www.electricenergyonline.com

Electric Energy T&D MAGAZINE

MARCH-APRIL 2009 Issue 2 • Volume 13

In this Issue

Information Technology: A Guide to Environmental Compliance for AEP

smart metering

time varied rates

demand response

critical peak pricing

environmental sustainability

Elster...
energy conservation for the Smart Grid

proven // flexible // open // interoperable

elster

www.elster-eis.com

Innovate AMI. Increase Reliability. Reduce Emissions.

Energy consumption concerns are on the rise, as is the demand for environmentally conscious energy. Comverge is leading the charge with innovative Clean Energy solutions. Select from Demand Response, energy efficiency, advanced metering, and grid management solutions to solve your energy demand challenges while doing your part to help protect the environment. Partner with Comverge and discover the innovative solutions for meeting growing demand.

www.comverge.com | 888.565.5525

ZigBee® Certified product

Publisher:
Steven Desrochers: steven@electricenergyonline.com

Editor in Chief:
Mike Marullo: mam@electricenergyonline.com

Advertising Sales Manager:
Jimmy Desjardins: jimmy@electricenergyonline.com

Circulation Manager:
Janet Guay: janet@jaguar-media.com

Art Designers:
Anick Langlois: alanglois@jaguar-media.com
Tarah McCormick: tarah@jaguar-media.com

Internet Programmers:
Johanne Labonte: jlabonte@jaguar-media.com
Sebastien Knap: sknap@jaguar-media.com

Electric Energy Magazine is published 6 times a year by: Jaguar Media Inc.
1160 Levis, Suite 100, Terrebonne, QC Canada J6W 5S6
Tel.: (888) 332-3749 • Fax: (888) 243-4562
E-mail: jaguar@jaguar-media.com
Web: www.electricenergyonline.com

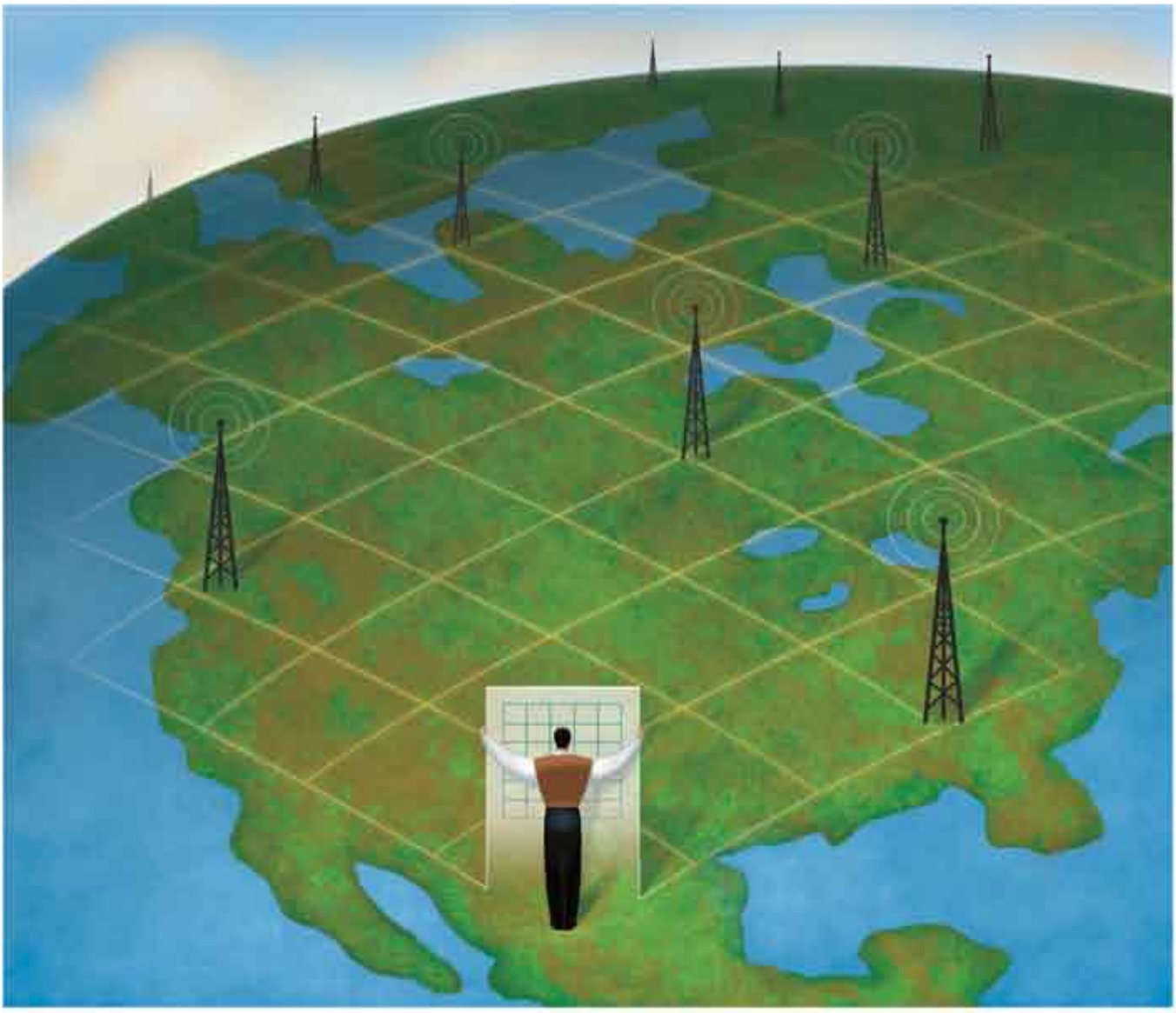
***Electric** Energy **T&D** Magazine* serves the fields of electric utilities, investor owned, rural and other electric cooperatives, municipal electric utilities, independent power producers, electric contractors, wholesalers and distributors of electric utility equipment, manufacturers, major power consuming industries, consulting engineers, state and federal regulatory agencies and commissions, industry associations, communication companies, oil & gas companies, universities and libraries.

Post Publication mail agreement #40010982
Account #1899244

COVER PAGE IMAGE: www.istockphoto.com

Electric Energy T&D MAGAZINE

IN THIS ISSUE



The Smart Grid Gets Real

The "Smart Grid-Ready" FlexNet AMI System from Sensus is the real world, proven AMI solution for water, gas and electric utilities. In fact, we have the largest number of AMI endpoints in operation in the world. It's the only AMI system with enough range to reach more homes with far less infrastructure. So you need fewer collectors, fewer maintenance hours, and fewer things to go wrong.

FlexNet® also gets you "Smart Grid-Ready" with ANSI compliant metering, IP-based wide area communications, open standards home area networking, and IP-based information systems. It communicates with a complete range of endpoint devices, including smart water, gas and electric meters, intelligent home devices, and distribution automation equipment in any mix of rural and urban settings.

To learn more about how FlexNet can help your Smart Grid solutions to get real, visit

www.sensus.com/flexnet. Or call 1-800-METER-IT.

SENSUS

Michael A. Marullo, Editor in Chief

Welcome to the March/April 2009 issue of *Electric Energy T&D!*

As you read this, already the second quarter of the year will be well under way, and we should be starting to see not only more details about how and when the looming economic challenges we are all facing will be addressed, but also how our industry will fare in that process. It seems that everyone I talk to these days has passionate and deep-seated feelings about how to fix the economy, often emanating from widely polarized positions. However, we have some of the best minds in the world working on it, and I for one, remain optimistic that we'll pull out of this slump and regain the higher ground as the balance of 2009 unfolds. But, however it finally turns out, and whatever the time frame, it seems likely that major changes are afoot.

A common element of even the most divergent views is that an unprecedented level of investment is warranted in both energy and conventional infrastructure, regardless of how it is ultimately financed and carried out. Needless to say, these two areas – energy and infrastructure – go hand-in-hand, and both are clearly in need of a massive rejuvenation after decades of neglect and unrealistically deferred attention. I suppose one could say that it's finally time to pay the piper, but the size of the task – both in resource and economic terms – is daunting, to say the least.

One piece of good news is that most industry analysts, investors and others I've spoken with recently agree that the energy and utilities sector is probably better positioned to withstand the sluggish economy than practically any other major vertical market – at least for the near-term, but quite possibly in the longer term as well. The very fact that electric power is so vital to our economy, our security and especially our quality of life, portends a fundamental need for investment that simply cannot be overstated.

As you probably know, it has been widely reported that critical grid transformation investments are probably in the $1.5 to $2 trillion range over the next ten years, but even that level of commitment may prove insufficient to keep power flowing smoothly unless we start taking bold steps toward shoring up the elements that are among the most critical and vulnerable in our decaying T&D infrastructure.

But there's also more good news: Now that most utilities have returned to core business – following a rather disturbing foray into non-regulated businesses a decade ago when deregulation was the hot topic – investors are once again turning to utilities; not just as a safe, stable environment, but also as a rich field of new and exciting opportunities to move toward a more sustainable and secure energy future. Moreover, having long been a safe haven during economic downturns, utilities are once again drawing interest from the investment community. This renewed interest includes not only large institutional investors and venture capital firms but also smaller, industry-specific firms and individuals alike. With such a pronounced emphasis, it's hard to imagine how our recovery could possibly NOT include a huge boost for longstanding energy supply, delivery and efficiency goals – many if not most of which have been delayed for far too long.

As you probably noticed from our cover and table of contents, this issue is primarily focused on Geospatial, Mobility & Field Automation applications, and among the key areas of investment being considered within the context of the economic recovery is the creation of a National GIS database. And none other than the man who is virtually synonymous with geospatial technology – Jack Dangermond, president and CEO of ESRI – spearheads this bold initiative.

You will learn a lot more about the architectural structure, salient benefits – and even the estimated cost – of a National GIS in the second installment of our 2009 Automation/IT Leadership Series interview with Jack Dangermond and Bill Meehan, the latter being the person responsible for overall corporate direction for ESRI's infrastructure industries, including electric and gas utilities, transportation, water and telecommunications.

This issue also offers a diverse collection of articles and features that cut across the entire energy/utility market landscape. These range from insights into major Clean Tech projects among the largest of utility enterprises – featured in our second LightsOn™ installment – to innovative product, system, service and application articles designed to enrich your own work experience, whether as a supplier, user, consultant or third-party participant.

Judging by the editorials contained within the covers of this issue, it should be clear to even the most casual observer that there is a lot of innovation going on and that the solutions such innovations produce are in higher demand today than perhaps ever before. Our future is now; it starts today, so let's all do our part to make sure we get on with it sooner rather than later… tomorrow might be too late. **– Mike Marullo**

Southern Company Reaches Milestone in Smart Meter Program with 1 Million Installations

Atlanta, GA – Southern Company announced that it has installed 1 million Smart Meters, achieving a milestone in an advanced electricity metering program that will eventually see 4.4 million meters in place for its customers across the Southeast.

The program - which integrates advanced metering, communications and other innovative technologies to provide superior customer service at reduced operating costs - is producing direct benefits for the customer, the environment and the company while positioning the company to employ additional features of the technology in the future.

The initiative began in January 2008 and will deploy Smart Meters for customers of Southern Company's electric utility subsidiaries Alabama Power, Georgia Power, Gulf Power and Mississippi Power. The company is installing about 4,500 meters each day.

In addition to reducing operating costs that can help keep rates lower for customers, the company expects the program to lessen environmental impact. Southern Company, for example, expects to reduce the vehicle fleet used for meter reading by at least 500, saving 12.5 million miles of driving annually and producing direct benefits in lower vehicle emissions.

Once fully deployed, the Smart Meter program may also allow customers to manage energy consumption, helping them to be more efficient by providing detailed energy usage information and innovative rate options.

"Southern Company continues to be an industry leader in adopting technology that benefits customers while reducing environmental impact," said Southern Company CEO David Ratcliffe. "The company's progress in the Smart Meter program underscores our commitment to customer service and environmental responsibility."

Installing Smart Meters throughout Southern Company's territory lays the groundwork for many potential technology opportunities and benefits in the future as well. Those include:

- Innovative billing and rate options
- Remote programmability of meters
- Power quality monitoring
- Prepaid power options

Southern Company's program is based on the Sensus FlexNet® Advanced Metering Infrastructure network, which uses advanced technology that allows for a range of features, including meter reading for monthly billing, two-way communication between customers and the company, outage detection, and remote reconnects and disconnects.

With 4.4 million customers and more than 42,000 megawatts of generating capacity, Atlanta-based Southern Company (NYSE:SO) is the premier energy company serving the Southeast. A leading U.S. producer of electricity, Southern Company owns electric utilities in four states and a growing competitive generation company, as well as fiber optics and wireless communications. Southern Company brands are known for excellent customer service, high reliability and retail electric prices that are significantly below the national average. Southern Company has been listed the top ranking U.S. electric service provider in customer satisfaction for nine consecutive years by the American Customer Satisfaction Index (ACSI). Visit our Web site at *www.southerncompany.com*.

Circle 21 on Reader Service Card

ABB wins major BC Hydro retrofit contract in Canada

Vancouver, BC – ABB, the leading power and automation technology company, announced today that it has been awarded an $18 million contract by BC Hydro at the utility's G.M. Shrum (GMS) power generation station located at Hudson's Hope, British Columbia.

The work is to be carried out in three stages, with the first phase to be completed by August 2009 and the balance of the work by 2010 and 2011, respectively.

The contract calls for ABB to carry out a retrofit of station service equipment at the GMS facility. Being executed by ABB's Service team, with overall project management to be handled by the Hydro and Electrical Balance of Plant center of excellence, the project includes the supply of ABB medium voltage and low-voltage switchgear, dry-type transformers, cables and other equipment. ABB will also be conducting system studies and providing complete engineering, installation and commissioning services.

"ABB is one of our preferred suppliers," said Boyd Mason, project manager at BC Hydro. "ABB made significant efforts to understand both our technical and commercial needs, and clearly demonstrated that it understood our requirements and risks, and we are confident that they will deliver. Another factor supporting our decision to go with ABB was that they exceeded our design requirements and incorporated a number of additional key safety features into the design of their solution supporting BC Hydro's continual commitment to safety – our number one value."

