment experience strengthens a company's brand and increases the potential to transition customers to paperless billing.

Three Questions Every Utility Company Needs to Ask About Their Billing Processes

1. **How can I turn customer interactions into profitable relationships?** Utility companies need to deliver payment solutions that are reliable, secure and functional. The key to improving customer loyalty while reducing overall costs and improving profitability is to promote adoption of the online channel. In a survey conducted by Fiserv in 2008, 27 percent of consumers who received bills online reported that the experience improved their relationship with the company from which they received the bill, and 30 percent said it made them less likely to switch to a competitor.

   Industry data suggest that nearly 50 percent of calls made to customer care are billing and payment related. The ability to direct customers to online self-service options can dramatically reduce customer care costs. In addition, paperless electronic bills can significantly lower the cost per billing transaction, as seen in the chart below.

Cost per billing transaction

	2008		2006	
	All responses	Excluding outliers	All responses	Excluding outliers
Average cost to produce, print and mail bill statement (including postage, labor and overhead costs)	$1.15	$0.98	$0.64	$0.58
Average cost to process customer payment – hard-copy check received in the mail (includes postage, labor and overhead costs)	$0.58	$0.43	$0.40	$0.32
Total	$1.73	$1.41	$1.04	$0.90
Cost per billing transaction for paperless Internet bill presentment and payment – e-bill	$0.20	$0.20	$0.24	$0.23

Chartwell's Guide to Bill Presentment and Payment 2008 | December 2008

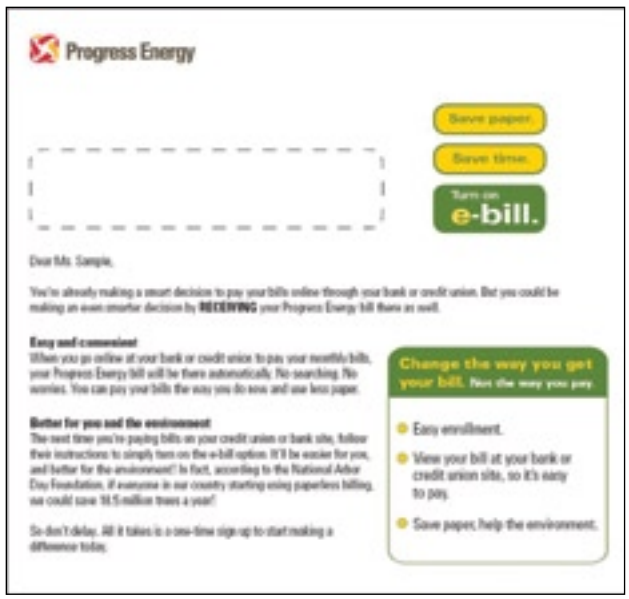
2. **How can I deliver choice while maintaining operational control?** For utility companies, providing billing and payment services is not a core competency. Many utilities would like to maintain control over how their bills are presented, and the appearance of the bill itself, while handing payment processing duties over to a third party. Utilities should strive to achieve a balance that allows them to deliver top-notch payment options, but does not require them to surrender operational control, by partnering with respected providers of billing and payment services.

3. **What channels do I want and need to support to meet the payment preferences of my customers?** It is important to offer a variety of payment options for your customers. Some consumers prefer walk-in bill payments; others want to pay online at their financial institution website. With mobile phones on the rise, mobile payments are another option to consider. Evaluating and understanding your customer is a key factor in guiding the types of payment options you should offer.

Leveraging the Online Channel to Optimize Customer Interaction

Once these three questions have been answered, utilities will likely find that it is worthwhile to focus on developing and delivering a robust online billing and payment experience, and encouraging customers to adopt the online channel.

Utility companies have a significant incentive to improve their online billing and payment capabilities in order to influence consumer payment behavior. While the imperative is to address the customer's payment preference, the end goal is to optimize the speed and method by which payments are collected – an objective that can be accomplished by driving customers online. The ultimate business objective is to guide customers away from higher cost service channels to lower cost-to-serve online billing and payment options: Internet usage, online enrollment, online payment, e-bill and paperless billing.



Customers have high expectations for online payments, based on the robust capabilities they have experienced when they view and pay bills issued by pioneering online billers such as credit card issuers and wireless phone carriers. However, the experience of paying utility bills online has historically left much to be desired. Leading industries in this area issue electronic bills (e-bills) that are rich in content and integrate added functionalities, such as the ability to view billing history or initiate an online chat with a customer service representative. By contrast, e-bills issued by utility companies have historically been difficult to navigate and contain essentially the same information the customer would receive via a paper bill. Utility companies must look to implement billing and payment solutions that provide users with an intuitive experience and more robust capabilities than they can find offline.

The Preference-Driven Payment Interaction

When customers choose how, when and where to view and pay their utility bills, they are initiating a payment relationship that can provide advantages to both parties. Customers are looking for convenient methods, types and times of payment that fit their lifestyles. While a Gen-X customer may prefer to pay through a consolidated bill payment website such as a bank, credit union or brokerage, their Gen-Y counterparts may prefer to pay at the utility's website or by phone.

In any case, when customers have a question about their bill, they want speedy and responsive support. Utility companies that view billing and payment as more than a passive collection function have the opportunity to deepen the customer relationship by implementing solutions to provide a positive experience for each customer. To accomplish this, utilities must reinvent the way consumers think about them.

This reinvention may begin with an integrated online payment function, and can then progress to include all online self-service transactions: viewing bills, analyzing usage trends, making emergency payments to avoid service disconnects, etc. Only then can utilities change the way they are perceived by their customers, which will ultimately drive satisfaction up and drive costs down.

Optimizing the Revenue Cycle

Whether the challenge is maximizing return on the investment, accelerating cash flow, reducing postage and paper costs, streamlining or automating payment processes, or improving customer satisfaction and loyalty, the focus always seems to fall on the areas of billing and payment. These functions drive such a large percentage of the interaction with the customer that they are core in determining the status of the customer relationship. Utility companies can optimize the process of collecting revenue by implementing a solution framework that supports consumer payment preferences across all payment channels — and that minimizes the overall cost to serve the consumer.

Strategically, the right solution framework will also allow a utility company to capitalize on the wealth of transactional data inherent in payment processing systems. Transactional data can provide a complete view of customers — who they are, how they pay, when they pay and where they pay. This "transactional intelligence" can be used for strategic advantage by enabling a unified view of payments across all payment streams, allowing utility companies to identify and promote high-value options, such as cost-effective online payment channels.

Encouraging Adoption of the Online Channel

The marketplace now includes customers at varying levels of "tech savvy-ness" — from the non-PC user who frequently calls customer service representatives, to the regular online payer capable of navigating a robust online self-service.

In a 2008 report, Javelin Strategy & Research[1] predicted that 83 million households will be banking online by 2013, with 45 million paying bills through banks and credit unions. Javelin also forecasts that 56 million consumers will view bills at the billing organization websites, while 54 million will pay bills there.

Clearly, the online channel will only continue to gain in popularity. The optimal business strategy will educate customers and move them through a continuum of lower cost-to-serve online capabilities, beginning with online payment and progressing to electronic billing, paperless billing, and self-care.

Focused marketing campaigns to help drive paperless adoption can assist with this effort. For example, by utilizing customer segmentation, research, and analytical support to drive a local conservation campaign promoting the environmental benefits of going paperless, Progress Energy realized an increase in its electronic billing adoption rate of more than 200 percent among targeted customers.

Similarly, Con Edison experienced a 65 percent increase in e-bill activations in twelve months after implementing a ubiquitous marketing campaign promoting a "green" paperless billing message. Examples of the marketing tactics used by both Progress Energy and Con Edison can be seen in the illustrations.

Conclusion

Electric utility companies who serve their customers across all payment channels with strategies for evaluating and optimizing the mix of payments they receive – including driving customers from offline to online - will emerge as market leaders. They will enjoy a complete view of their customers — who they are, how they pay, when they pay and where they pay — allowing them to enjoy improved service levels, cash flow and internal efficiency among traditionally disparate systems. And, by transforming the entire revenue cycle into a highly efficient, cost-effective, profitable revenue stream that helps to grow business, utilities are able to control their payment streams that will best grow the bottom line. ■

About the Author

Michelle Flint is General Manager for Online Billing & Payment within the Biller Solutions division at Fiserv. Flint is responsible for the overall strategic direction and business unit operations that enable clients to meet key business objectives and optimize the customer interactions through the facilitation of bill delivery and payment products and services. Prior to joining Fiserv (CheckFree) in 1998, Flint spent ten years in key management positions within the banking and credit card industry.

[1] 2008 Online Banking and Bill Payment Forecast: Financial Crisis Makes It More Vital Than Ever to Target Online Channel; November 2008; Javelin Strategy and Research.

EXECUTIVE Directions

Professional Association Spotlight
Elliot Boardman, Executive Director, PLMA

Though it seems like it was only a few years ago that we first met, when I spoke to Elliot Boardman about this interview in March, he reminded me that PLMA – the Peak Load Management Alliance – is about to celebrate its tenth anniversary! This caused me to reflect on just how much this part of the market has changed in a decade. Among the most notable changes is that Load Management has become Demand Response. This is more than just a change of label, however; indeed, it symbolizes a change of mindset as well where the pervasive problem of load control is concerned. The emphasis on demand response is a something that I'm quite certain we'll all be watching closely in the weeks, months and years ahead as the new national energy policy continues to unfold.

EET&D: Let's start with an easy question, but one that a lot of our readers probably won't be able to answer on their own: What exactly is the Peak Load Management Alliance, and who formed it?

Boardman: The Peak Load Management Alliance (PLMA) is a diverse association of leading energy professionals dedicated to developing and promoting consumer participation in electricity markets around the world using load management. It was formed by a group of interested organizations following a conference that was held in Palm Beach, Florida in October 1999. This group had specific interests in dealing with the tremendous price fluctuations and reliability problems experienced in electricity supply markets.

EET&D: Could you perhaps also share some insights about the form of the organization and its mission/vision?

Boardman: Sure. First off, the Alliance is a not-for-profit organization. As such, we reinvest most of our revenue – mainly from membership fees and other PLMA activities – right back into the association for the benefit of our members.

An important part of my job is making sure we stay focused on the objectives put forth by our mission statement, which is very simple and straightforward:

"To create a community of expertise on demand response and its role in creating efficient electricity markets. Through this community, the Alliance will bring forward useful information on price responsive loads, market structures and market rules. This will include information on market participants roles, customer needs and actions, enabling technologies, and specific programs as appropriate."

Our primary vehicle for achieving our goal is the preparation and delivery of educational and strategic information targeted at the regulatory process, operating markets, market counterparties and the way these organizations interact with consumers.

EET&D: We know that some organizations like yours are professionally managed while others depend extensively or, in some cases, entirely on volunteerism. Can you tell us more about how the PLMA is managed and its membership composition?

Boardman: The constituent organizations of PLMA selected A.C.E. Management – an association management firm located in Houston (TX) – to provide administrative services for the Alliance. Over the past decade, PLMA has grown to include member organizations from all phases of the demand response industry. In fact, it is the only one of its kind, counting among its member organizations utilities, retail providers of electricity,

curtailment service providers, demand response equipment suppliers, research organizations, trade associations and consulting firms.

EET&D: With that kind of diverse membership, it seems like it would be quite a challenge to make sure everyone's needs are being met – especially since those needs are probably as diverse as your members. What are some of the services the PLMA provides to its members?

Boardman: Well, you're right about the diversity, and we're always looking for new and better ways to serve our members. Among our most important activities are conferences and workshops – both conventional and Web-based – and training seminars. But we also produce and publish white papers, newsletters and various other information vehicles in printed and electronic formats, as well as responding to queries from regulatory agencies.

EET&D: Can you give readers a specific example of the role PLMA plays in the national dialog on Smart Grid and energy efficiency?

Boardman: Earlier this year, FERC was seeking input regarding the content of the Energy Independence and Security Act of 2007. The solicitation was intended to generate comments on the possible elements to include in a National Action Plan on Demand Response.

The solicitation focused on the requirement – described in section 529 of the Act – to develop a National Action Plan. The broad purpose of this initiative was to meet three main objectives:

- Identification of requirements for technical assistance to States to allow them to maximize demand response resources
- Design and identification of requirements for implementation of a national communications program on demand response that includes broad-based customer education and support
- Development or identification of tools and materials for use by customers, States, utilities and demand response providers.

In this case, PLMA acted as the clearinghouse for several of our members' responses to the FERC request. This allowed us to present a unified front, which is always more powerful than a collection of individual ones. We're very pleased that so many of our members came forward with some very creative and constructive suggestions. Naturally, we'll continue to vigorously support these kinds of initiatives going forward.

EET&D: Before we close, are there any other PLMA initiatives or activities you'd like to mention that anyone who might want to learn more about the Alliance and/or topics directly or indirectly related to demand response should be aware of?

Boardman: Yes, there is something new that I think would be of interest to anyone with a serious interest in DR. We are designing a basic training course in demand response that will be available to organizations either as an in-person seminar or as a series of webinars. Also, our website contains copies of the presentations from speakers at our past conferences. The site is searchable by keywords and is full of great information that anyone can access.

[Editor's Note: Additional information about PLMA is available at www.peaklma.org or by calling the PLMA headquarters at 1-936-271-5020.]

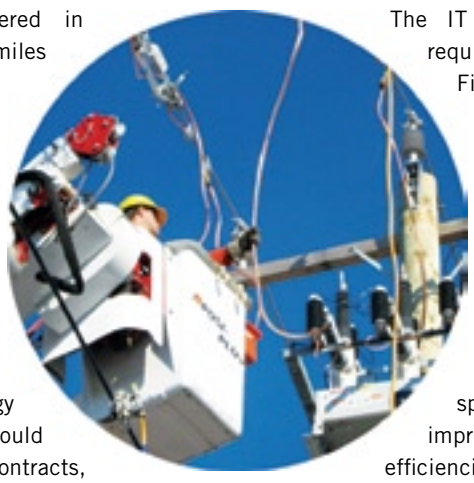
Elliot Boardman is president of A.C.E. Management, Inc. (Magnolia, TX) and can be reached via email at eboardman@peaklma.org.

CASE STUDY
Bluewater Power Goes ERP Route to Address Deregulation

By Keith Broad, Director - Information Technology Bluewater Power Distribution Corporation

The story of Bluewater Power Distribution Corporation closely parallels the deregulation of North America's utilities. Industry colleagues have often inquired as to how Bluewater Power has flourished over the past decade in a rapidly evolving marketplace. Our answer: Enterprise software has played a major role.

Bluewater Power was formed in late 2000 upon completion of a merger of six local utilities. Today, the Canadian corporation distributes electricity to 35,000 customers in southwestern Ontario including residential customers, large industries, international companies, financial institutions and commercial establishments. Our distribution system network consists of more than 344.2 miles of overhead plant and 125.9 miles of underground plant, covering a service area of 68.78 square miles. Bluewater Power employs more than 90 full-time people and is headquartered in Sarnia, Ontario, located about 65 miles northeast of Detroit.