"Among our greatest challenges with this contract," said Greg Farthing, vice president of Sales and Marketing for ABB's Power Products and Power Systems, "was to develop effective ways of upgrading BC Hydro's system without interrupting operations at its plant, as well as to complete the work on schedule, safely and with respect for the environment. We are confident that we will meet all of these demands, and in so doing, be in a position to win similar contracts during the years to come."

As the third largest electric utility in Canada, BC Hydro (*www.bchydro.com*) serves customers in an area that is home to over 94 percent of British Columbia's population. Through its world-class integrated

RUGGEDCOM®
INDUSTRIAL STRENGTH NETWORKS™

Rugged Communications

Networking Solutions for Electric Utilities

Smart Grid

The ***enabler*** of the Smart Grid with reliable communications

Substation

Designed Specifically For ***Harsh Utility Environments***

Power Generation

An ***integral part*** of real-time control systems for plant automation

Renewable Energy

Ethernet ***connectivity*** to the process control IEDs right in their native environment

- The Industry's Most Complete Line of Hardened Products
- The Industry's Most Comprehensive Cyber Security Solutions
- Advanced Network Management Software Solutions

RUGGED RATED

- High EMI Immunity (IEC 61850, IEEE 1613)
- Wide Temperature Range (-40°C to 85°C)
- Fast Network Fault Recovery
- High Reliability and Network Availability
- Integrated Cyber Security Features

RuggedSwitch® Ethernet Switches

RuggedServer™ Serial Device Servers

RuggedRouter®
Cyber Security Appliance

RuggedSwitch®
IP66/67 Ethernet Switch

RuggedWireless™
Wireless Ethernet Switches

RuggedMC™
Media Converters

RUGGEDNMS
Network Management Software

Network Management Software

Gauntlet

Cyber Security Solution

Cyber Security

RuggedCom Corporate Headquarters
30 Whitmore Road, Woodbridge,
Ontario, Canada L4L 7Z4

Tel: + 1 (905) 856-5288
Fax: +1 (905) 856-1995

RuggedInfo@RuggedCom.com

www.RuggedCom.com

hydroelectric system the utility assures an efficient and reliable supply of electricity in support of the province's development. Thanks to this outstanding system, British Columbians enjoy some of the lowest electricity rates in North America.

Circle 22 on Reader Service Card

SolarCity's 'Think Half' Promotion Can Make Solar Power Twice as Affordable

Offer Combines Discount, Government Incentives and Utility Rebates to Provide Solar System Installations at Net Cost Up to 50 Percent Below 2008 Retail Value

Foster City, CA – SolarCity®, a national leader in solar power system design, financing, installation, monitoring and related services, is offering a promotion that, when combined with government incentives and utility rebates, can allow homeowners to pay a net cost for a solar system installation up to fifty percent less1 than the typical full retail price in 2008. SolarCity's "Think Half" promotion incorporates an introductory discount for sleek, recyclable thin-film solar modules from First Solar (*www.firstsolar.com*) in SolarCity's service areas in California and Arizona. The promotion lasts until March 31, 2009, and marks the first time First Solar's advanced thin-film technology, known for delivering the lowest manufacturing cost in the industry, is widely available for the residential market.

First Solar modules deliver superior performance in variable light and high temperature, and achieve the lowest environmental footprint of any photovoltaic technology on a lifecycle basis. Residential customers prize the slender, frameless black modules for their striking, reflective-glass aesthetic. First Solar also provides a comprehensive collection and recycling program for its modules at the end of their useful lives.

"Increasing solar's return-on-investment, and improving solar system aesthetics are consistently the two greatest priorities for our customers, and this promotion addresses both," said Lyndon Rive, SolarCity's CEO. "Solar power systems continue to be among the safest, most predictable investments homeowners can make in the current economic climate."

Homeowners interested in "Think Half" can contact SolarCity 1-888-SOL-CITY or *www.solarcity.com* to arrange a free, no-obligation solar consultation. Interested Arizona homeowners can learn more about the promotion and rebates at: *http://www.solarcity.com/campaigns/2009/ads/halfoff/arizona.aspx*

California homeowners can view additional information on the promotion here: *http://www.solarcity.com/campaigns/2009/ads/halfoff/default.aspx*

Circle 23 on Reader Service Card

New Energy-Saving Products from GE

Louisville, KY – The U.S. Department of Energy and the U.S. Environmental Protection Agency have awarded GE Consumer & Industrial the ENERGY STAR® Sustained Excellence award for the fourth straight year. Also this marks the sixth year GE has been acknowledged as an ENERGY STAR Partner of the Year. These awards recognize GE's tremendous efforts to create high-performance household appliance and lighting products that help reduce energy spending and protect the environment.

In 2008, the number of ENERGY STAR qualified appliance base models was up 26.5% from the previous year for a total of 563 models. In fact, 54% of the GE appliance products are ENERGY STAR qualified. The number of ENERGY STAR qualified lighting models grew in 2008 to a total of 271. The majority, 99.3%, of the 2008 GE compact fluorescent lamp sales were ENERGY STAR qualified models.

"The ENERGY STAR awards represent achievements the Department of Energy is proud to recognize as they represent notable progress or sustained excellence in working to secure our energy future," explained Richard H. Karney, DOE ENERGY STAR Program Manager. "In 2009, our partners receiving these awards demonstrated superb commitment to advancing the adoption of energy efficient products and addressing our environmental challenges," he continued.

GE has been an active supporter of the ENERGY STAR program through a variety of methods, including broad consumer and customer education, participation in national and regional ENERGY STAR events, and the promotion of ENERGY STAR products to consumers and homebuilders.

New Energy-Saving Products from GE:

GE has introduced the **world's first truly incandescent-shaped Energy Smart® CFL bulb**. Miniaturized electronics developed by GE Consumer & Industrial engineers and scientists are the enabling technology of a new covered GE Energy Smart compact fluorescent light (CFL) bulb featuring the GE Spiral® CFL inside the glass bulb. With this new CFL-a design achievement that GE has protected with more than a dozen U.S. patent applications-the electronics fit in the neck of the bulb. The result is a profile that's practically identical to a standard incandescent light bulb. GE anticipates its new 15-watt incandescent-shaped covered Energy Smart® CFL will appeal to people that want the energy savings and long-life performance of a GE Energy Smart® Spiral® CFL with the appearance, size and fit of a traditional incandescent bulb.

In April 2008, GE was proud to introduce two innovative water heaters that were the first to meet new 2009 ENERGY STAR requirements. GE was one of the key participants in the criteria-development process and urged the DOE to adopt aggressive standards for high–efficiency ENERGY STAR water heaters. The GE Tankless Gas Water Heater, currently available, and the **GE Hybrid Electric Water Heater**, available later this year, represent the latest in a series of GE appliances designed to help energy efficiency in the home.

The innovative new GE Hybrid Electric Water Heater is designed to provide the same hot water homeowners are accustomed to, but requires only about half the energy to produce it. For example, based on the same standard tank water heater that uses approximately 4800 kWh per year, the new GE Hybrid Electric Water Heater is designed to:

- Use less than half of that energy – or about 2300 kWh per year – a savings of approximately 2500 kWh per year
- Save approximately $250 per year—based on 10 cents per kWh.

GE Is Leading the Way in Energy Management too: "Now that ENERGY STAR® appliances are recognized by 75 percent of American consumers, the next step is to reshape when energy is being used," said Kevin Nolan, Vice President Technology for GE Consumer & Industrial. "Peak hour energy demand is growing faster than total energy demand. It is imperative that we begin to shift some of the energy load from peak hours to other parts of the day -- helping to avoid the need to build new power plants to meet the demand," he explained.

In the first Quarter of 2009, GE will introduce a suite of "smart" appliances or **Energy Management Enabled Appliances**. These GE appliances will be enabled to receive a signal from the local utility companies that are participating in tiered rate programs to help consumers manage their peak energy usage. The appliances will receive the control signal that utility rates are high and react based on the appliance's internal programming.

Within 10 years, energy management enabled appliances could easily occupy the market space held by ENERGY STAR qualified products today. GE is investing in these appliances today, and – by doing so – will be ready to help consumers use less energy and reduce their utility costs in the future.

Currently most utility company rates are the same throughout the day. However, many utility companies across the country are considering a time-of-use pricing structure so that consumers can avoid using energy during critical peak hours (typically between 3 p.m. and 7 p.m.) and save money.

"At GE, we believe that peak load reduction is the next opportunity in energy saving appliances. We believe that smart, energy management enabled appliances will be the next phase of innovation," explained Nolan. "It's not enough to simply use less power, as ENERGY STAR encourages today, we now need to consume our power more intelligently."

For more information, consumers may visit *www.ge.com*

Circle 24 on Reader Service Card

Eka Systems Named AlwaysOn GoingGreen 50 Winner

Company Selected as a Leading Green Technology Innovator for 2009

Germantown, MD – Eka Systems (*www.ekasystems.com*) announced that it has been selected to the 2009 GoingGreen East 50 Top Private Company List. The GoingGreen East 50 Award is given to private, emerging companies creating new business opportunities in green technology. Eka Systems was selected by the AlwaysOn editorial team based on demonstration of growth, market opportunity, quality of innovation and customer traction.

"We are delighted to receive this Award and pleased that our commitment and success in the Smart Grid and Smart Metering marketplace continues to gain recognition", said Prakash Chakravarthi, Chairman and CEO of Eka Systems. "Coming on the heels of our ***AMI Project of the Year Award*** in early February, by Utility Automation Engineering T&D, this win further establishes Eka Systems as a premier provider of proven AMI solutions to utilities", he added.

Eka Systems and the other GoingGreen East winners will be recognized at the GoingGreen East Conference at the Four Seasons in Boston, MA, on March 9-11. This two-and-a-half day executive conference is co-presented and will feature presentations and high-level debates from CEOs, journalists, industry experts, investors and greentech executives.

"The GoingGreen East 50 companies have demonstrated their tenacity even in the toughest economic conditions that the technology world has ever encountered," said Tony Perkins, founder and editor of AlwaysOn. "We applaud their success in pushing the boundaries of innovation, creating market opportunities and transforming the industry even in the earlier stages of their businesses."

The GoingGreen East 50 winners were selected from among hundreds of other technology companies nominated by investors, bankers, journalists and industry insiders. The AlwaysOn editorial team conducted a rigorous three-month selection process to finalize the 2009 list.

A full list of all the GoingGreen East 50 winners can be found on the AlwaysOn website at *http://alwayson.goingon.com/permalink/post/31372*

Circle 25 on Reader Service Card

Con Edison Tree Care Blooms With National Award

Arbor Day Foundation Names Company "Tree Line USA Utility"; National Award Recognizes Tree Care, Planting and Public Education Efforts

New York, NY – Con Edison has been named a "Tree Line USA Utility" for the first time by the Arbor Day Foundation and the National Association of State Foresters in recognition of its ongoing tree trimming efforts to improve electric reliability. The award spotlights the company's care and maintenance for trees within New York City and Westchester County along with its commitment to public education programs, all while meeting service objectives.

"We are delighted to receive this recognition. It signifies our continuing commitment to promoting, protecting and enhancing our urban forests," said Louis L. Rana, president of Con Edison. "Regular maintenance and natural pruning of trees improves electric reliability, and the trees in our service area will be with us to beautify our neighborhoods for years to come."

Con Edison trims trees along distribution and transmission power lines to maintain safe and reliable service. Overgrown and fallen tree limbs are the leading cause of power outages during storms. The company's tree maintenance program helps ensure safe, reliable service, carefully trimming branches that may interfere with power lines.

The company also reinforces its dedication to preserving community trees though public education efforts, which advise customers on which plant species are appropriate to plant near utility lines.

Stay in control with the SEL-351R Falcon

The SEL-351R Falcon Recloser Control combines flexible applications and simple operation with a lightweight cabinet that is easily installed by just one person. This economical control is perfect when upgrading hydraulic reclosers or retrofitting traditional 14-pin controls. SEL investments in manufacturing and engineering have decreased our costs, enabling us to offer the SEL-quality Falcon at the lowest price in the industry. Learn more about the SEL-351R Falcon and our complete line of recloser controls at **www.selinc.com/3eetd**.

SEL-351R Falcon Recloser Control

SEL-351R FALCON

SEL Celebrating 25 Years of Innovation

www.selinc.com
info@selinc.com
+1.509.332.1890

"Across America, people are recognizing and celebrating how vital trees are to our cities and towns," said John Rosenow, chief executive of the Arbor Day Foundation. "Trees help reduce peak demand by conserving energy. They also clean air and water, increase property value, and make our homes more comfortable, livable places."

Con Edison is a subsidiary of Consolidated Edison, Inc. (NYSE: ED), one of the nation's largest investor-owned energy companies, with approximately $14 billion in annual revenues and $33 billion in assets. The utility provides electric, gas and steam service to more than 3 million customers in New York City and Westchester County, New York. For additional financial, operations and customer service information, visit Con Edison's Web site at *www.conEd.com*.

Circle 26 on Reader Service Card

AltaLink Invests in Essential Transmission Infrastructure

Calgary, AB – In 2008, AltaLink continued to deliver much-needed electric transmission projects to keep the lights on for Albertans. Following the unprecedented period of expansion in our province, our focus is on reinforcing our system and building essential transmission infrastructure.

"The need for investment in a more modern and smarter transmission grid in Alberta remains clear," said Scott Thon, AltaLink's President and Chief Executive Officer. "Whether to enable diverse, new renewable electricity sources or improving the efficiency and reliability of the existing system, transmission is a key to unlocking the benefits of the electric system for Albertans."

"These investments not only ensure a safe, reliable and cost-effective electricity system, but also bring valuable jobs and new opportunities for our province."

Highlights of AltaLink's operations in 2008 included:

- Safely and efficiently carrying out a capital construction program with investments of $174.4 million in facilities for our customers; Successfully refinancing $100.0 million of long-term debt which matured in 2008;
- Completing the Keephills-Ellerslie-Genesee (KEG) transmission line on April 6, 2008, the first 500 kV line to be energized in Alberta in more than 20 years;
- Enabling up to 2,700 megawatts of future Alberta renewable wind power resource by completing the hearing process with the Alberta Utilities Commission for our 240 kV Southwest Development project together with moving forward on the first phase of the proposed Southern Alberta transmission reinforcement project; and
- Being named "Best Place to Work" in the Energy/Oil and Gas division by Calgary Inc Magazine.