At about the same time as our merger, Ontario's energy market was preparing to deregulate and that ushered in a host of new mandates. Under the deregulation rules, utilities in the province were obligated to provide unbundled bills and exchange customer electronic business transactions with energy retailers. Deregulation meant retailers could sign up customers with electricity contracts, requiring utilities to be able to bill customers regardless of whether they had a retail contract or not.

Further, the new rules opened up the cost of power on the wholesale side, requiring utilities to conduct wholesale settlements with the Independent Electricity System Operator (IESO), the organization responsible for managing Ontario's bulk electricity power system and operating the wholesale market.

Until the merger and deregulation, the newly privatized corporation ran its business on a highly customized legacy system that housed numerous mission-critical software applications including customer data, human resources and financials. Given the new multi-tier cost-of-power model, our information technology (IT) team quickly realized that the legacy system would not be able to handle the new requirements. A request for proposal (RFP) was issued with half a dozen utility-specific and enterprise resource planning (ERP) software vendors responding.

ERP Critical for Success

The IT team had a number of important requirements for the new software platform. First, we needed a solution that could support Ontario's local market, meet regulatory demands and easily adapt to future regulatory changes. Secondly, we are a very small team – just five people in total – so we needed a solution that was easy to use and required little support. In addition, we were adamant about implementing an ERP solution – specifically, a single product that would improve the strategic alignment and efficiencies of Bluewater Power's financial, human capital and operational processes.

We also needed retail and wholesale settlement functionality to accommodate the new deregulated electricity market. With the enhanced enterprise productivity and insight that an ERP system promised, we felt we would be better able to adapt quickly and cost-effectively to changing business and market requirements.

After a thorough analysis of a number of software solutions, we selected the SAP ERP application and the SAP for Utilities solution portfolio, including billing and financial management

applications. Since Bluewater Power went live with those solutions in 2002, the software has provided numerous immediate and longer term benefits. Better control of data translates into increased confidence in regulatory compliance and financial information and provides more visibility and greater cost control across operations. It has also improved statistical tracking and offered tighter controls to ensure correct time and materials along our entire supply chain.

Given that SAP was typically known to be a large business product, we were surprised by the scope, flexibility and scalability. Not only does it meet our present needs – including providing automated support for customer transactions and settlement processes without requiring additional middleware products – but it can accommodate future conditions in the rapidly changing energy market while allowing Bluewater Power to easily grow in response to our Board of Directors' mandate.

Within the stated timeline of six months, an integrated platform with all necessary utilities processes bundled together was delivered. The IT team leveraged utility-based templates and best practices as well as the Accelerated SAP (ASAP) implementation methodology, which streamlined the implementation by providing templates, methods, tools, and accelerators that have been built on the success of thousands of previous implementations. A cross-functional team dedicated to the project was housed in a separate work space to ensure all business requirements were met by the deadline.

A train-the-trainer approach and a superuser model ensured a smooth transition from the legacy system. Gartner estimates that every hour of needed IT professional training is worth an average of 5.75 hours to the enterprise, and every hour of needed end-user training is worth an average of five hours to the enterprise. Consequently, the training program focused on establishing customer self-sufficiency through easily maintainable methods, materials and tools, with a view of the long-term sustainability of our ERP solution.

While the implementation was not without its challenges, we had minimal disruption to our business during the implementation. In fact, we were able to generate bills and continue offering quality service without customers noticing that we were in the midst of transforming our business.

Faster response improves customer satisfaction

With the system in place, Bluewater Power has been able to respond quickly to frequent, urgent regulatory changes in a cost-effective, prudent manner – without disrupting business or cash flow. This provides Bluewater Power with a sharper competitive advantage over its competitors. In addition, improved statistical tracking means Bluewater Power now has visibility into consumer trends, allowing us to further enhance customer satisfaction and to plan and execute our growth strategy effectively.

The ERP system has also allowed Bluewater Power to handle all activities related to settlement, a central component of the deregulated energy market in Ontario. In 2006, we deployed the SAP Energy Data Management solution component, which provides Bluewater Power with a central repository for both register- and interval-based meter-reading values, independent of the measurement unit. This has improved the accuracy and granularity of data by eliminating the use of a niche solution to handle interval-based only data separately.

As a result, we have cut the time it takes to complete wholesale settlements and complex bill generation in half. Further, we have greater insight across operations, thereby reducing inventory by up to 15 percent and decreasing write-offs by up to 15 percent. We have also reduced the time to count inventory by 30 percent.

Grid maintenance and operations have also improved, and the implementation helps us to more effectively maintain and manage the entire distribution grid infrastructure. Moreover, this allows Bluewater Power to streamline procurement and construction processes and plan for managed work-order activities. And, technicians have the functionality they need to handle repairs, maintenance, inspection, measurement, and customer service – all within a single solution platform.

Preparing for Industry Changes

Today, the electricity industry continues to evolve with conservation, renewable energy, smart metering and the smart grid becoming the new challenges and opportunities for utilities. Once again, Bluewater Power is making plans to extend its capabilities even further through a technology upgrade.

For example, in 2010, smart meters will become mandatory for all residential customers in Ontario. In fact, it will be the biggest change after deregulation of the market. It will also be a stepping stone into a smart grid and offer good opportunities for conservation and for flexibility on the customer end. Internally, however, smart meters will fundamentally change how Bluewater Power interacts with its customers and how the utility is structured in terms of staffing.

Specifically, our system will enable our customer service representatives to more efficiently handle the increased call volume anticipated with time-of-use billing. Additional functionality will streamline customer interaction and allow for better customer access to information. In short, we will be able to easily grow and adapt to changing regulatory requirements while managing the deployment of smart meters to customers.

Business intelligence will also improve. With a clear picture of day-to-day, real-time business functions and transactions, the utility will know at all times what its outstanding bills are, where it is in the billing cycle in terms of leads, evaluate trends and address concerns. This will add tremendous value to Bluewater Power's customer interaction centre, where employees will be able to retrieve information on customer accounts, respond to queries and address smart meter concerns more quickly. Not only will this enable Bluewater Power to improve customer service and interaction, but it is also expected to yield greater operational efficiencies.

Software Selection 101

The pace of change in the global utility industry continues to increase at a rapid rate. From very small utilities with less than 1,000 end-use customers to very large utilities with more than 16 million customers, utilities are looking for solutions that enable transparency, end-to-end process integration across the back and front office, and compliance in a changing regulatory environment.

Regardless of a utility's market segment, market model or growth strategy, there are several important considerations to keep in mind when selecting a software solution to enable better decision-making and quick responsiveness in all critical business areas. According to SAP Canada, utilities should look for solutions that:

- integrate customer service with finance and enable compliance with local laws and regulations;
- provide efficient and automated exchange of data with market participants, enabling supplier switching as well as payment and settlement processes;
- support efficient load-schedule management, forecasting, and management of high-volume interval data;
- integrate information and processes from portfolio management, energy trading, and risk management;
- deliver personalized services and provides up-to-the minute information about interaction history, technical environment, and account status for improved customer relationship management;
- integrate information and processes from finance, procurement, maintenance, operational safety, and workforce management to better manage assets;
- streamline procurement and revision processes for reduced material inventory and efficient collaboration with contractors and suppliers; and,
- provide online controls for auditors to address legal requirements, reduce the risk of noncompliance, and improve corporate governance.

Finally, be sure your software providers are committed to the utility industry and to investing in their software. Look for vendors that are financially stable to ensure that they have the capacity to support your utility well into the future.

Bluewater Power is also further upgrading its SAP solution suite. This technology upgrade will allow Bluewater Power to more easily integrate to the province's centralized meter data management repository (MDMR) responsible for time-of-use billing. Furthermore, it will address advanced metering infrastructure (AMI) business processes as well as help us comply with the International Financial Reporting Standards (IFRS) that will become mandatory in Canada in 2011.

Bluewater Power remains committed to using technology to make continuous improvements that align its configuration more closely with best business practices. The utility will continue to leverage and build on its flexible platform to satisfy its growth objectives, including mergers or acquisitions, expansion of services, and vertical extension.

Words of Advice

We have had a very successful ERP implementation, one that has lasted a decade and is now ready to take on the future. We have learned many lessons along the way.

First, know your existing business requirements and find a solution that will meet them. But, perhaps more importantly, find a trusted and reputable business partner that is committed to developing its products and services in concert with changing business needs. Choose one that is committed to remaining advanced as well as dedicated to developing and maturing their products as global trends emerge yet is still capable of configuring their systems at the local level. Engage a partner that is going to be around for the long term. In this way, a utility can ensure its business systems will meet regulatory change today and adapt to the new business opportunities of tomorrow.

Although Bluewater Power may be a small utility compared to many of our North American counterparts, we have found that partnering with a reputable vendor has also given us presence as a mid-sized utility and repeatedly earns us credibility when interacting with larger utilities – an unexpected bonus. ■

About the Author

Keith Broad is Director of Information Technology at Bluewater Power Distribution Corporation, based in Sarnia, Ontario, Canada.

Making the "Utility of the Future" A Reality… Today

By Phil Daniele, Managing Director, BearingPoint Utility Practice

Meeting the demand for electricity may be daunting, but that's not all that's haunting utilities today. Electric utilities are scrambling to compete in a marketplace with increasingly complex and evolving challenges – and becoming a utility of the future, where all systems are fully integrated for optimal internal performance and external interaction – may seem like an unobtainable goal.

Today, utility companies are concerned with growing their markets and controlling and reducing operating costs. They also face major challenges like: 1) dealing effectively with declining infrastructure and an aging workforce, 2) environmental impacts, and 3) rising customer service expectations.

They are being pushed to re-think their operations entirely: How they can increase efficiencies, grow revenues and satisfy customer demands? The innovative organizations recognize that this means introducing new business practices that offer dramatically improved operational data, greater customer-focused services and more flexible offerings. These are the keys to growing market share in unregulated utility markets and maintaining customer loyalty in regulated ones.

Upgrading Customer Information Systems

To keep pace with increasing change and the desire by customers for a wider array of interactive services, leading utilities recognize that upgrading their Customer Information Systems (CIS) are a key part of the solution. Not only will upgrades address the utilities' needs for more efficient client communications, but these changes also will enable utilities to meet the needs of today's more tech-savvy customers, while streamlining the utility's back office processes.

One of the main challenges facing today's utilities is outmoded CIS systems based on old technologies, such as those supported by mainframe/COBOL systems. These systems were designed – often more than 20 years ago – to support a more traditional and often more costly approach to customer service. These older technologies are out of step with the increasing need for innovative, responsive customer service and a variety of billing alternatives. Furthermore, they cannot support such innovations as interval billing and meter data management (MDM) integration.

In addition, utility industry executives are also predicting they will have to write off an average three percent of revenues due to unpaid bills during the current recession. By utilizing current CIS programs and technology, utility companies will have more advantages in capturing fees and recovering unpaid bills.

Aside from being tied to outdated technology systems, utilities are also saddled with other challenges such as an older workforce and an equally aging infrastructure. A growing number of senior-level workers are leaving the utility workforce, taking with them into retirement significant knowledge of current systems and operations.

As these original computer programmers retire, utilities find themselves stretched to hire and cost-effectively train replacement workers who can support existing technology applications. Replacing a retiring workforce with employees who already have industry knowledge is itself difficult, but the new generation of tech-savvy workers also has higher expectations for the software and solutions with which it expects to work each day. What's more, older infrastructures can fail – and with replacement costs rising – a utility's reliability can be negatively impacted.

Because of current antiquated systems, many utilities aren't able to fully integrate customer activities and processes throughout their organizations. With silos of activities occurring, workers are forced to create manual workarounds that cobble the processes together. Multiple departments that need access to the same information cannot obtain it as efficiently as they could with newer CIS technology.

New CIS technologies can loop all departments together, a system that benefits the internal operations as well as the customer. For example, with the right technology, if a developer wants to have a temporary power pole installed to support a housing project in a new subdivision, the initial online request goes to the business unit that will actually perform the installation. It also is shared with customer service and the accounting department that will bill for the work.

As a result, there is a seamless flow of real-time data across relevant departments within the utility, eliminating the need to batch-process information. For the developer, a well-integrated CIS technology system at the utility makes it easier to order and track the progress of the installation and then pay its subsequent bill once the job is complete.

Environmental Impacts

A second significant challenge for today's evolving utility of the future is the growing concern over climate change.

As the political and environmental debate continues to unfold, utilities are being pressured to reduce carbon emissions, while being simultaneously threatened with increasing regulations. They face developing and implementing a business model based on conservation, while seeking alternative sources of energy. Adding to this complex mandate are those who ask for alternative energy sources, yet lead the NIMBY (not in my back yard) hue and cry when wind, solar or nuclear infrastructure is proposed.

However, we see an investment in renewed generation technology, particularly solar, wind and nuclear, as having a huge impact on all facets of utility operations – knowledge, resource requirements, costs and processes. President Obama's plan currently calls for not only increased reliance on renewable energy sources, but also reducing demand for electricity (and the attendant environmental impact) by 15 percent from projected levels by 2020.

Utilities that can demonstrate their own efficiency, while helping their customers reduce their personal impact and take control of their interactions with their utility company, are the ones that will thrive in years to come.

Interaction by Customers – On Their Own Time

The third significant challenge facing utilities is that today's customers want to interact with their providers according to their own schedules. It may not always be convenient to wait to speak with a customer service representative during traditional business hours. Instead, many customers want to jump online when they have the time and handle routine transactions, such as updating billing records, monitoring electricity usage and viewing and paying bills electronically.

CIS technology can be a boon to customer service, especially when it provides immediate information concerning outages and restoration management. Customers are eager to know when their service will be restored, and they like being able to initiate service orders – such as a new residence connect or disconnect – by themselves and online.

Utilities look to new technology for improvement in such areas as credit, collections, reporting systems and overall better business intelligence through analysis of new data they were previously unable to obtain.

New CIS technology also gives utilities the ability to offer innovative usage pricing programs. Pricing can be designed to lure customers into shifting – when possible – the bulk of their electricity consumption to off-peak, less-costly times of day. Both the utility and their customers benefit from such a system; that is, customers get a price break for cooperating, while utilities get a better grasp of anticipated loads to prevent overwhelming the grid during peak demand periods.

Interval billing technology is one CIS tool that enables such usage-pricing programs by monitoring electricity consumption in very small intervals, such as 15-minute segments. Previously, legacy meters could only measure overall electricity consumption and had to be read manually "in person." The new technology supports electronically read meters that capture electricity usage in real time in small, useful bites. Interval billing technology has been in place in the commercial market for some time, but is only now entering the consumer market.

This smart metering technology, coupled with smart grid technology, also enables utilities to remotely turn meters on and off instead of "in person." Not only is the new system faster and more efficient for both sides, but it also offers a more cost-effective way to operate.

PUCs Encouraging More CIS

The nation's utilities are moving cautiously ahead with the deployment of smart metering technology in the consumer market, such as AMR (Automatic Meter Reading) to collect data for billing and analysis. In order to capitalize on AMR, utilities must have an AMI (Advanced Metering Infrastructure) to collect, measure and analyze energy usage based on the data collected by the AMR devices.

Public Utility Commissions, which regulate electrical utilities, have begun encouraging utilities to adopt more modern CIS technologies in order to save energy, cut costs and increase customer satisfaction.