AltaLink, L.P. also announced its financial results for the 2008 fiscal year. AltaLink recorded net income for the year ended December 31, 2008 of $40.7 million compared to $37.6 million for the year ended December 31, 2007. Revenue for the year ended December 31, 2008 was $233.4 million, compared to $213.4 million for the year ended December 31, 2007.

The year over year increase in tariff revenue results primarily from growth in our regulated rate base for transmission assets, recovery of higher operating costs due to system growth, recovery of depreciation charges on new capital additions, and higher allowed returns on capital invested as the allowed rate of return on equity increased from 8.51% in 2007 to 8.75% in 2008.

Net income for the year ended December 31, 2008 is $3.1 million higher than 2007 primarily due to higher transmission tariff revenue derived from our continuing investment in regulatory transmission assets, which is partially offset by higher operating expenses, depreciation and interest expense attributable to the growth in rate base assets.

The net income reported above is pre-tax, and is not directly comparable with net income reported by companies that recognize tax expense in their financial statements.

AltaLink's full financial results and management's discussion and analysis can be found on AltaLink's website at *www.altalink.ca* or on SEDAR at *www.sedar.com*.

AltaLink, Canada's only fully independent transmission provider, is responsible for the maintenance and operation of more than 11,600 kilometres of transmission lines and approximately 260 substations in Alberta. As Alberta's largest supplier of safe and reliable transmission, AltaLink is moving forward to provide a transmission system that will continue to meet the growing needs of Albertans. AltaLink has been a proud supporter of Alberta 4-H since 2003, and as a Legacy Builder it is the title sponsor of all regional, district and provincial communications and public speaking programs.

Circle 27 on Reader Service Card

Echelon Launches LonWorks 2.0 Platform for Smart Networks

New Platform Enables More Powerful and Economical Smart Networks in Buildings, Factories, Cities and Homes

San Jose, CA and Nuremberg, Germany – Echelon Corporation (NASDAQ: ELON) announced the launch of the LonWorks® 2.0 platform, the next generation platform of control networks and products that make it more cost effective than ever to build everyday devices in buildings, factories, city infrastructure, homes and other applications that are smart, connected, and energy aware. This new platform utilizes the latest technology in improving the speed, power, and cost-effectiveness of systems designed to deliver smarter, more convenient environments for work, play, and living while simultaneously lowering energy use.

The LonWorks 2.0 platform brings a new level of performance and simplified installation to control networks based on the ISO/IEC 14908 body of standards and is fully compatible with the millions of intelligent LonWorks devices already deployed worldwide. The announcement was made at the Embedded World Exhibition & Conference underway in Nuremberg, Germany, March 3-5, 2009.

"Since its founding 20 years ago, Echelon has been focused on bringing the power of networks to everyday devices so that they can make better operating decisions and improve our lives. With the increased performance and reduced cost of the LonWorks 2.0 platform, we have expanded the opportunity for even more devices to become smart and energy-aware at a time when the world needs it most," said Ken Oshman, CEO at Echelon.

"Working together intelligently and automatically in buildings and systems all around us, LonWorks networks can reduce energy consumption and operational costs, while increasing quality, reliability, and comfort. Saving energy has never been more important than now, both with respect to the climate impact and the economic impact – and we are proud to able to play a leading role in making this happen," Oshman continued.

Expanding Market for Energy Aware Networks

LonWorks 2.0 based products will accelerate the move to smart networks and products that are energy aware that has been pioneered by companies that have built control applications on the existing LonWorks platform. Smart products and systems that automatically manage their energy usage in response to changing grid conditions have redefined the smart grid. With the LonWorks 2.0 platform, a new generation of cleaner and greener smart networks is possible.

The immediate beneficiary of the initial set of LonWorks 2.0 products will be the commercial building sector – a key energy consuming sector that by some estimates consume as much as 50% of United States' total electricity generation. The expected impact is likely to be on systems for small buildings and the efficiency retrofit market.

Small buildings comprise over 98% of the commercial building market and almost uniformly lack sophisticated control systems or energy response capabilities. Within the large building market, a call for improved efficiency is expected to accelerate the demand for greater levels of control and accountability for energy incentive programs.

New LonWorks 2.0 Products

The first set of LonWorks 2.0 products includes the Neuron® 5000 processor, the FT 5000 Smart Transceiver, LNS® FX network operating system, LonMaker® FX installation tool, the NodeBuilder® FX Development Tool and the Mini FX Evaluation Kit. (See related press release dated March 3, 2009 for additional details and availability, *http://www.echelon.com/company/press/2009/lonworks2products.htm*)

More information about Echelon can be found at *www.echelon.com*

Circle 28 on Reader Service Card

Information Technology: A Guide to Environmental Compliance for AEP

By Lawrence Goldenhersh, Enviance,
Ray King, Microsoft, and
John McManus, AEP

Lawrence Goldenhersh

Ray King

John McManus

A calculator, logbooks and piles of quickly outdated spreadsheets and reports from multiple systems: Most environmental coordinators have used these or similar tools, along with a telephone and e-mail over the last few decades to fulfill environmental reporting requirements. However, tough legislation – along with savvy investors and consumers – demand an approach that is more systemic and formal.

Today, utility companies the world over are being pushed from every angle to reduce greenhouse gas and other emissions. And, the coming years promise to be even more challenging. Every utility executive should be considering options – and selecting an approach – that is both fiscally and socially responsible to guarantee that utilities meet growing power demands while fulfilling societal pressure to reduce emissions and environmental impact.

American Electric Power (AEP), with about 5.1 million customers in 11 states and more than 38,000 megawatts of generation capacity in the United States, is one such utility taking a leadership role in using information technology (IT) to improve its greenhouse gas reporting and environmental compliance management. This article will introduce you to AEP's compliance reporting strategy and how other utilities can use IT to boost their own reporting capabilities.

Today's Environmental Climate

Utilities face a dynamic regulatory landscape and the need to answer customers' and shareholders' increasingly sophisticated environmental concerns. According to research by the HSBC Climate Partnership released in November 2008, 43 percent of the 1,000 people from 12 countries surveyed chose climate change ahead of the global economy when asked about their current concerns, despite the turmoil in the financial markets taking place at the time. Investors and shareholders are also expressing concern in shareholder meetings and through involvement in sustainable investments funds.

A number of countries around the world have adopted programs to reduce greenhouse gas

Figure 1: AEP will begin carbon capture and storage at its Mountaineer Power Plant (New Haven, WV) beginning fall 2009.

The Brand Most Specified By Utilities.

- INDUSTRY LEADING PROTECTION
- PREFERRED COMFORT
- PROVEN PERFORMANCE

After investing millions of dollars and several years testing & comparing the performance of various FR fabrics in electric arc flash explosions, Con Edison of New York specified INDURA® Ultra Soft® flame resistant fabrics by brand name. To find out more and view live arc flash videos, visit our new expanded website **www.westexinc.com.**

www.westexinc.com • 866-4-WESTEX
Westex Inc. 2845 West 48th Place • Chicago, IL 60632
773-523-7000 • fax 773-523-0965

WESTEX INC.
A WORLD LEADER IN FLAME RESISTANT FABRICS

Circle **20** on Reader Service Card

emissions, and the United States Congress has discussed a national program for several years. Statistics show that power generation in the United States is a significant contributor to U.S. emissions. The U.S. Department of Energy's Energy Information Agency (EIA) reports that electric power generation is the biggest source of energy-related greenhouse gas emissions with 39.8 percent of the United States' total energy-related emissions in 2006.

As utilities manage the already rigorous process to track, reduce and report emissions such as sulfur dioxide, nitrogen oxides, mercury – and ultimately brace to add carbon dioxide – IT systems can help. Today's IT-based solutions can more comprehensively account for carbon emissions, which is critical as more companies consider setting greenhouse gas reduction targets. AEP already set targets through its participation in the Chicago Climate Exchange. The company is also implementing an IT system that AEP's executives believe will help them streamline recordkeeping and track progress toward reduction goals.

Determine Where You Are; Set Your Destination

Many utilities openly state their general sustainability intentions. But AEP takes its commitment even more seriously by setting and announcing specific emission reduction targets and timelines. In 2003, AEP announced its commitment to reduce or offset a cumulative 46 million metric tons of carbon dioxide by 2010 from a 1998 – 2001 baseline. By the end of 2007, the company had already reduced or offset 43 million metric tons of CO_2. Part of that reduction includes substantially reducing leakage of sulfur hexafluoride, a potent greenhouse gas, from transformers. And AEP has planned power plant efficiency improvements to reduce greenhouse gas by more than 400,000 tons per year by 2010.

AEP soon will be able to measure its achievements toward these goals and meet compliance reporting requirements with a high degree of ease and accuracy with an environmental information management system that puts reports and data into the hands of each employee who needs them. Its workers will use the system to better manage greenhouse gas reporting and Clean Air Act and Clean Water Act permit and compliance. With accurate and accessible emissions data and analysis, companies can set reasonable targets. When employees understand the big picture, they can meet reporting and permit requirements and hopefully also have the information they need to take steps toward meeting the company's greenhouse gas management goals.

In addition to required compliance reporting and other outside pressures, AEP also completed a major merger in 2000, which meant combining IT systems and operating procedures. The company – and the entire industry – faces changing and more complex regulatory agency reporting requirements as well as complex data in growing amounts from multiple sources and outdated processes for accessing compliance-related information.

Much of AEP's compliance data and reporting processes reside in the brains of plant staff and on computer hard drives, with varying processes and technology in place to capture it. Executives know that valuable data and knowledge is at risk of being lost as workers retire in the coming years. How can new staff and the rest of the company manage increasingly complex compliance requirements without valuable historical knowledge? The new AEP compliance system will help address these and other reporting challenges.

Figure 2: AEP's Emissions Record Under Chicago Climate Exchange Program

Track and Report Your Path

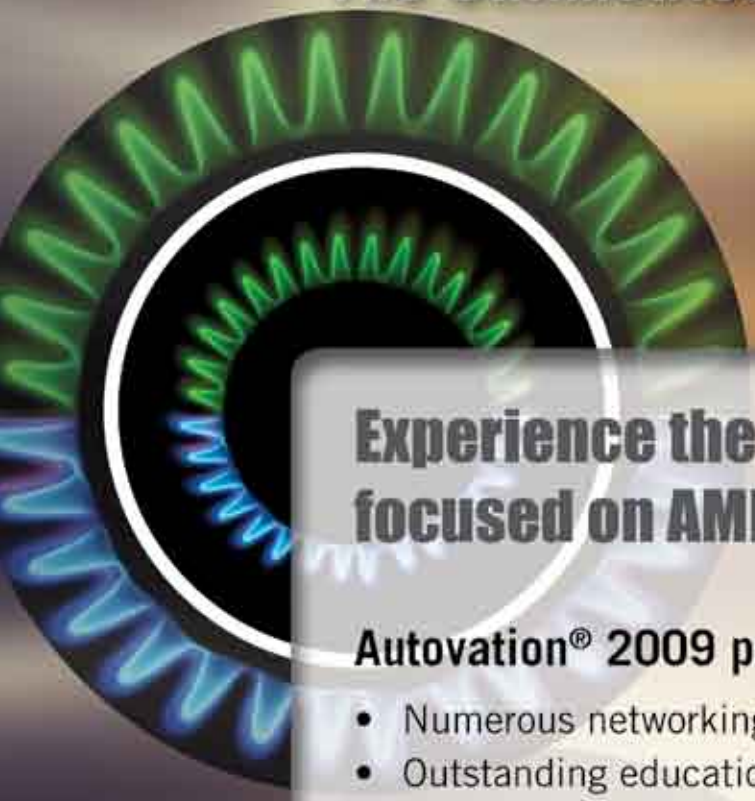
Once a utility determines its emissions goals and knows where they are today, IT tools can track progress and keep workers on the right path. IT systems provide consistent and automated reporting using up-to-the minute requirements and documented compliance processes for water, air and other required reporting – all securely accessible to any worker who needs the information.

As an example, AEP launched a new project in 2007 called M.E.S.H. – Managing Environment, Safety and Health. With the goal to standardize the company's compliance management approach, AEP also added an IT component called iMESH. The project includes efforts to enhance the company's environmental compliance measurement and reporting.

Autovation® 2009

The Utilimetrics International Symposium

September 13–16, 2009
Colorado Convention Center
Denver, Colorado



Experience the premier conference focused on AMR, AMI and Smart Metering

Autovation® 2009 provides:

- Numerous networking opportunities
- Outstanding educational sessions
- Solutions to optimize operational efficiencies
- Access to leading manufacturers and services
- Hands-on demonstrations of the latest innovative technologies

Utilimetrics has assisted utility professionals improve metering operations for more than 20 years.

This is the ONE conference not to be missed in 2009.

For more information on
Autovation® 2009, visit www.utilimetrics.org.

UTILIMETRICS
Alliance for Advanced Metering & Data Management Solutions

A significant part of AEP's iMESH initiative is the use of the software plus services (S+S) computing model with an Enviance-powered compliance solution and hosted software that runs from the web. "Software plus services" loosely defined means that software applications that run on a local computer or server are used in combination with an Internet-based service like Enviance.

Enviance provides Internet-based, on-demand systems that help companies manage and automate environmental, health and safety compliance activities and greenhouse gas tracking and emissions reduction. The system handles AEP's Clean Air Act Title V and greenhouse gas reporting and National Pollutant Discharge Elimination System (NPDES) compliance management. It also collects valuable data on things like plant maintenance and emissions monitoring equipment calibration and will work in combination with AEP's locally run software applications such as Microsoft Excel and SharePoint, creating an effective S+S environment.

The greatest values of the S+S model are that it provides flexibility with regards to data and systems architecture and is also easy to deploy, maintain and use. AEP plans to use the Enviance software to help the company more effectively manage the myriad of federal, state and local emissions regulations. AEP is in the process of validating the historical emissions, improving data links and configuring inventory sources for power plants in 11 states with the goal of ultimately allowing AEP to rely solely on this software for greenhouse gas reporting as well.

The S+S model requires little IT infrastructure and support and will allow for quick deployment across AEP's many operational jurisdictions. S+S also creates a flexible online/offline work environment for users and allows easy but secure access via desktop, laptop or mobile computing devices through the corporate local-area network. For example, an environmental compliance professional could gather the information needed and create reports for all plants from their laptop in their home office via the Internet within the secure company firewall.