At present, municipal utilities are more actively adopting CIS technologies because these utilities tend to be smaller and the impact on their rate case going before the PUC is smaller. They are better positioned to pass along new technology/equipment costs to their customers.

On the other hand, investor-owned utilities (IOUs) tend to trend slower when investing in new CIS technologies if they cannot easily recover these costs from ratepayers. Utility commissions are less likely to offer IOUs the same type of relief in order to offset these technology investment costs.

CIS Can Help Improve Shared Services

To achieve the most effective operation, utility leaders should explore CIS technology options for assistance in knowledge management, talent management and back office needs. CIS technologies can help integrate all utility systems for improved shared service offerings. Moreover, the new technology can help facilitate business process outsourcing, such as call centers or engineering, and better integrate these back-office services throughout the entire organization. With improved systems, utilities can perform advanced budgeting and performance management. These advanced functions will allow them to do a better job of determining what needs to be done and how to best allocate the appropriate budgets to support these activities.

Utility leaders should realize that it is not just new software they are seeking. They should consider the quest for new technology as a key part of doing business in new and improved ways.

In their search for more modern, efficient ways of operating, utility leaders should seek an established service provider for assistance with a project of this magnitude. Considered providers should have 1) extensive experience with a wide variety of CIS applications; 2) significant public sector and energy practice expertise; 3) knowledge of both municipal and investor-owned utility segments; 4) demonstrated examples of delivering complex, high-quality, on-time transformation projects; and 5) a good "cultural fit" with the utility organization.

It takes more than just knowledge of new technology systems; a good service provider is one that challenges a utility to re-think the way it is operating. For example, the utility's business processes should be mapped against the new systems' functionality. One of the goals should be to make as few software modifications as possible in order to accommodate necessary business processes. This analysis is an opportunity to take advantage of best practices, and utilities should be bold enough to consider doing business in new ways.

It is also critical that any new technologies integrate well with a utility's existing systems and processes. New technology solutions are most effective when they are designed and implemented to address current requirements and to accommodate business needs that will arise in the future.

Not every utility is quite ready to become a utility of the future. Readiness requires a significant commitment and considerable effort. Still, it is encouraging that so many utility leaders are eagerly exploring new technologies and the positive impact they could have on their operations. Not only will these new technologies improve efficiencies, streamline operations and help contain costs, but they also will help attract and maintain a loyal customer base that demands the future now.

About the Author

As managing director responsible for BearingPoint's North American Utilities CIS Practice, **Phil Daniele** has more than 25 years of experience successfully leading CIS projects for municipal and investor-owned utilities. His extensive expertise includes proposal development and evaluation; project management; defining system requirements; design specifications; software package implementation; program coding and testing; and quality assurance.


Dennis McCombs


Mohan Inguva

Open, Standardized, and Integrated Spatial Data Accelerates Operational Processes

By **Dennis McCombs**, IT Manager for Transmission and Distribution, and **Mohan Inguva**, Mapping Technology Supervisor, NV Energy

There's no doubt that the bright lights of Las Vegas make a powerful impression. The city is an exciting place, and that excitement is absolutely vital to the economy of Nevada. Behind the glitz, there's an energy company making sure that Las Vegas – and the rest of the state – gets the energy it needs to grow and thrive.

NV Energy provides electricity to 2.4 million residents throughout Nevada and parts of northeastern California. We also deliver electricity to meet the needs of the 40 million people who visit the state each year. With a service area of 54,500 square miles and 3,126 employees, NV Energy must operate efficiently to ensure that the people of Nevada get reliable service and good value. Our design and mapping technology helps NV Energy achieve that goal by supporting and improving operational processes.

How do design and mapping support operations? Decision makers can view real-time maps showing operational conditions. Customer service agents have fast access to outage information. Construction crews receive the materials they need to get the job done right the first time. And field crews can find and address issues more quickly. But these operational improvements didn't happen overnight. NV Energy had to overcome some challenges along the way.

Explosive Growth

In July 1999, Nevada Power, Sierra Pacific Power, and Sierra Pacific Resources merged to form one company, Sierra Pacific Resources. The company is now known as NV Energy, Inc. At the same time, the Las Vegas area and the state as a whole were growing rapidly. Approximately 40,000 new customers join the distribution network each year, and at the time, Sierra Pacific Resources was the fastest growing energy company listed on the New York Stock Exchange.

The company's internal processes and people were challenged to keep pace. In the design and mapping areas, our technology supported individual tasks, but not the rapid execution of entire processes. For example, in the design department, drafters used one application to design new connections, another to estimate costs, and generate a bill of materials (BOM). As a whole, the process was slow. It was common for drafters to over- and under-estimate materials, which resulted in returns or work crews having to retrieve additional materials to complete projects. Mapping processes suffered from a similar lack of integration, resulting in backlogs of new designs and as-builts.

Open, Standardized, and Integrated

In 1999 – the same year as the merger – the company's design, mapping, and information technology departments decided to adopt a bold approach to ensure that our technology better supported our processes. The approach was based on three simple concepts: open, standardized, and integrated. Our strategy for this bold approach was as follows:

- **Open** – To create and store data, we decided to move to applications that rely on open data standards. Technologies that employ open standards are more flexible over the long term. We viewed our data as a core asset, and we didn't want to create and store data in proprietary formats, which limit what can be done with data, how data sharing occurs, and whether data can easily move to other systems.

- **Standardized** – From design to mapping to materials ordering, the company decided to refine and optimize standards for creating data and executing processes. Consistent processes are simply easier to improve and automate.

By adopting technology that could embed and enforce our standards, we saw an opportunity to reduce the risk of errors, train new employees faster, and move information between processes and department more seamlessly.

- **Integrated** – It was decided (as a long-term strategy) to move towards storing data in a central repository, giving us a single integrated, authoritative source for the information driving processes. Information that is stored in disparate systems cannot be easily shared and used across the enterprise in a timely manner. For instance, if customer service agents are unable to access location-based outage information through the tools available to them, they cannot answer customer questions about outages with precision. Instead, they're forced to rely on general updates from specialists with access to outage management systems.

Since 1999, NV Energy has implemented the open, standardized, and integrated approach, tackling and focusing on key processes along the way. The results are striking. At each step, we've successfully transformed our processes to save time, serve customers better, and operate with greater overall efficiency.

Starting with Design and Data Creation

NV Energy's technology and process improvement efforts began in the design department, where much of the data that drives operational processes originates. We decided to adopt a design application that used a CAD interface familiar to virtually any trained drafter and that allowed us to embed our own business rules and design standards within the design process. The application (from Autodesk), was a design productivity tool that automates the materials ordering process and integrates with the work management system.

Today, NV Energy's design process is no longer slowed by multiple applications. Instead, drafters begin new designs by selecting a job type and drafting the needed elements. Throughout the process, the application allows the drafter to reference standard "compatible units." Compatible units are simply NV Energy's standard groupings of materials. Using compatible units, drafters can easily choose the most cost-effective equipment for the job. In addition, NV Energy-specific rules help drafters perform and interpret calculations (e.g., voltage drops and sags), in order to select properly sized equipment. Because so much of the process is guided by NV Energy's business rules, we're able to train new drafters on our standards in a fraction of the time it previously took.

The most dramatic improvement to the design and data creation process involves bills of materials (BOMs). From within the same application used to create designs, drafters automatically generate and review BOMs that are based on precise measurements of all elements of the design and on NV Energy's business rules. For large jobs, we're saving several hours per BOM because drafters no longer use manual processes to create estimates. But the real savings are in the field. Crews get to job sites with the right amount of materials needed to complete work. That means they no longer have to stop work to retrieve missing materials, saving significant time and money.