Unique software and IT architectures available today enable valuable real-time reporting against live data. Integration technologies such as the Microsoft .NET Framework enable systems, databases and other data sources to be easily connected so that workers use live data to analyze, track progress, explore options and make faster, more accurate decisions.

Compliance workers collaborate to make even more informed decisions faster if companies take full advantage of software applications they might already have such as Microsoft Office Communications Server. This and other applications in the Microsoft Unified Communications and Collaboration platform help utility workers collaborate securely in real-time with each other within company firewalls, across borders and with partners and vendors, governments and research organizations, and customers.

AEP is on track to have all of its plants and facilities on the same compliance system by 2010. As a result of the company's IT use and refreshed business processes, emissions tracking and reporting is becoming more streamlined and efficient. The system implementation process also allowed the company to fine-tune and document its compliance reporting processes so that as employees change roles, new staff has easy access to the procedures.

AEP is on its way to reaching its compliance goals and, with the help of IT, the company knows where it stands today, where it's headed and the status of its progress.

A Look Ahead

We can all count on rapid regulatory and accountability activity in the area of climate change. Knowing that, utilities can use information from multiple sources and solution providers, and then, combine it with business intelligence and analytics to be better prepared for tomorrow. Notably, this approach turns required compliance tasks into activities that add strategic business value.

To be better prepared for future reporting and compliance requirements, AEP will add an internal data hub that will complement the compliance reporting and S+S delivery model the company currently uses. The project will begin by AEP and its partners consolidating 38 databases into a single Microsoft SQL Server database to improve the system's efficiency, and then they begin data hub construction.

Take Your Own First Steps

After considering the tremendous efficiency, productivity, accountability improvements and potential return on investment that today's IT capabilities bring to sustainability strategies, some utilities may want to prepare their own IT business case. Although there are some challenges in preparing for this step, there are none that should inhibit utilities from beginning the journey and realizing the benefits.

- **Secure leadership support:** Before beginning, utilities should first secure leadership commitment to data transparency. This requires a philosophical shift in leaders' abilities to trust employees and open up information flow to those who need it. Support should come once they fully comprehend the value of workers understanding the big picture, and then have the ability to drill down to their oversight areas to make progress toward the company's overall goals.

- **Determine the business architecture:** Consider the overall company goals; the compliance-related processes that will be affected and how those processes can be enhanced and improved. Set specific goals such as reducing compliance report preparation time from two weeks to one day and operational goals regarding specific emission reduction amounts and timeframes. Gaining agreement on a set of business rules is critical. Conduct a facilitated session among the major stakeholders to gain understanding and agreement upon those conditions required for optimal performance.

- **Review business processes:** Since systems mirror current business processes, utilities should review various compliance processes that are in practice at all locations and standardize them to achieve consistency companywide.

- **Synchronize regulation interpretation:** Utilities may also find that engineers and environmental compliance personnel may interpret regulations in varying ways. Companies should agree on a standard interpretation of regulations so that reporting and compliance efforts are also consistent.

- **Determine IT architecture:** Consider security needs, mobility requirements, offline operations, broadband requirements and other aspects of the company IT infrastructure needed to deliver the compliance tools and applications to users.

Features & Functions to Look for in an Environmental Compliance System
Flexible IT foundation to integrate with existing systems and data sources
Easy to implement and maintain to prevent adding to the IT department's workload
Easy for workers to learn and use – preferably with a familiar user interface
Provides role-based access so the right person can access the right information when they need it
Adds ability for workers to collaborate and use shared workspaces
Provides capability to keep and share historical data and detailed descriptions of compliance processes

Conclusion

While utility companies tend to be conservative, many such as AEP are rapidly changing – especially in the area of IT adoption. Compliance experts within these forward-thinking companies will find that the right IT foundation and systems can serve as a guide toward enabling new business models that will address complex reporting and compliance requirements, operational efficiencies and environmental concerns in a fiscally responsible way. ■

About the Authors

Lawrence Goldenhersh *founded Enviance in 1999 to improve the quality of compliance management by leveraging the Internet's revolutionary power. As president and CEO, Goldenhersh is responsible for the company's strategic and operational management.*

Ray King *drives industry solution strategy as solutions director of Microsoft's energy industry team. His primary responsibility is guiding the industry to thrive in today's market-driven environment. King brings more than 25 years of business and technology experience in the energy space and holds a Bachelor of Science in industrial engineering.*

John McManus *is vice president, Environmental Services, with oversight of environmental support for all AEP generation and energy delivery facilities. Environmental Services provides day-to-day compliance support for AEP's various business units and is responsible for the development of information systems to help manage AEP's environmental compliance obligations. McManus is currently a member of U.S. EPA's Clean Air Act Advisory Committee.*

LightsOn™ focuses on companies and technologies that are making tangible contributions to improving reliability and sustainability – the things that are instrumental in keeping the lights on!

Jack Dangermond

The 2009 Automation/IT Leadership Series

ESRI

Jack Dangermond
President & CEO, ESRI
Bill Meehan
Director, ESRI Utility Solutions

Bill Meehan

"As America's leaders work to speed economic recovery, they need a system to properly manage and execute the Stimulus Plan; building a National GIS is key to success."

These are the words of Jack Dangermond. Jack is president and CEO of the Environmental Systems Research Institute – better known today as ESRI – which he cofounded with his wife (Laura) in 1969. It is a rare privilege to be able to ask a person so widely recognized as an industry leader where he thinks it's headed and why, but this is precisely such an occasion. Indeed, Jack Dangermond is practically synonymous with the geographic information systems (GIS) industry – and vice-versa – so his voice stands out among users and suppliers alike.

Bill Meehan and I first met in 2000 through our mutual membership in the Geospatial Information Technology Association (GITA) when he was then vice president for electric operations at NSTAR in Boston, Massachusetts. Bill joined ESRI in 2002 as Director of Utility Solutions. Today he provides overall corporate direction for ESRI's infrastructure industries including electric and gas utilities, transportation, water and telecommunications and is responsible for business results for this sector.

Positioned at the forefront of the global GIS industry, these executives will almost certainly continue to have a hand in shaping the role of geospatial solutions around the world. And when it comes to using technology as a tool for achieving social, economic and environmental objectives in these difficult times – and especially in the months and years ahead – you will agree that, to their way of thinking, there really are no limitations. **– Ed.**

EET&D: ESRI has certainly had a remarkable history over the past forty years. During that time the geospatial market has changed in many ways – especially with regard to the level of public awareness, which is at an all-time high. That's something that can be attributed in part to your company and even to you personally. Why do you think that happened?

Dangermond: We started the company as a consulting firm specializing in land use and environmental analysis projects with its early mission focused on organizing and analyzing geographic information. We're very fortunate to have enjoyed steady growth and choose consciously to avoid debt, venture capital or public funding. After about 11 years of doing project work we began to sell our software, which encapsulated in large part our methodology of integrating geographic information to help in decision-making. The expansion of GIS and its applications is a result of many different factors including a growing interest and need for an information and science-based approach. This continues today.

In more recent times there has been a growing awareness that geography matters in so much of what we do. Today, business and government see the tangible benefits of this and are adopting GIS technology much like they did accounting and ERP software several decades ago. It's not just about having cool project maps; it's about making companies more efficient and effective with respect to their customers, assets, the environment, and the communities they serve.

EET&D: Would you say that your goals and objectives have changed along the way, or is your original blueprint for the company still intact?

Dangermond: We have stayed closed to our original idea of building tools and methods that bring more rational decision making to the world. We have done this through the

GIS technology platform, which is now in over 300,000 organizations. We have not been distracted by other business activities and are very aggressive in our software engineering development efforts. We invest nearly 20% of our revenue in advancing our products. Our approach is to listen closely to what our users want in the product and embrace the newest technology and evolve our platform as a result. This continuous development has sometimes resulted in truly breakthrough GIS technologies. Looking back over the years, however, I believe it's the continued focus on our users – including their problems and their criticisms – that has been among our key success factors.

EET&D: As someone who has had the opportunity to develop a truly global perspective on geospatial market drivers, issues and trends, I'm sure our readers would like to know how you see the industry evolving over the next 3-5 years, especially given the rather dour economic outlook at this point. Can you perhaps give us a few data points from your personal crystal ball?

Dangermond: We know that the world's resources are limited. We also know we are placing more and more strain on our environment. Our infrastructures are aging. On top of our economic crisis, these problems are literally challenging our sustainability. One of the reasons GIS is growing so rapidly is that it responds to the need to see our world holistically and provides valuable information to help make geographic decisions about how best to respond to rising demands and diminishing resources. GIS can help guide us.

One of my very first projects was finding the right path to route a new transmission line. We needed to understand the optimal way to meet the added demands for electricity and, in this case, to minimize the impact on the environment. GIS was used to overlay all the factors – social, environmental, economic, landowners, etc. – and pick the optimum route. The computer graphics we used were not as good as what we have today, but the quantitative and visual framework allowed everyone to appreciate the solution – the company, citizens, and regulatory authorities. Today, we need more guidance than ever. We believe that our technology and the smart people who use it are changing the world by solving problems using analytical approaches that result in better decisions and management.

EET&D: The current economic situation being what it is, and with nearly everyone in a state of concern about the future at practically every level, I'd like to jump right into your proposal for creating a National GIS database – or GIS for the Nation, as you call it. It certainly seems like a novel and creative concept, but maybe you could start with the salient points of what you have in mind.

Dangermond: GIS for the Nation has to do with server-based, Web-enabled GIS portals for sharing information. This will create an up-to-date comprehensive view of our nation using GIS. Our new president wants and needs this kind of system. His desire for everyone to see where the stimulus money is going, knowing that it's going to the most important things and will be managed with full transparency and accountability, would be directly addressed with such a system.

Geographic data including parcels, wildlife habitats, land features, a base map, topographic information, imagery, and elevation models would all be part of this system. Public and private users could add and share their own data as a means of collaborating and designing our future. The idea is that it be multi-participant and available to both public and private applications. This program would deliver benefits at all levels of government and business that would result in better decision-making, more collaboration and better use of our resources. Also, the level of communication would increase dramatically.

Some have called such a system a spatial data infrastructure (SDI) that provides highways for serving and sharing large amounts of geographic imagery and information. Such a system is already emerging and being useful in many settings from sustainable development to climate change to emergency response. As you know, a principal focus of the current stimulus package is to develop infrastructure. GIS already plays a valuable role in designing modern infrastructure from building roads to implementing energy smart grids. A national system would simply expand our common geographic knowledge and be immensely useful to a wide range of people and organizations as we face infrastructure development in the months and years ahead.

EET&D: How would you characterize the role of utilities in this effort towards creating a National GIS database?

Dangermond: There are four areas of measurable change that have recently occurred in the utility sector, resulting in a transformation of GIS for utilities. These areas are: 1) Wider use of GIS to support their business; 2) Integration with other enterprise systems; 3) GIS participation in organizational workflows; and finally, 4) A greater need to use internal and external information sources in day-to-day operations. All of this has positioned an increasing number of utilities as a rich and expanding source of quality GIS data that can help create the foundation for such a system.

EET&D: Let's briefly address these items one at a time, starting with how utility GIS proliferation helps utilities support their business. Also, I suspect that 'integration with other enterprise systems' – your second point – is probably related to that answer, so it would probably make sense to discuss both of these together.

Dangermond: Yes, I think that's a valid perspective, but I want to let Bill take that one on, since systems integration is one of his strong suits.

Meehan: Utilities have historically segmented their work and their information systems have tended to follow these segmented processes. Today, utilities need to have access to information from a variety of sources presented in simple to understand ways. Our industry now demands accurate and current information. We can't be checking in the field every time we need to change out a switch because we have discrepancies in our many systems. Integration allows utilities to discover things they could not see alone in a single system. That's what makes GIS so exciting for utilities; it provides them with new knowledge so they can make better decisions.

EET&D: I have some ideas about what you mean by 'GIS participation in organizational workflows', but rather than guess, how would you characterize the levels and types of participation?

Dangermond: We have worked hard with our customers to understand their workflows and evolved our spatial technology to enhance those workflows. A very simple example is how a utility handles street light outages. Several users have implemented a system that allows customers to go online to report a streetlight out by pointing at a map showing where the damaged light is in relation to where they are. Sometimes this is accompanied with a phone call. This saves the investigative costs and fundamentally changes the workflow for everyone.

Customers and the utility discover exactly which light it is. The utility then creates the work order, integrates the work order with other work the repair crew is doing, optimizes the work route, notifies the supply chain and accounting systems, and keeps track of street light repair to report to the regulators. The GIS plays a pivotal role in that workflow.

EET&D: And finally, most utility people would agree that there is indeed 'a greater need to use internal and external information sources in day-to-day operations'. What, in particular do you have in mind for how a National GIS might play into that scenario and vice-versa?

Dangermond: The most obvious need is during times of great national stress. This could be a natural disaster, a financial crisis or a terrorist action. During these times we need ready access to information to deploy first responders, to identify where jobs are being lost or where to deploy relief materials. Information is needed to plan and prepare for these events in creative ways so when these crises hit, we will be ready. Bill, is there anything you'd like to add to that?

Meehan: Utilities and governments spend enormous time and energy building information. Yet they may not have either the resources or the knowledge to maintain the data. An electric utility, for example, needs to know about vegetated wetland delineation near its transmission right of way, yet they really have no way of knowing when its characteristics have changed. Having ready access to the National GIS where information is gathered from the people who created the data would provide timely and easy access to that kind of information.

EET&D: Most Americans – and indeed people around the world – have been closely following the Obama administration's economic Stimulus Plan. Now that it has been signed into law, how will a National GIS provide help or support this massive and potentially far-reaching plan?

Dangermond: A National GIS is uniquely capable of providing unity to the Stimulus Plan. As a cornerstone program, it will enable leaders to achieve the greatest results for each taxpayer dollar spent. With initiatives such as Imagery for the Nation, The National Map, and the National Spatial Data Infrastructure, federal agencies including USGS, Census Bureau, NOAA, DHS, and DOI have already formed the foundation for a National GIS. Moreover, a National GIS will immediately create high tech jobs and engage hundreds of private firms while supporting infrastructure improvements and energy initiatives.

EET&D: What is the present role of GIS, and how would that change as a result of having a National GIS if such a database were to be created?

Dangermond: GIS is already deeply entrenched in both the business and societal dimensions of everyday life. It is used extensively in planning and managing infrastructure, disaster response and economic development as well as increasing efficiency; advancing science, conserving nature and the environment; improving human health; and enhancing security – just to name a few of the most prominent ones.

The creation of a National GIS would change everything from how we reason about national issues to how we organize, communicate and share information. It would also encourage and enable working, acting and reacting to business challenges in a systematic and scientific way. Moreover, a National GIS would provide a uniform foundation for developing more holistic, analytical and quantitative approaches to problem-solving resulting in visual solution sets that can be easily understood and interpreted by a much broader set of users.

EET&D: That all sounds quite interesting, but can you offer some specific examples of how and where it might be used?

Meehan: The potential applications are endless, but traditional GIS applications such as land parcels, wildlife habitats, topographic data, satellite and photogrammetric imagery and elevation data would probably be among the first to derive benefits almost immediately. Just having all of those kinds of information in one place would yield huge economies of scale and efficiency at substantially all levels of the public and private sectors. And building a National GIS would immediately stimulate economic activity, very quickly creating more than 24,000 high-tech and support jobs. It would also provide an invaluable information resource for getting stimulus infrastructure projects up and running much faster than might otherwise be possible.

EET&D: Job creation is, of course, a very important issue these days. Could you be more specific about the kinds of jobs you see coming out of this effort?

Meehan: Yes. We think that besides 500 senior-level GIS positions, something on the order of 2,500 geospatial analysts and 5,000 data collection and mapping technicians would be needed. We would also see the creation of some 16,000 support positions as the initiative moves forward.

EET&D: So what is needed to put such a capability in place?

Dangermond: Clearly, the implementation of such an ambitious undertaking will require much more than just data and technology. Vision and leadership on several levels will be paramount to success as will the need for getting the right people into the right places early in the process. From a cost standpoint, we're looking at less than $1.5 billion, which by today's standards, is actually a fairly modest figure.

EET&D: How long would you expect it to take to put a National GIS in place?

Dangermond: That really depends in part on how we approach the task from an organizational leadership standpoint. The Secretary of the Interior – the lead agency for geospatial is currently leading this initiative, but another alternative would be the creation of a national GIS trust fund. It would be inappropriate to try to put a timeline out there until that path is determined since it would almost certainly be wrong.

EET&D: Any final comments on how this might all play out from this point forward?

Dangermond: Clearly we're at a crossroads on multiple levels at this point in our history. We'll need to bring together every technological tool at our disposal if we're going to turn the corner and return to prosperity sooner rather than later. A National GIS is clearly one of those technological tools that has the potential to expedite that process and significantly improve the outcomes. ■

Designing and Populating Geospatial Systems to Support Advanced Applications for Field Automation

By Gene Kindrachuk, Principal Consultant
Enspiria Solutions

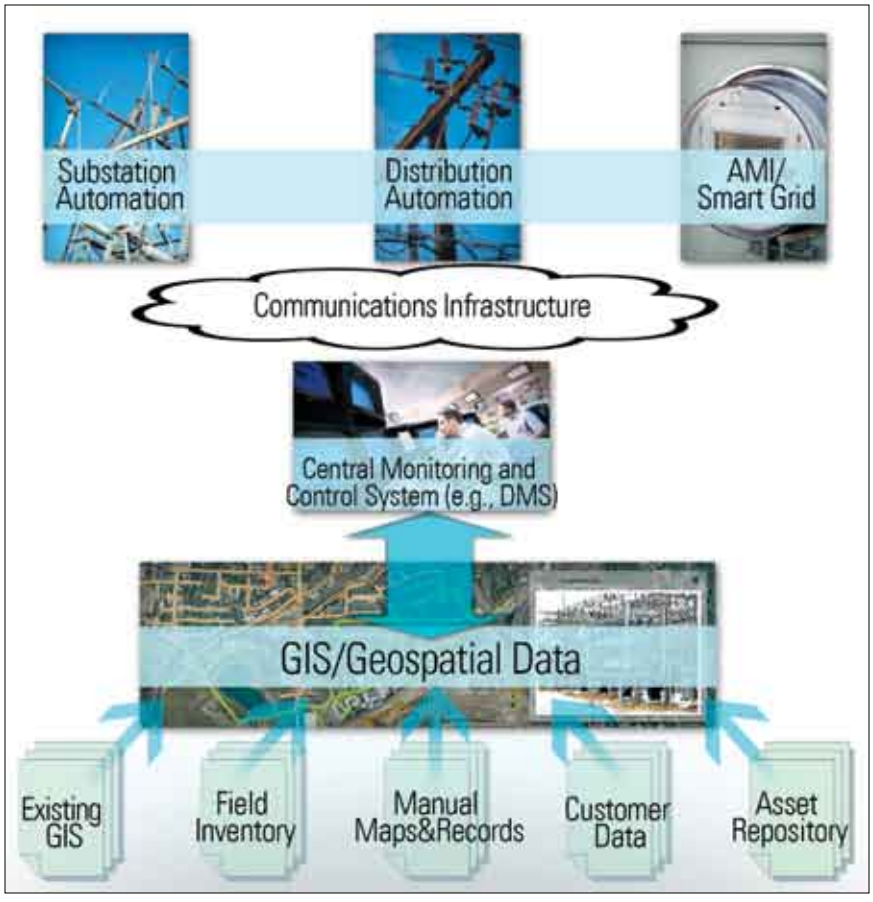
Introduction

Electric utility companies are typically using aspects of GIS to support the various business processes involved in managing the electric system and providing service to customers, such as feeding outage management and power flow analysis systems. As more and more new field automation technologies — including Distribution Automation (DA), Substation Automation (SA), Advanced Metering Infrastructure (AMI), and Smart Grid applications (SG) — become mainstream, GIS plays an even more critical role.

Evolution of GIS

Early GIS systems have their roots in automated mapping with some facilities management capabilities. Current GIS technologies for utilities provide not only support for spatial data, i.e. the ability to see where facilities are and to manage the relationships with other spatial features, but also provide for managing network topology of the electrical system components.

GIS in electric utilities began in the late 1970s primarily as a tool to automate a company's manual mapping functions. There was a strong focus on presentation of facilities data, to ensure that symbols, line work, and annotation were legible; and the ability to generate multiple map products at various scales. Some products (among them IBM's GFIS), however, did put an emphasis on developing a model behind the graphical representations of the electric facilities with the idea of managing these facilities. In addition to typical attribute information (dates, material, manufacturer, model, ratings) the models also dealt with relationships including electrical connectivity.



As GIS has evolved over the past thirty years, there has been an increasing emphasis on the model of the electric system and growing reliance on the model behind the map to provide information to users and integrated systems rather than focusing on multi-purpose presentations of map-type data. Moreover, many electric utilities are using their GIS to provide network connectivity models to system analysis and planning tools to perform power flow analyses of various types, and now, commonly to outage management systems.

Table 1 delineates the four major levels of utility automation, from stand-alone deployments to integration of near real-time field automation. Each level represents increasingly sophisticated spatial data usage, and the expansion of advanced applications and integrations. And each level allows the utility to realize increasing benefits and efficiencies in the energy delivery process. As GIS evolves, it can help move utilities to Level 4 by becoming a key source and repository for integration of real-time, location based data

Utility Automation Level of Adoption	Key Characteristics
Level One - Standalone Deployments for Mapping, Facilities Management and Workforce Automation.	Localized application; value-added tools such as graphic work design leverage geospatial technology, but other non-spatial tools such as work management do not and miss opportunities. Data redundancy and multiple maintenance results in many conflicts.
Level Two - Integration of Energy Delivery Systems for Workforce Optimization (GIS, CIS, OMS, WMS, GWD, CMMS)	Integrated applications leverage spatially enhanced functionality; the value of non-spatial applications is extended through location-based awareness. Integration through enterprise integration technology. Business processes are still largely departmental.
Level Three - Integration of Energy Delivery Data Marts for Asset Optimization	Integration occurs at the business process level; definition of enterprise workflows. Instead of spatially enabling applications, core data are spatially enabled — attaching a location to each asset optimizes the asset management process. GIS is enabling technology and the correlation engine for analysis.
Level Four - Integration of Near Real-time Field Automation	Real-time, location based data from substation and distribution automation, SCADA, advanced meters and other field automata are integrated, enabling near real-time analysis and decision-making.

Table 1 - Field Personnel Functions

from substation and distribution automation, SCADA, advanced meters and other field automation devices, enabling near real-time analysis and decision-making.

Field Automation Data Requirements

Field automation entails the installation of various types of monitoring and operating devices at the electric substation and potentially including devices within the customer premise. These can be meters, automated switches, monitored reclosers or sectionalizers. They will either be autonomous devices that perform specific actions based on specific monitored location conditions or, communicate with a central monitoring and control system, such as a Distribution Management System (DMS), to provide status information and/or accept commands. A DMS is a decision support system to assist the control room and field operating personnel with the monitoring and control of the electric distribution system, specifically to minimize impact of outages to customers and to protect the system from damage due to failures.

Communication between the field automation device and the central monitoring and control system can be over the electric network itself via BPL (Broadband over Power Lines), a dedicated communications network (such as fiber), cellular communications or radio frequency (RF) media. In any case, in order for the DMS to correctly interpret the information being fed to it and to make the correct decisions about actions to take, an accurate representation of the distribution system is required. This accuracy is not necessarily from a spatial perspective, but from the aspect of electrical connectivity.

Modern DMS applications perform near real-time power flow calculations to either provide information to operators about whether switching operations can or cannot be safely performed or to allow those decisions to be made automatically. This representation (or model) must be such that for every location where an Intelligent Electronic Device (IED) is installed, the system needs to know the characteristics of the circuit downstream of that device in terms of customers, loads, peaks, conductors, generators, and other devices.

The GIS model that would feed such a system therefore needs to have a complete, accurate, connectivity model from the substation through to the customer at the individual phase level. The model must provide for the ability to represent internally the individual phases (conductors, units within a bank, customer connections) of all electrically conducting features. This includes the conductors, switches, fuses, transformers, capacitors, reclosers, and sectionalizers. Particularly, complex devices such as pad mounted switchgear need to be accurately depicted in terms of their internal configurations. This requires modeling the internal bus, switches, fuses, and elbows that make up that equipment.

With these new field automation applications in mind, a utility can proactively enhance its GIS and related databases to provide the required data structure and content to support field automation. This requires planning, design and conversion activities to bring data organization, contents and quality on par with field automation requirements.

Current State Assessment of Data

The first task to be undertaken is to develop a thorough understanding of the current GIS database as well as other related datasets that provide additional information about the electric system. These would include the utility's customer information system (CIS), possibly a work management system that contains asset or equipment data, and standalone equipment configuration and maintenance databases.

It is very common in GIS (as well as many other databases and systems) that the initial data model design includes attributes and relationships based on the many user and application requirements. But for various reasons during initial database population (conversion) or through ongoing updates through related business processes, this information was either not populated, or was populated inconsistently. In addition, as business requirements change, there is often a need to start capturing additional information about database entities. In many cases it may not be possible, practical, or cost effective to modify the database schemas and/or applications software to record this new information. In these instances, the fall back tactic is to place this information into the comments or another unused field in a coded fashion. In many cases this is information that needs to be structured correctly in a database so that it can be made available to various applications and end users.

Typical Conditions to Address for GIS to Support Field Automation

The following are a number of typical situations that may need to be addressed:

- **Customer to transformer/device connectivity** – Customer connectivity to a distribution transformer (in most cases), or alternately to a primary metering device. Typically this information is managed in a CIS or Meter Data Management System, but if not, or if the quality of the data is questionable, then this relationship needs to be established and business processes need to be implemented to ensure that the relationship is created correctly for new customers, and updated when connections in the field are modified. This relationship can be established in various ways, depending on the individual case. Options include:
  - Geocoding service addresses (computing a map coordinate from street addresses using an street center line network) and performing a spatial proximity search to associate customers with transformers based on distance, type, voltage, phasing, and class of service.
  - If available, analyzing or tracing secondary and service conductors between transformer and the customer premises
  - Field inventory
  - If the utility is planning to install an advanced metering infrastructure, then all meter locations can be GPS-located when the meter upgrades are performed and the serving transformer identified.
- **Underground systems not complete** – Very often underground systems within manhole/vault/duct systems are either not modeled or not populated correctly due to the complexity and detail of the existing records. This class of data needs to be researched either from existing detail drawings (manual or CAD), physical field inspection, or a combination of the two.
- **Pad-mounted Switch Gear at High Level Only** – If complex devices are only modeled as the structure itself, showing terminating conductors only, then additional detail on the internal configuration will need to be captured. This requires the correct representation in the GIS model depicting bus connections, individual switches, fuses and elbows by phase. This representation may be able to be determined from examination of operating maps or schematics, by physical field inspection, or a combination of the two.
- **No Phasing information** – For many utilities whose initial emphasis was on automated mapping, phasing information is represented only by annotation, and then, often only on selected device classes with users interpreting the symbology and annotation to infer phasing information when needed. By contrast, modern GIS models require this data explicitly on all electrically connected features. If this data is available for certain subsets of features, it may be possible to develop software to propagate this to connected features, being careful to enforce certain connectivity rules (i.e., a single phase feature cannot feed a multiphase feature). Typically, operating maps or schematics will contain sufficient information to be able to infer phasing, but ambiguous situations may still require field inspection.

The analysis of the existing GIS and related datasets needs to determine the usability of the data. For each feature (entity) and attribute the following types of characteristics must be understood:

- How many of the records have null data values?
- How many have illegal or non-plausible values?
- If there are interdependencies between fields or special business rules, are these valid?
- Is there valuable information in comments fields or other unstructured formats?
- Is the unstructured data in a form that can potentially be parsed with software?
- Do records in other datasets contain identifiers that can be used to correlate with the GIS?
- What is the correlation rate across records in different datasets?

This analysis should yield a type of "health and wealth" assessment of the utility's GIS and related databases. This will provide the kind of information necessary to plan how the existing databases can be processed to provide the required data structure and content to support field automation.

The **sidebar**, *Typical Conditions to Address for GIS to Support Field Automation*, highlights typical situations that may need to be addressed based on the outcome of the current state assessment. Depending on the overall assessment of data completeness and quality, a field inventory may be required for the system as a whole, or hopefully for only a subset of the network (i.e. overhead only, or underground manhole/duct).