Ending Mapping Backlogs

At about the same time that NV Energy enhanced the design process, we undertook a related project to reduce backlogs in the distribution network mapping department. Prior to this project, drafters were distributed among district offices. They were using a commonly used CAD application, but it was different from the CAD application used by other areas of the company. In addition, the drawing format was typically different from the format of the drawings sent in by developers. This required drawing conversions. Also, there was no common land base. This presented many problems such as drafters having to edge match design drawings. The process was time consuming. With the population of Nevada growing, backlogs were the norm, just as they are for those utilities in areas without significant growth.

NV Energy decided to centralize the mapping function and to standardize on just one CAD application for the enterprise. We also opted to store the data within an Oracle database that used open standards. Leveraging an existing investment in AutoCAD technology to edit data, the new distribution system mapping process allows data to move easily from design into the GIS.

Now, after designs are complete, GIS specialists import them into the GIS database, marking them as pending until they're built. Converting data between formats is no longer necessary. After construction, the specialists update the information with any new as-built and switching information and make the information live in the database. The new open, standardized, and integrated process is so much faster that NV Energy was able to drastically reduce the backlog of updates to the GIS within just a few months of implementation. So even when we added 40,000 new customers per year, the mapping department kept pace.

A Single Source of Spatial Data

NV Energy's process improvement efforts did not stop with transforming design and distribution mapping processes. The success of the open GIS database inspired us to explore the potential uses of spatial data throughout the organization. We realized that sharing online maps using the NV Energy intranet was an easy, low-cost way to disperse information company-wide.

When NV Energy first began using online maps in 2000, online mapping was quite new. The idea was to provide an easy-to-use interface that allowed people to query the database for location-based information, such as the nearest transformer or address to an outage, and get the information they needed on a dynamically generated map. We selected a map display tool based on open source technology to generate the browser-based maps, but the simple applications we developed in-house to process information requests were the real stars. They proved to be so easy to develop that we created dozens inspired by ideas from people throughout the organization.

NV Energy developed a number of applications for its web application – so many that they cannot all be described here – but the basic idea behind each is that employees without GIS or design application expertise gain access to spatial data. Customer service agents can view online maps and simple map-building applications that support their needs. For example, agents can see outage updates on maps linked to customer addresses, which helps them answer customer outage questions faster and with more detail.

Direct Database Queries Save Time

With spatial data being used to enhanced processes throughout NV Energy, we did not rest in our efforts. In fact, we noticed additional areas for improvement – and ways that our technology did not take us far enough. The database implemented around 2000 had some limitations. Specifically, it could not render spatial data queries within the database environment. Instead, another application, such as a spatial data design or creation tool, was needed to help process the query and the results. This limited the speed of queries and the types of queries that we could run. So NV Energy decided in 2005 to move to a spatially enabled version of Oracle database technology.

One formerly complex process provides a clear illustration of just how useful direct spatial queries can be. Wire mile tax calculations used to take a few weeks with a couple of drafters on the task fulltime, in part because tax districts in Nevada tend to be unusual shapes. We created a simple tool that makes it easy for accounting staff to conduct wire mile studies for tax calculations. The display interface is the same online mapping tool mentioned earlier, but all of the rendering is done within the database. Staffers simply select a tax district, and the application calculates and displays distribution assets the company needs to pay taxes on in that district.

Continually Improving Processes

While aligning our technology to better support operational process took hard work, the effort has paid measureable dividends in a number of areas. Drafters save several hours per design. We're reducing material handling and time with enhanced material estimating. NV Energy employees are serving customers more effectively and efficiently. Perhaps most importantly, our technology has the flexibility we need to continually refine our processes and meet new operational challenges into the future.

For instance, we are currently forging ahead with another ambitious project. NV Energy's open and spatially enabled database provided an environment well-suited to mapping and managing the assets within our transmission and fiber networks, which we had not formerly included in its GIS. Today, we are mapping the transmission and fiber networks within the spatial database, and at the same time, we are implementing an asset management system designed to integrate with the spatial database.

When complete, the new system will accelerate virtually every process related to mapping and maintaining the transmission network. The company will be able to directly import designs from the engineering firms that carry out most of projects on the transmission network. More significantly, we will be able to trace circuits remotely and plan maintenance activities more cost-effectively and proactively. When this project is complete, we'll find yet more ways to leverage open, integrated, and standardized technology to get more done in less time. ■

About the Authors

Dennis McCombs is the IT Manager, T&D, for NV Energy. He has worked for the company for over 15 years. He manages the teams that provide application development support for NV Energy's CAD, work management, GIS and web applications. Dennis holds a Bachelor of Science degree and a Master of Technology Management degree from Brigham Young University.

Mohan Inguva has been NV Energy's Supervisor for Mapping and Technology since May 2007. He is currently in charge of mapping NV Energy's north and south regions. His responsibilities include providing support to field crews and gathering requirements for mapping applications. Prior to his current role, Mohan was responsible for the implementation of Autodesk Utility Design and several applications for Autodesk MapGuide. He has been with NV Energy for 15 years and holds a Masters degree in Electrical and Computer Engineering from the University of Nevada, Las Vegas.

Distribution Automation for Back-Feed Network Power Restoration Emerges as a Key Smart Grid Technology

By Zhenyuan Wang, James Stoupis and Fahrudin Mekic, ABB Inc.

One of the key characteristics of the much-discussed Smart Grid refers to electric power systems that enhance grid reliability and efficiency by automatically anticipating and responding to system disturbances. To achieve Smart Grid status at the power distribution system level, various automation technologies have been attempted in the areas of system metering, protection, and control. Within these technologies, automated power restoration is an important part of the Smart Grid puzzle.

Traditionally, electric utilities have used their trouble call systems to detect power outages. Specifically, when a fault occurs and customers experience power outages, they call and report the power outage. The distribution system control center then dispatches a maintenance crew to the field. The crew first investigates fault location and then, implements the switching scheme(s) to conduct fault isolation and power restoration. This traditional procedure for power restoration often takes several hours to complete, depending on how fast customers report the power outage and how quickly the maintenance crew can locate the fault point and conduct the power restoration.

In recent years, utilities have deployed feeder-switching devices, such as reclosers and circuit breakers, with intelligent electronic devices (IEDs) for protection and control applications. The automated capabilities of IEDs, such as measurement, monitoring, control and communications functions, make it practical to implement automated fault identification, fault isolation and power restoration. As a result, the power outage duration and the system reliability can be significantly improved.

Based on the information provided by IEDs, automated fault location identification and fault isolation are relatively easy to achieve. In contrast, automated power restoration is a challenging task, and many research efforts have been focused on tackling this application and to consider the operating constraints, load balancing and other practical concerns.

Although some of the many proposed automated power restoration algorithms aim to provide a real-time solution, most of them are only suitable for planning analysis or were developed to be executed in the distribution control centers to assist system operators in making appropriate decisions.

This article presents an online method for the automated power restoration application previously described. The developed method conducts an analysis to achieve back-feed power restoration – healthy load zones that have lost power that are restored through their boundary-tie switching devices from neighboring sources, with no reconfiguration beyond the tie devices under consideration. The back-feed restoration should not overload any part of the back-feeding network.

Requirements, Concepts and Methodologies

A restoration switching analysis (RSA) method produces a switching sequence that, when executed, will reach a valid post-restoration network that satisfies the following requirements: 1) it is radial; 2) there is no current violation at any network component; 3) there is no voltage violation at any network node.

Other optimization requirements are also considered. For example, losses can be minimized, and the back-feed transformer's loading can be balanced.

A. Network Model

For the sake of method description, a simplified network model (depicted below) includes three types of components: 1) sources, 2) switching devices (i.e., switches that represent sectionalizers, load switches, circuit breakers and reclosers) and 3) loads. Feeder conductors are assumed to be load attributes.

Sources are assumed to have limited capacity (ampere rating) but constant voltage. Switches are assumed to have limited loading capability. (In amperes, circuit breakers and reclosers have unlimited current interruption capability.) Loads are assumed to be constant, aggregated lumps that connect to switches over zero-impedance feeder conductors. The conductors have limited current carrying capability.

B. Network Connectivity

The connectivity of the network model must be known in order to achieve successful restoration. The switching devices, loads and sources – as well as how these different components are connected – are required for the restoration method. Restoration by this method is most effective when multi-layered back-feed networks are present in the distribution system.

C. Restoration Validation Check

The restoration validation check confirms the validity of the post-restoration network configuration in order to ensure that the network is radial and all the currents and voltages are within the component limits. The restoration method produces radial post-restoration networks. Thus, any additional radiality checks are not necessary.

A current violation check is done as an integral part of the algorithm, based on the loading aggregation method described below. This check ensures that for all the network components, their post-restoration loading currents are less than their loading current limits.

D. Network Tracing-based Loading Aggregation

As stated in the introduction, back-feed power restoration should not overload any part of the back-feeding network. In the described method, this is achieved by recursive network tracing-based loading aggregation method:

1) Start from a back-feeding source (usually a transformer), and trace down all the network components it supplies until the end of the tree structure is reached;
2) When returning to the source, the tracing method sums up the loading current at each network component and if applicable, compared with its corresponding limit;
3) The available capacity of a source can be calculated after the tracing goes back to the source.

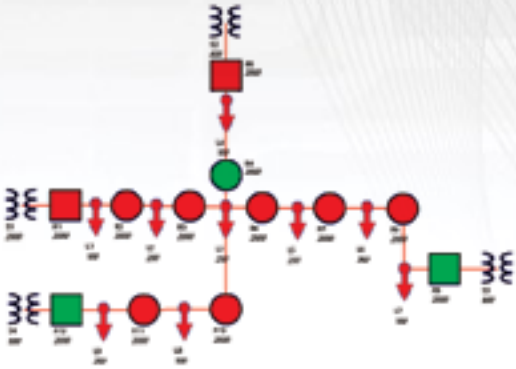
E. Single-Path and Multi-Path Restoration

If a source can provide the restoration power over a single path to an out-of-service load zone, the restoration is called a single-path restoration. Otherwise, the out-of-service load zone may have to be split into two or more load zones to be back-fed; this scenario is called multi-path restoration. Both single-path and multi-path restorations may have to shed load in cases where the back-feed source capacity or feeder components' loading capability is not adequate.

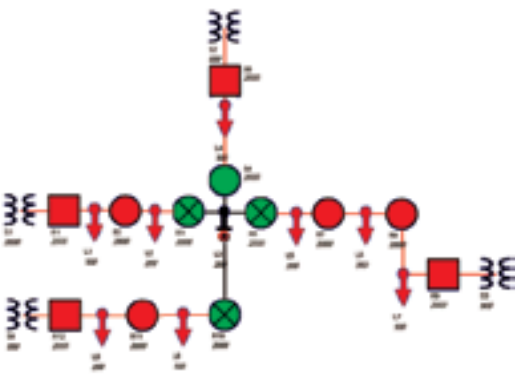
Solution Examples

Figure 1 shows a single-path, full restoration example, where a fault at T-node, L3, must be isolated by opening a forward-feed isolation switch, (R3) and two back-feed isolation switches (R6 & R10). In this example, back-feed sources (S3 & S4) both have sufficient capacity to pick up the out-of-service load on their corresponding restoration path and each tie switch (R9 & R12) can be closed to achieve the restoration. The post-restoration circuit topology is shown in **Figure 1B**.

Figure 1: Single-Path Full Restoration Example



(**1A**) Normal Topology



(**1B**) Post-Restoration Topology

Figure 2 shows a multi-path full restoration example, where a fault at load node L1 must be isolated by a forward-feed isolation switch R1 (in this case no forward restoration is required) and a back-feed isolation switch R2. In this example, none of the back-feed sources S2-S5 can completely pick up all the loads that are left unserved after fault isolation.

Hence, the algorithm splits the network into two parts – as in Step 4 (above) by opening R13 and the out-of-service load restored by closing both R9 and R12 (from both S3 and S4). The post-restoration circuit topology is shown in **Figure 2B**.

Figure 2: Multi-Path Full Restoration Example

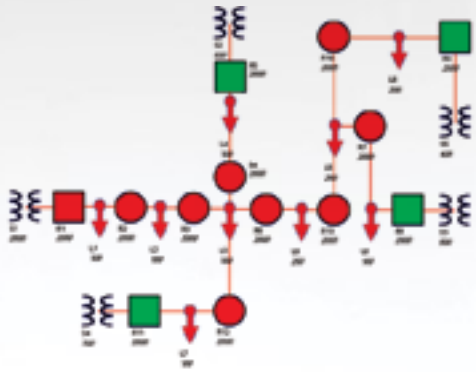


Figure 2A -Normal Topology

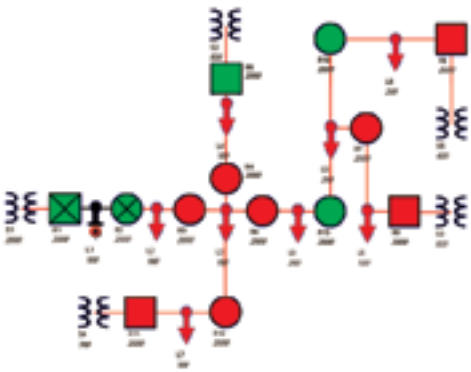


Figure 2B - Post-Restoration Topology

Figure 3 shows an extreme example where the splitting of the out-of-service load zones is still not enough. Following the fault at load L1, and its isolation by opening R1 and R2, none of the back-feed sources can pick up the out-of-service loads completely or even partially without violating the current capacity limits of those sources.

Load L5 has to be shed in order to restore power to as many out-of-service loads as possible. The post-restoration circuit topology is shown in **Figure 3B**. Note that the out-of-service load zone has to be split into three portions, according to the algorithm.

Figure 3: Multi-Path Partial Restoration Example

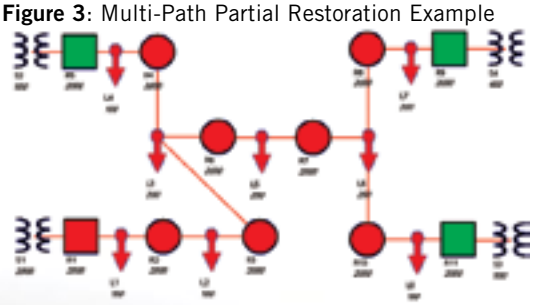


Figure 3A - Normal Topology

Figure 3B - Post-Restoration Topology

Algorithm Demonstration

During the development of the algorithm, a physical circuit with three sources, five switches and three loads was setup, and a controller application was programmed.

In the circuit of **Figure 4A**, because of the given source capacity (**4B**), a fault at load L1 results in a splitting of the out-of-service network of L2, R3 and L3, by the opening of switch R3. Both tie switch R4 and R5 close to restore power to the out-of-service loads, as shown in **4C**.