Action Plan

The current state assessment is followed by the development of an action plan for the work needed to achieve the data organization, content and quality required to support the field automation devices and applications.

While the end state in terms of a GIS database design will be fairly uniform across the industry, the important issue here is that each individual organization will have a unique set of pre-existing conditions to deal with. Therefore, the specific steps and activities that need to be taken will be unique for each company. For each class of data being addressed, some combination of the following activities will need to occur:

- Combining two (or more) record sets into one, removing redundancy, and resolving ambiguities
- Developing software to parse or decode unstructured data elements into a structured format (i.e. address or comments fields)
- Setting up software and processes for human beings to analyze exceptions and efficiently enter correct data into the database
- Locating and analyzing legacy manual maps, drawings, or records to extract additional information needed to supplement automated data

- Developing software and processes to convert completely manual datasets into the GIS
- Establishing specifications to be issued to external data conversion companies to provide any combination of the above mentioned activities
- Developing quality assurance and quality control specifications, software, and procedures to ensure that the data being produced (internally or externally) meets requirements

Another necessary activity is to ensure that the interface from the GIS to the central monitoring and control system (such as a DMS) is transferring all required device classes, attribution, and relationships completely and accurately. In the initial stages of testing and deployment the central system is likely to identify many erroneous or ambiguous conditions. These need to be corrected in the GIS source system so that subsequent updates will be more accurate. In addition, business processes surrounding the GIS update process may need to be improved to ensure the timely update of the network database with proposed, energized, and as-built data.

Conclusion

With the advance of utility field automation comes the critical need for geospatial systems to become a key source and repository for integration of real-time, location based data from AMI and Smart Grid, substation and distribution automation, and other devices, thus enabling near real-time analysis and decision-making. The GIS model that can feed such a system must, therefore, have a complete, accurate, connectivity model from the substation through to the customer at the individual phase level.

With these new field automation applications in mind, a utility can proactively enhance its GIS and related databases to provide the required data structure and content to support field automation. This requires a "health and wealth" assessment of the utility's GIS and related databases, followed by development of an action plan to define the work needed to achieve the data organization, content and quality needed to support the field automation devices and applications. ■

About the Author

Gene Kindrachuk *is a systems design and analysis expert with more than 25 years of experience in GIS and utility applications. His expertise includes data conversion and migration; system design, development, and integration; business process and data analysis; database design, and development of specifications for hardware, software, and communications for AM/FM/GIS, WMS, MWFM, OMS, and related technology solutions. He holds a B.S. in Computer Science from the University of Alberta.*

Smart Grid Takes Flight at Crow Wing Power

How a project to wirelessly connect rural substations helped one co-op deliver 2-way advanced meter reading and discover a shared utility network, laying the foundation for future smart grid applications

By Todd O'Hotto, IT Manager | Crow Wing Power

Crow Wing Power, an electric cooperative serving 36,000 members in rural north central Minnesota, recently reached the one-year mark in a project implementing a 700 MHz licensed wireless broadband communication network from Arcadian Networks. A project that began with a simple push to update infrastructure to support substation automation communications, advanced metering, and energy efficiency programs, has grown into a smart grid movement among rural electric co-ops belonging to Great River Energy. By leveraging infrastructure already deployed by Great River Energy, Crow Wing Power has been able to address current challenges and move its two-way infrastructure communications technologies to the forefront of smart grid readiness.

Figure 1: Arcadian Networks' "plug & play" equipment was installed quickly to link 25 Crow Wing substations

Communications Challenges

Crow Wing Power faces obstacles familiar to many rural electric co-ops throughout the United States. In fact, statistically, Crow Wing Power is the typical rural electric co-op, serving approximately seven customers per line of power, which is the national average, according to the National Rural Electric Cooperative Association (NRECA). With most residents of Minnesota's eleventh-fastest growing county depending on them for reliable power, Crow Wing Power must deliver electricity – and communicate – with an infrastructure built on technologies put in place more than seven decades ago, when the co-op was formed following the Rural Electrification Act of 1936.

The climate and terrain in the north central region of Minnesota place further demands on Crow Wing Power. Communications to substations must be reliable, whether during a February blizzard or an August scorcher. Crow Wing Power delivers power across more than 4,700 miles of lines.

While connectivity from substations to homes was provided by a Landis+Gyr two-way advanced metering solution, ensuring two-way communications from those substations back to the co-op control room remained an obstacle in 2007.

The Search for a Solution

Long interested in improving its load control efforts, Crow Wing Power's leadership began to realize that the road to fulfilling their smart grid aspirations lay in addressing communications to their substations in the field. The project began in earnest in August 2007, as Crow Wing Power explored ways to expand on its two-way advanced metering programs while updating communications with its rural substations. Major concerns

Figure 2: Crow Wing County is located in the scenic, but sometimes challenging, terrain of central Minnesota.

were security and reliability in distribution substation system communications. Early on, they had investigated a variety of alternative communications technologies, including a microwave system.

An Intriguing Offer

As the search continued, however, Crow Wing's power supplier (Great River Energy) approached the utility with an innovative proposition -- a solution already in use at other Great River Energy members, including Connexus, Todd-Wadena, and Agralite Electric. The proposal would allow Crow Wing Power to join a community of utility users deploying a 700 MHz licensed wireless communications network. Great River Energy, already using the network in their communications, would allow Crow Wing Power to piggyback onto its equipment. Crow Wing Power readily welcomed the concept for several reasons.

In addition to the savings on equipment and maintenance costs, they could expect a further benefit – avoiding the expense

and difficulty of plowing the often-frozen Minnesota soil to bury lines. And, Crow Wing Power could easily investigate the success of the technology at their fellow Great River Energy co-ops before launching it themselves.

A Community of Utility Users

Earlier that same year in the spring of 2007, Connexus (the largest customer-owned electric utility in Minnesota) had faced similar challenges in upgrading the communications capabilities at all of its power stations. Connexus Energy's legacy communications infrastructure had been built around a private frequency, which was burdened by slow, overloaded lines with limited bandwidth. Security and reliability had become major concerns. With Great River Energy's support and Arcadian's network solution, by the end of 2007 Connexus had converted 20 substations to 700 MHz, with plans to continue rolling out SCADA to all substations over the next four years.

Crow Wing Power decision makers found the Great River Energy offer increasingly compelling as it became clear they could achieve the efficiency and reliability upgrades they wanted by simply plugging into the Arcadian network connection ports. The wireless network would meet the need to communicate across a widely dispersed service territory, and it appeared that the installation would be far easier than anticipated. Best of all, Crow Wing Power could contain costs while investing in a proven private network specifically designed to serve the energy space and already in use across their rugged and challenging central Minnesota terrain.

Deployment

Beginning in October 2007, Crow Wing Power began connecting to the 700MHz licensed broadband network for two-way wireless data communication with 25 substations, supplying approximately 55,000 member customers. Communicating with Arcadian's network was fast and efficient, due extensively to its highly interoperable features. Within minutes of installation, engineers were able to provision modems and set up full operation on the network. (Great River Energy actually installed the units.)

Most substations were up and running by June 2008. Working aggressively to finish infrastructure improvements before winter 2008, the Crow Wing Power team began to see immediate benefits from the new 700MHz communications platform. Moreover, engineers reported it was not only possible, but relatively easy, to get the wireless system up and running.

Bridge to a Smart Grid Future

Crow Wing Power knew the future depended on the ability to have high-speed, two-way communications and control with their substations. But achieving that goal took some investigation and some innovation to make it a reality. The 700 MHz licensed wireless IP communications network turned out to be a smart choice for achieving those goals.

Reliability: Like Connexus, a neighboring utility with estimated up-times of nearly 99 percent, Crow Wing Power has seen increased reliability and faster data delivery. A year into the project, data delivery has been consistent, even in the worst of winter freezes and storms.

Load Control: The co-op has succeeded in supporting high-speed communications for critical peak load control voltage management programs coordinated with Great River Energy. They have also expanded their capability and reliability for two-way advanced metering back-haul and more.

Applications Accessible: Installing the equipment, Crow Wing Power noted the potential to interconnect with virtually any present or future applications, including AMI, VoIP, SCADA, and WIFI. They all hook into the Arcadian network, opening a window to a variety of smart grid projects and promising increased efficiency and further cost benefits in the future.

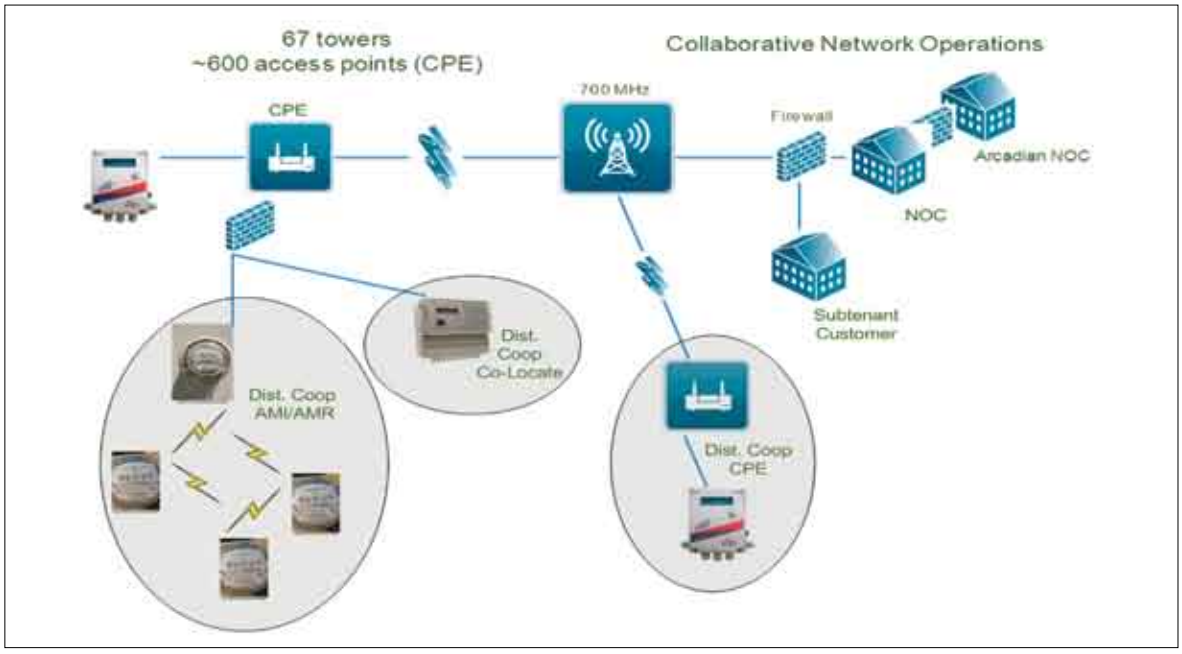


Figure 3: Field Communications with Arcadian Wireless Architecture

By deploying substation communications over their new 700MHz network, Crow Wing Power has found a reliable way to support delivery of substation automation communication, advanced metering, and energy efficiency programs. By participating as one member of a shared, multi-utility, multi-application network in a community of utility users on this network, the utility can also leverage assets already deployed by others to effectively update its own communications infrastructure.

Looking Ahead

Crow Wing Power looks forward to building on the communications platform with new load control initiatives rolling out for 2009. The wireless network has provided a base on which to build future smart grid applications that will control costs and increase security.

The 2-way 700MHz implementation also reduces the co-op's cost to supply power, which should help keep charges low for its members. The network has proven itself to be a secure and reliable foundation for smart grid innovations -- and smart business in support of Crow Wing Power membership. ■

About the Author

Todd O'Hotto *serves as Manager of Information Technology for Crow Wing Power.*

Figure 4: Arcadian field teams worked closely with Crow Wing Power crews to connect the first of 25 substations to the 700MHz network in 2007 and complete the remainder by the end of 2008.

Tim Taylor

Integrated SCADA/DMS/OMS: Increasing Distribution Operations Efficiency

By Tim Taylor, Business Development Manager and Hormoz Kazemzadeh, Director of Marketing
ABB Inc.

Hormoz Kazemzadeh

Many electric distribution organizations are presently evaluating their approach to integrating three key operational systems – SCADA (Supervisory Control and Data Acquisition), OMS (Outage Management System) and DMS (Distribution Management System). SCADA, which has long been prevalent throughout transmission systems, is finding increased applications on distribution systems.

Modern OMS, utilizing GIS-based connectivity models, is now well established and a key component of many organizations' outage management business processes. The implementation of DMS functionality is a relatively recent trend. While a DMS can include and improve the traditional outage management functions, a DMS also typically includes applications that assist in the improved operation of the electric distribution system, as well as functionality for improving planned work on the system.

This article first reviews SCADA, OMS, and DMS systems. Considering that both OMS and DMS require a connectivity model of the distribution system, the benefits of integrating OMS and DMS are presented. Next, the integration of SCADA with DMS/OMS is discussed, including the functionality of the integration and the resulting benefits. Finally, a proposed architecture for an integrated distribution operations center is presented.

SCADA

SCADA systems are globally accepted as a means of real-time monitoring and control of electric power systems, particularly generation and transmission systems. RTUs (Remote Terminal Units) are used to collect analog and status telemetry data from field devices, as well as communicate control commands to the field devices. Installed at a centralized location, such as the utility control center, are front-end data acquisition equipment, SCADA software, operator GUI (graphical user interface), engineering applications that act on the data, historian software, and other components.

Recent trends in SCADA include providing increased situational awareness through improved GUIs and presentation of data and information; intelligent alarm processing; the utilization of thin clients and web-based clients; improved integration with other engineering and business systems; and enhanced security features.

Outage Management Systems

Modern computer-based OMS, utilizing connectivity models and graphical user interfaces, has been in operation for some time now. OMS typically includes functions such as trouble-call handling, outage analysis and prediction, crew management, and reliability reporting. Connectivity maps of the distribution system assist operators with outage management, including partial restorations and detection of nested outages.

In recent years, OMS has become more automated. Outage prediction – the process of analyzing outage events such as trouble calls, AMI outage notifications, and SCADA-reported status changes – has improved. Interfaces to Interactive Voice Response systems (IVR) permit trouble call entry into an OMS without call-taker interaction and also permits the OMS to provide outage status information to customers and provide restoration verification call-backs to customers who request them.

OMS systems have also become more integrated with other operational systems such as Geographic Information Systems (GIS), Customer Information Systems (CIS), Work Management Systems (WMS), Mobile Workforce Management (MWM), SCADA, and AMI. Integration of OMS with these systems results in improved workflow efficiency and enhanced customer service.

Today's OMS is a mission-critical system. At some utilities, it can be utilized simultaneously by hundreds of users. It integrates information about customers, system status, and resources such as crews, providing a platform for operational decision support.

Figure 1 - Outage Management Systems Improve Reliability Through Enhanced Outage Analysis, Fault Location, and Crew Management

Distribution Management Systems

In comparison to OMS, DMS functionality is relatively new. While DMS applications are utilized in outage management processes, DMS also extends to the efficient management of planned work and normal electrical operations. DMS is also typically associated with receiving real-time status and analog points from the distribution system, and the generation of supervisory control commands to distribution breakers, switches and reclosers, switched capacitor banks, voltage regulators, and load tap changers (LTCs). The importance of DMS will increase as additional amounts of customer generation, energy storage, and demand response are placed on distribution systems.

DMS is receiving a lot of attention because it can provide solutions to many challenges distribution organizations face today. **Table 1** below contains a listing of DMS applications, functionality and benefits.

Integration of OMS and DMS

Integrated DMS/OMS provides a number of benefits to the distribution organization, as discussed below.

1. Integrated DMS/OMS Improves Operator Efficiency

An integrated DMS/OMS assists operators in performing their responsibilities better, compared to separate DMS and OMS systems. Displays have the same appearance and can provide a single intuitive interface for navigation. Additional displays for separate systems are not required in already-crowded operator workspaces. Operator training is minimized, since operators only need to learn the features of one GUI.

DMS Application	Functionality	Benefits
Unbalanced Load Flow Analysis	Determination of the line currents and node voltages per phase for the entire distribution system, either on-line or off-line in simulation mode	• Improved system awareness • Higher asset utilization • Improved contingency planning
Load Allocation & State Estimation	Intelligent allocation of telemetered or historical measurements over the network to calculate estimated power flows, voltages, and limit violations based on real-time conditions	• Improved load flow & state estimation calculations • Improved notification of overloaded equipment and voltage violations
Fault Location	Identification of possible fault locations on system	• Improved crew efficiencies in managing outages • Reduced CAIDI and SAIDI
Restoration Switching Analysis	Evaluation of isolation and restoration switching schemes	• Improved operator efficiencies during outages • Increased reliability
Distribution Volt/VAR Control	Monitoring and control of line capacitors, voltage regulators, and LTC's to reduce peak load and system losses	• Reduced customer demand at system peaks • Lower system losses • Improved voltage profiles
Line Unloading	Computation and analysis of load transfer options, including overload reduction	• Reduced thermal-mode failures • Longer equipment life due to reduced overloads • Higher asset utilization
Remote Switching & Restoration	Automatic feeder reconfiguration considering network operating conditions	• Reduced CAIDI and SAIDI • Lower system losses

Table 1 - DMS – Improving the Management of Distribution Systems

2. Integrated DMS Applications Improve the Outage Management Process

The integration of DMS applications in the OMS has proven to improve outage performance. For example, a fault location algorithm uses the as-operated electric network model, including the location of open switches, along with an electrical model of the distribution system with lengths and impedances of conductor segments, to estimate fault location. The DMS Fault Location functionality therefore uses the electrical DMS model, but ultimately improves the OMS process. The experience of Progress Energy Carolinas with the ABB Fault Location application shows a significant reduction in SAIDI over the 6 years since the application has been in operation.

Similarly, a Restoration Switching Analysis application evaluates the possible isolation and restoration switching actions that can be done upon occurrence of a permanent fault. The application executes an unbalanced load flow to determine overloaded lines and low-voltage violations for each switching action, and the operator is provided with a listing of recommended switching actions. Again, the functionality utilizes the DMS model of the system, but improves the Outage Management process and reduces CAIDI and SAIDI.

3. DMS/OMS Integration Improves Coordination of Planned and Unplanned Work

Distribution systems are dynamic in nature, with changes occurring on a daily basis due to both planned work and outage restoration. If a safe and efficient operation of the system is to be achieved, then it is critical to ensure that the current state of the network is continuously maintained and made available to those working on planned and unplanned work. This includes operators, dispatchers, persons responsible for switching requests and switching plans, field crews, engineering, and others who require an accurate representation of the system state.

Temporary network changes such as line cuts and jumpers, phase jumpers, switch operations, protective device operations, grounding tags, safety, warning, and information tags, and temporary generators should be represented. This is easiest if a single model is used for the DMS and OMS.

With DMS and OMS working with the same operational model of the distribution system, circuit analysis can be fully functional considering temporary changes. This includes circuit tracing, trouble call and outage analysis, safety interlocks, loop and parallel source detection, fault location and load flow. The result is a more comprehensive and accurate understanding of system conditions at any moment in time.

4. DMS/OMS Integration Reduces Data Maintenance Efforts

Many distribution organizations maintain and make planned updates to the network model in their Geographic Information System (GIS). Since DMS and OMS both require a connectivity model of the distribution system, data maintenance processes are simplified if the DMS and OMS are operating from the same model. The result is one set of processes for managing the network model, and one process for the incremental update to the DMS/OMS model instead of two.

Integration of SCADA and DMS/OMS

Integration of DMS/OMS with SCADA is an increasing trend. While the inclusion of SCADA "breaker-open" operations in OMS have long been used for outage detection, recent business challenges have driven a more comprehensive integration between the two systems. Available functionality now includes the transfer of status/analog points from SCADA to the DMS/OMS; the sending of supervisory control and manual override commands from the DMS/OMS to the SCADA; an integrated user interface running on the same operator console, and integrated single sign-on for users.

The benefits of integrating SCADA with DMS/OMS include:

- Improved operations by close integration of DMS applications with distribution SCADA
- Increased operator efficiency with one system, eliminating the need to go to multiple systems with potentially different data
- Integrated security analysis for substation and circuit operations to check for tags in one area affecting operations in the other
- Streamlined login and authority management within one system
- One network model for OMS and DMS analysis
- Consolidated system support for DMS/OMS and Distribution SCADA
- Simplified data engineering via coordination of SCADA point and GIS data changes

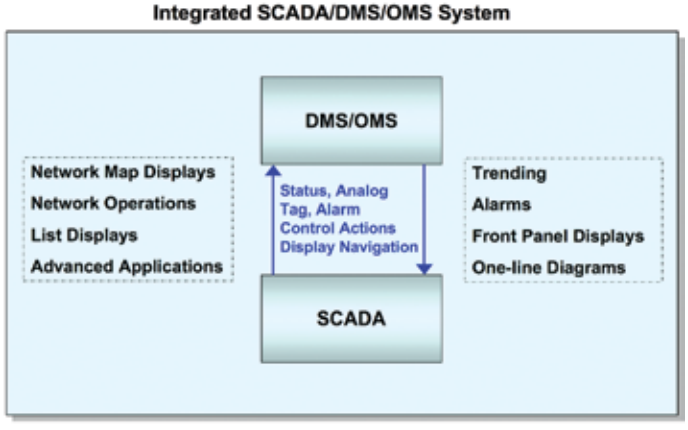


Figure 2 - DMS – Integrated SCADA/DMS/OMS Architecture

Integration of SCADA and DMS/OMS can be between systems of the same vendor, or between different vendors, using a protocol such as ICCP (Inter-Control Center Communications Protocol). Using systems from the same vendor typically results in increased functionality and can reduce the need for data engineering in the systems.

Integrated Distribution Operations Center

Figure 3 depicts the architecture for a fully integrated distribution operations center. The integrated DMS/OMS system model is initially created using a one-time data load from the GIS. Periodic updates to the DMS/OMS model is then performed using an incremental update process from the GIS. Since the DMS and OMS use the same network model, it is only necessary to have a single update process.

As shown in **Figure 3**, the DMS applications and OMS applications utilize a common network model. The OMS applications are used primarily in outage response. The DMS applications typically relate to the electrical operation of the network and utilize electrical data from the integrated DMS/OMS model, such as line and cable impedances, equipment ratings, and customer load characteristics. The DMS/OMS can utilize data from other distribution IT systems that collect system data from field devices. This includes SCADA, as discussed above. SCADA continues to expand past the distribution substation and onto the feeders, providing improved situational awareness and control.

The increasing presence of AMI has many organizations asking how the AMI data can be utilized for operational purposes. Interfaces between AMI/MDM (Advanced Metering Infrastructure/Meter Data Management) and the OMS have been provided for metering pinging, outage notifications, and restoration notifications. The use of other AMI data in DMS applications, such as interval demand data and voltage violations, is being explored.

In addition, many organizations are increasing the amount of substation automation and substation computers on their systems. This provides increased access to the data in intelligent electronic devices (IEDs) that are being installed in substations and distribution system, many of which have communications capabilities. These include "more intelligent" recloser controls, switch controls, and voltage regulator controls.

The architecture of how data is transmitted between field devices and the integrated operations center will vary among distribution organizations, and there may be several approaches with a company itself. Whatever the approach, the data can assist in increasing operational awareness on the system.

Summary

Distribution organizations are increasingly turning to integrated distribution operations centers, including integrated SCADA/DMS/OMS systems and associated decision support tools, to improve their operational processes. An integrated DMS/OMS solution eliminates redundant processes for maintaining the network model and also improves operational efficiencies. Integration of SCADA and the DMS/OMS permits advanced DMS applications to access data from SCADA, analyze the real-time DMS/OMS network model, and provide increased operator efficiencies. Integration with other systems, such as AMI and substation automation systems, provide additional means to leverage the available data throughout an organization. ■

About the Authors

Tim Taylor *is the Business Development Manager - DMS for ABB Network Management. Tim has been with ABB for almost 14 years in a number of engineering, consulting, and business development roles. Tim has performed distribution planning studies for companies around the world and has developed and taught courses on distribution planning and engineering. Tim is a Senior Member of IEEE and holds an MS in Electrical Engineering from NC State University and an MBA from UNC-Chapel Hill.*

Hormoz Kazemzadeh *is the Director of Marketing for ABB Network Management. He has over 18 years of experience in development, implementation, and integration of network planning and operations systems for the electric utility. Hormoz has held positions in system engineering, project management, and marketing. He holds a Masters degree in electrical engineering from the Ohio State University in Columbus, Ohio.*

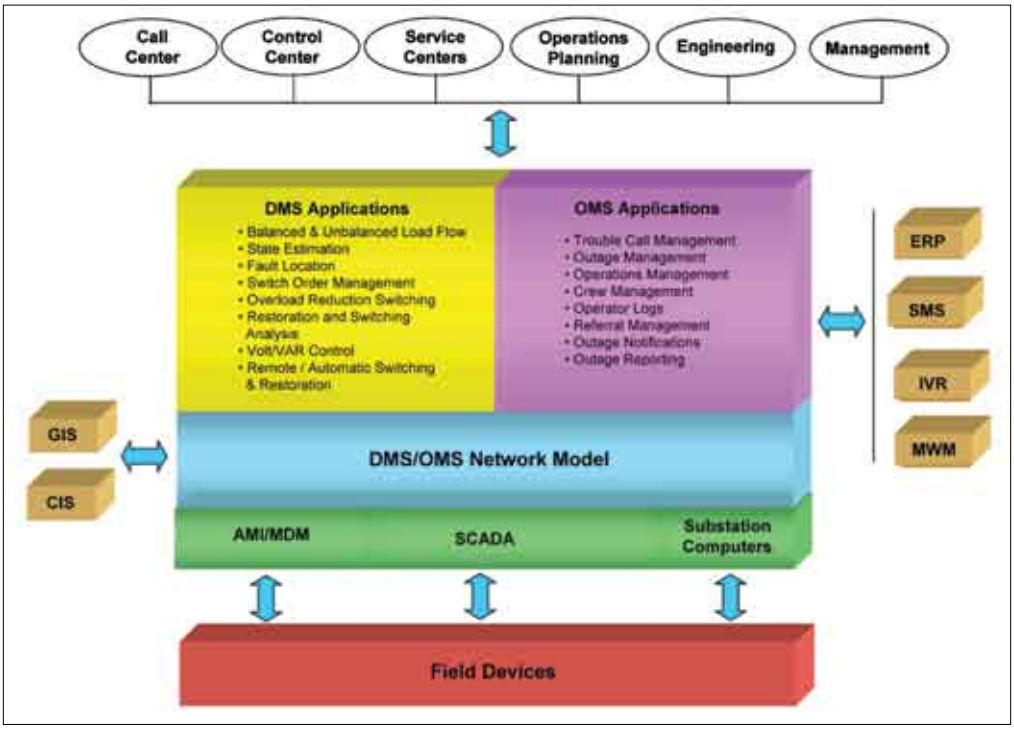


Figure 3 - Architecture for a Fully Integrated Distribution Operations Center

Keith Sturkie

Keeping the Lights on in Central South Carolina:

How Mid-Carolina Electric Cooperative Improved Service with Outage Management Technology

By Keith Sturkie, VP of Information Technology and Lee Ayers, System Engineer
Mid-Carolina Electric Cooperative

Lee Ayers

Power outages, whether large or small, can range from a mere inconvenience to a matter of life or death. Outages are almost always unplanned events, but electric utilities have a responsibility to their customers to provide reliable service, no matter the circumstance. During an outage, the customer is interested in getting the lights back on, and is not concerned with the "how" and "why" of the situation. The main question is how, even in the face of disaster, can the utility meet customer demands and safely, quickly and efficiently respond to outages?

A modern outage management system can help a utility overcome these challenges and operate more efficiently even in the worst of situations. For a utility to effectively operate in today's evolving industry it is critical to employ a solution that helps streamline crew management, safeguard workers and the public, improve restoration time and efficiency, enhance customer service, enable better maintenance management, monitor network performance and reduce the costs, risks, and uncertainty involved in energy distribution; a tall order, to say the least.

As a not-for-profit electric distribution utility with about 50,000 members, Mid-Carolina Electric Cooperative (MCEC), which is headquartered in Lexington, S.C., needed an efficient and effective way to accelerate outage response and restoration. MCEC also wanted to improve and enhance worker and public safety, improve network reliability, reduce outage durations and increase member satisfaction. In 2002, the utility's outdated outage management system was unable to handle current demands due to a lack of updates and support by the vendor. It was also based upon AutoCad drawings rather than a true geographic information system (GIS), which MCEC upgraded in 2002. The utility's technology was stuck in the past, and MCEC had to move on.