Figure 4 - The Demo Circuit

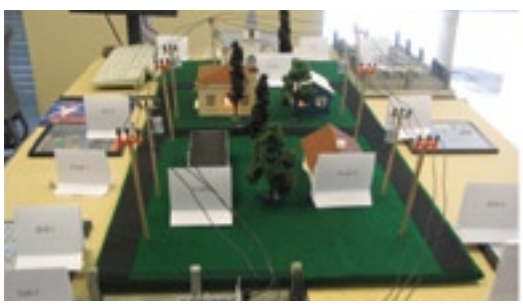


Figure 4A - Physical Circuit

Figure 4B - Normal Operation

Figure 4C - Normal Operation

The fault detection and service restoration switching sequence in **Figure 4D** proves the effectiveness of the algorithm.

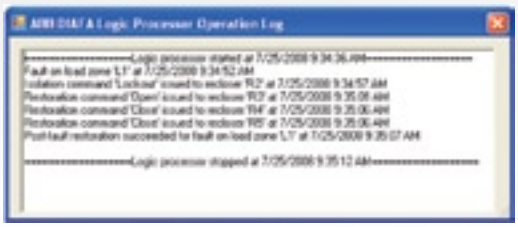


Figure 4D - Operation Log of the Controller Application

Conclusion

This article has described a deterministic algorithm that identifies a restoration strategy to restore the out-of-service load due to fault isolation while ensuring that the post-restoration network has a valid configuration. The algorithm is based on the concepts of network tracing and it supports both single-path and multi-path restoration. Applications and physical demonstration circuits today have proven that this process can produce appropriate back-feed switching strategies for any network topology.

This algorithm provides significant value to electric utilities in the Smart Grid arena. By deploying this intelligent solution with an adequate communications infrastructure, the reduction of customer outage minutes and the improvement of service reliability will be achieved. This technology is one major step in truly achieving a self-healing distribution network. ■

About the Authors

Zhenyuan Wang joined ABB US Corporate Research Center in Raleigh, North Carolina in 2000, where he is currently a Principal Consulting R&D Engineer. His research interests include electric power equipment condition monitoring/ assessment/ diagnosis, system monitoring, and control and automation. His experience includes asset management IT applications in the electric power industry, power system transient analysis, substation/distribution automation, and data integration/ warehousing/mining applications.

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Gregory K. Lawrence

FERC Issues Proposed Guidance and Smart Grid Development Plan

Guidelines Propose Rate-based Recovery Measures

By **Gregory K. Lawrence**, Partner, McDermott Will & Emery (Attorneys)

The Federal Energy Regulatory Commission (FERC) sets draft policy to encourage the implementation of Smart Grid technologies, which it expects will greatly increase system reliability and efficiency and at the same time lower the cost of electricity for consumers. Members of the "Smart Grid Collaborative" outline criteria for the DOE to consider when it begins providing grant and other funding from the $11 billion for Smart Grid projects under the Recovery Act.

Explosive Growth

On March 19, 2009, the Federal Energy Regulatory Commission (FERC) issued its Proposed Policy Statement and Action Plan setting forth its initial guidance and near-term priorities related to the development of a Smart Grid for the United States' electric transmission system. The term "Smart Grid" refers to the application of digital technologies to the bulk transmission system that allows for real-time coordination of information between the users, owners and operators of that system. FERC expects that implementation of Smart Grid technologies will greatly increase system reliability and efficiency and at the same time lower the cost of electricity for consumers.

The Energy Independence and Security Act of 2007 (EISA) requires FERC to adopt standards and protocols necessary to facilitate the functionality and interoperability of Smart Grid technology in the interstate transmission of electric energy and in regional and wholesale electricity markets. Prior to doing so, FERC must allow for a sufficient consensus to be reached on these issues through a process coordinated by the National Institute of Standards and Technology (NIST).

NIST's process will ultimately result in the submission of standards for adoption by FERC via a formal rulemaking. FERC notes, however, that a sense of urgency exists within industry and government for the development of these standards, and therefore FERC is providing its proposed policy statement to help inform the development process. FERC is allowing for the submission of public comments on its proposed policy statement on or before May 11, 2009. FERC will consider all filed comments prior to finalizing its recommendations.

FERC's proposed policy statement and action plan contains two major components. First, FERC provides its initial guidance on certain key elements of the Smart Grid. Second, FERC introduces a rate recovery plan for jurisdictional utilities implementing Smart Grid technologies in the near term.

Key Elements of the Smart Grid

FERC's proposed policy statement seeks to provide guidance on standards for four major elements of the Smart Grid:

- Cyber-security and reliability requirements
- Common information models for communications among all elements of the bulk power system (i.e., market operators, utilities, generation assets and demand-side resources)
- Implementation of equipment that provides system operators with a complete "wide-area" view of their systems to facilitate better monitoring and system optimization
- The coordination of the bulk power system with new and emerging technologies such as renewable resources, demand-side resources, energy storage and electric transportation

FERC notes that the development of inter-system communication, system security, wide-area situational awareness, demand response, electric storage and electric transportation should be prioritized and accelerated.

Rate Recovery Policy

In order to offer some rate certainty and to encourage jurisdictional utilities to implement Smart Grid technologies in the near term, FERC is also proposing an interim rate recovery policy that would enable public utilities to seek cost recovery for investment in Smart Grid technologies prior to the final implementation of Smart Grid standards.

To qualify for rate recovery, jurisdictional utilities would submit single-issue rate filings FERC and demonstrate that their proposed Smart Grid deployments would not inhibit compliance with FERC-approved reliability standards or

endanger grid security; make a good faith effort to further the vision of a Smart Grid by stressing interoperability and the capacity for continued upgrading; and agree to share useful information gleaned from operation of Smart Grid programs, particularly pilot projects or demonstration programs, with the U.S. Department of Energy's (DOE's) Smart Grid Clearinghouse.

FERC will consider Smart Grid devices and equipment, including those used in a Smart Grid pilot program or demonstration project, to be "used and useful" for the purposes of rate-recovery if an applicant makes the applicable showings. The rate policy would also permit requests for accelerated depreciation and abandonment authority tied to Smart Grid deployments, with similar showings of mitigation required.

Details of the FERC's Proposed Policy Statement and Action Plan and additional Smart Grid materials are available at *http://www.ferc.gov/industries/electric/indus-act/smart-grid.asp.*

State, Federal Regulators Submit Criteria for DOE Smart Grid Stimulus Funding

On March 26, 2009, members of the "Smart Grid Collaborative" outlined a list of criteria for the DOE to consider when it begins providing grant and other funding for Smart Grid projects under the American Recovery and Reinvestment Act (ARRA) of 2009. The ARRA authorized $11 billion for electricity transmission and Smart Grid projects. The Collaborative is composed of state and federal regulators and is jointly sponsored by the National Association of Regulatory Utility Commissioners (NARUC) and FERC.

The funding criteria submitted by the Collaborative are divided into eight categories that focus on grant preconditions, project scope, technologies to be considered, rate design, regulatory issues, information requirements, protection of customer privacy and data, and mechanisms to monitor customer response. Pursuant to the suggested criteria, any application for grant funding must address how the project will provide for interoperability in the absence of approved standards, address cyber security issues, minimize the possibility of stranded costs, share information with the DOE Smart Grid Clearinghouse, and maintain the reliability of the grid and the integrity of communicated data.

In its transmittal letter to the DOE, the Collaborative stated that it believes these criteria, developed through consensus by a broad group of commissioners around the United States, many of whom will ultimately be responsible for approving Smart Grid projects within their jurisdictions, are important criteria to apply as the DOE considers which projects will receive funding.

About the Author

Gregory K. Lawrence is a partner in the Energy and Derivatives Markets Group of global law firm McDermott Will & Emery, and leads the firm's Global Renewable Energy, Emissions and New (GREEN) Products Group. Mr. Lawrence focuses his practice on renewable power, emissions and energy efficiency project development, regulatory proceedings, compliance and investigations, negotiations, and governmental affairs relating to the wholesale and retail electricity and natural gas industries.

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