About MCEC: Mid-Carolina Electric Cooperative (MCEC) is an electric distribution cooperative serving the midlands of South Carolina. The cooperative is headquartered in Lexington, SC with a branch office in the northwest Columbia town of Irmo. MCEC has 141 full and part time employees and a nine-member board of directors.

Turning It All Around

To operate efficiently and provide excellent customer service, utilities must ensure that customer service representatives, dispatchers and technicians are in sync with one another at all times. This was certainly one of the driving factors in MCEC's decision to replace its legacy system with Oracle Utilities Network Management System. The utility needed a highly scalable and fresh solution to connect its disparate working parts.

MCEC realized many benefits from its original implementation of Oracle Utilities Network Management System, including using its newly implemented ArcFM GIS system as the source of the network data model. After about five years of using the application, the utility decided to take the next step in more effectively and efficiently responding to the needs of its customers by improving outage restoration.

In 2008, MCEC decided to upgrade to the latest version of Oracle Utilities Network Management System. MCEC hoped the upgrade would allow it to streamline its automatic advanced metering infrastructure (AMI) integration, better identify and resolve power outages and, most importantly help identify "priority groups" – small groups of members in need of life support – in the event of an outage. Further, MCEC wanted to reduce call times in its service centers to improve productivity and enhance customer satisfaction.

Flipping the Switch

The implementation phase lasted approximately five months and the team went through numerous migrations and testing phases. Through this, the utility learned that it could meet its goals of improving restoration and meeting the needs of its customers by upgrading to the latest version of its Oracle Utilities Network Management System.

The project team was comprised of Oracle Utilities resources including a project manager and technical resources with expertise in the network management system program code, building the geometric network model and Oracle's Business Intelligence product. There were also three to four specific resources from Oracle that worked on an as-needed basis on the project.

MCEC provided project management, database management system (DBMS) expertise, integration assistance, testing resources and a comprehensive level of direction gained over the four-plus years of experience with the original network management system product.

MCEC's primary goal was to enhance its customer service – specifically with regard to outage management – which would eventually result in fewer service calls and help the utility to save money. To meet this objective, MCEC decided to marry three of its most important systems – its interactive voice response (IVR) system, advanced metering infrastructure (AMI) and outage management system. This integration allows the utility's IVR system (Milsoft PORCHE) to take the initial customer call and match the provided phone number with the customer on file. The IVR also helps scope the outage and determine the resources needed for restoration.

Next, the outage management system and integrated Aclara AMI system receive the customer information. The upgrade and integration have allowed MCEC to "ping" its meters to help utility managers identify outage boundaries and specific device failures, as well as predict fault locations. This capability helps dispatchers and repair crews manage and resolve issues quickly and efficiently. It also enables MCEC to identify "priority groups" experiencing outages and respond quickly to meet its members' needs.

The system flags critical customers with specific statuses indicating their needs, allowing for proper prioritization per established MCEC policies. The integration of these three systems allowed MCEC to streamline information sharing, enhance data integrity and accelerate issue resolution for its customers.

Major Success – Restoring Power to Thousands

Most recently, a 65-mile-an-hour wind storm sustained over a four-hour period hit Lexington, SC and caused more than 12,000 MCEC customers to lose service in about 300 different events. MCEC workers scrambled to get everyone back up and running, and were able to restore most sites within 36 hours. The utility estimates that without its upgraded outage management system it would have taken twice as long to get its customers' services restored.

With the outage management system, MCEC dispatchers can now more effectively manage schedules because they have the insight they need to prioritize emergency restorations and schedule repair work. In addition, by collecting and analyzing system data, MCEC can proactively prevent problems from developing. For example, the utility can tell if a specific meter has experienced multiple outages, allowing MCEC to locate faulty equipment and service it more quickly.

MCEC is also able to perform test runs on switching orders to assure that switching in the field does not inadvertently de-energize network elements. MCEC updates any meter connectivity issues into its ArcFM GIS from Telvent-Miner & Miner on a daily basis.

Furthermore, MCEC uses Oracle Utilities Business Intelligence and other customer information system (CIS) applications to compile its monthly outage reports and reliability figures. The business intelligence solution allows MCEC to better report its outage history to the Board of Directors or Trustees by allowing the utility to look at the number of outages, type and cause of outages, their duration and how many customers were affected by each outage.

Additional features of the system include:

- Improved asset performance tracking, which allows MCEC to accelerate asset management decisions to optimize expenditures on new and existing assets. This also enables the utility to improve service reliability by tracking all customers affected by an outage, determining electrical configurations of every device on every

feeder and compiling details about each restoration process – giving both the utility and its customers an accurate perspective of their specific outage

- The ability to access information – including manually entered crew location data – in real time, which allows MCEC to quickly direct workers to an outage site in case of an emergency, increasing crew safety and efficiency. MCEC is able to access automatically updated information via graphical maps and tabular lists. In the future, MCEC will also be able to incorporate an Automatic Vehicle Location (AVL) system that will directly integrate with the utility's network management system and provide real-time crew location data.

- Integrated existing data. MCEC is able to integrate data from its CIS, GIS, supervisory control and data acquisition (SCADA) system, interactive voice response systems and mobile systems into a centralized, real-time database. This guarantees the integrity of the data from the disparate systems in use at MCEC. Some of the utility's older systems employ the "silos of data" approach, but with its back-end system-wide integration MCEC is able to see near real-time concurrent data across the organization.

Future Plans

In the future, MCEC hopes to better verify customer information when customers call, enhancing outage prediction and identifying nested outages – that is, a smaller outage within a larger outage – and also have the ability to more quickly confirm restoration. For example, if a blown fuse causes an outage in a section of overhead line, MCEC can identify the problem and restore that outage, along with any other outages – such as a transformer outage on the same section of line – even if they have another cause.

The utility also plans to utilize the outage management system's meter pinging functionality built into the AMI system along with the circuit and phase assignment for each member MCEC generates daily from its CIS and GIS systems. The end result will allow MCEC to further build on its existing capability to qualify customer information by matching a customer phone number automatically to an address from the IVR before that information moves into the outage management system and, on the restoration side, make sure the power is back on in all locations before the crews even leave the area.

Moreover, MCEC hopes to reduce call time in its service centers by allowing its customer service representatives to automatically receive outage status notification information at their desktops via the outage management system. With this ability, they will be better equipped to provide accurate and real-time perspectives on outages, including information regarding the cause of a specific outage, work crew status and estimated restoration time.

Since MCEC's outage management system integrates with the IVR system, customer service representatives will be able to quickly assess the outage and determine the resources needed for restoration. Additionally, MCEC plans to publish near real-time outage data via its Web site for its customers, further reducing the amount of calls coming in to the service center.

Beyond that, MCEC plans to offer its customers the means to access information about current, in-process outages via the Web and give them the ability to report outages to the utility electronically. MCEC also plans to procure an automatic vehicle location (AVL) system that the utility can directly integrate with the outage management system so dispatchers will have access to real-time positioning of the crews. This will help improve safety and customer service because dispatchers will be able to pinpoint the exact location of its service vehicles. MCEC will use this data in its day-to-day operations to predict arrival times for scheduled and emergency appointments and also to locate service crews for re-routing in case of an emergency.

Lessons Learned

MCEC has worked to make its grid smarter for more than 20 years. From its experience, the utility offers the following lessons learned for other cooperatives and electric utilities.

- Evaluate and decide how well your present technical situation is serving you.

- Do your research, and find a solution that fits your co-op.

- The technical and non-technical challenges of installing such a system are significant, but with persistence and a good plan, the end result proves to be worth it.

- There will a unique solution for every utility; therefore, each must understand its own needs and develop its own solutions.

- As with any major IT project, be sure all parties have a full understanding of the goals and expectations. It is important to get organizational buy-in and leverage the knowledge base that already exists in the utility.

Conclusion

As electric utilities look to the future, they face huge pressure to improve reliability and customer satisfaction. An outage management system – integrated with other pertinent solutions like CIS, GIS, and AMI – can be the most important component to any electric utility's response strategy. When every second counts, and customers are left in the dark, it is essential to have the best and most reliable outage management system available. Utilities that invest in this technology will reap the benefits for years to come. ■

About the Authors

Keith Sturkie *is Vice President of Information Technology for Mid-Carolina Electric Cooperative. Prior to joining MCEC in 2002, Sturkie was Principal and co-founder of Southern Business Services (SBS) from1980 – 2002, a designer and marketer of CIS and Financial Software Systems for electric cooperatives in NC, SC, GA, AL and MN.*

Lee Ayers *is a System Engineer at Mid-Carolina Electric Cooperative, where he has been employed since 1986. Ayers has 27 years experience with integrating computer and automation systems for electric cooperative power systems, including OMS, load management, mapping, SCADA, AMI, RF communications, wide area fiber optic networks and all forms of substation and distribution automation. He holds a BSEE from Clemson University (1982).*

All in the Family: Managing Outsourced Service Contractors

By Dr. Moshe BenBassat, Chairman and CEO
ClickSoftware

For once, Harry left his office early on Friday afternoon, with all plans for next week's work completed. In particular, he had coordinated all the work required for laying a new underground electricity distribution circuit: He made sure that the contractor doing the digging has the right permits and called the contractor to verify one last time that the required people and digging equipment are available. He assigned a crew of his own workers to be on site and lay the cables, working with the contractor, and made sure his linemen were available as well since substantial parts of the work need to be performed with the digging contractor and the linemen working side-by-side.

Everything was ready to go first thing on Monday morning of the week we'll call "Week W". However, the weekend storm changed all that. For Harry, events like this are part of his job. It has happened to him before, and he expects it will happen again. He is resigned to it, but should he be? Isn't there a better way? Obviously, Harry doesn't have the technology to decree that there will be no more storms, but he may be able to change the planning processes and deploy new technology in order to make it much easier, faster and cheaper for him to revise his plans following small and large disruptions.

Along the way, he will also be able to use the same approach to improve the use of non-badged contractors in customer-facing tasks, too. This is the subject of this article, which will examine the implications of several types of outsourcing for electricity T&D companies, contractors and customers, and also present tips for overcoming the challenges many companies face when managing contractors to achieve smooth planning and execution: Ensuring work occurs when, where and how it is supposed to, regardless of whether the work is done by contractors or in-house employees.

Week W begins…

The linemen assigned to work with the contractor had worked hard all weekend to fix downed power lines and restore service. They need time off for fatigue, and besides, there is still some more work to be done to fully recover from the storm's effects. There is no way they can work with the contractor on week W.

Consider Harry's options. He must postpone the work by at least a week – this decision is forced, but it then opens up a long list of not-so-easy issues and questions:

- The internal-workforce crew assigned for this job has other jobs planned for next week ("Week W+1"). They will be available the following week (W+2), but this would delay the overall project by far too long.
- The digging contractor is under contract guaranteeing a certain amount of work per month. Delaying this job to the next month will place the contractor under the guaranteed quota, forcing Harry to pay twice for the work – once this month and again next month.
- The contractor may not have sufficient capacity for week W+2. Harry also has other contractors on call, but because they aren't under a guaranteed-quota contract, their costs would be higher. Worse than that, the only way for Harry to check availability for any of the contractors, for any week, is to call them and ask – and unless he decides very quickly, the answers may be out-of-date as the contractors make other commitments.
- A delay of more than two weeks would also force Harry to re-do the complex arrangements made with the local municipality in order to minimize the disruption caused by the digging.
- Any changes to this job would not only affect the project requiring this job, but also move the dates for which this project requires resources – internal workforce, contractors, equipment, etc. – thus unleashing a snowball of re-planning, re-budgeting and re-coordination (with internal and external agencies) across multiple projects.

The rising need for outsourcing

Outsourcing is not a new concept for most service organizations. However, today's challenges due to asset and workforce age, combined with greater price pressures mean that it's no longer a question of if, but when utilities will have to increase the use of contractors to manage more of their demand for field work. With a general shortage of linemen and impending programs (e.g., plans to install smart meters), utilities must take a hard look at increasing their offloading of tasks to third parties – which will in turn increase the decisions and challenges associated with managing and communicating with contractors.

The potential manpower and efficiency benefits are straightforward. Companies have a better chance of ensuring work gets completed when contractors can plan for it, regardless of whether demand exceeds regular workforce capacity. However, managing these contractors together with regular staff can be a complex undertaking. Not only does the company assume the added responsibility to ensure contractors deliver on time, but also that they do quality work – without direct control of the workforce. Brand reputation and customer loyalty are at stake.

While the opening anecdote was about activities, which aren't customer facing, utility companies are also increasingly bringing in contractors for customer-facing tasks. The rise in contracting for both kinds of work has many reasons. Sometimes it's due to a temporarily increased workload, such as the rollout of smart meters. Sometimes it's due to increasing unpredictability of the workload. Together with rising financial pressures, this creates higher motivation to use contractors to balance the peaks in demand.

Types of contracting

We should first distinguish between badged and non-badged contractor employees. For most intents and purposes of planning and scheduling, badged contractors may be considered an integral part of the workforce. The planners have full access to information about their skills, certifications, location and availability, and use this information in detailed planning.

The employees have appropriate levels of access to the internal systems used to access job data and schedules, report job progress, etc., and any required equipment and materials are provided by the organization that contracted for their work.

Although there are some differences that affect planning decisions, such as union rules and overtime costs, overall this type of arrangement does not substantially change the planning process. However, this model may be less financially attractive compared to traditional outsourcing arrangements.

In outsourcing, the whole job is assigned to the contractor, without detailed planning – that is, the contracting organization does not know, or need to know, how many people will be assigned; how long each of them will be on site; what equipment is allocated for the job etc. Instead, it just needs to know that the job will be completed on time per the specifications and when internal resources (e.g., inspectors) need to be coordinated. The contractor employees, in this case, are not badged, and they do not have access to the internal information systems.

A distinction is often made between guaranteed and non-guaranteed contracting. In a guaranteed contract, the contract specifies a minimum amount of work to be assigned to the contractor for every time period. In return, the contractor guarantees that it has sufficient capacity to perform the work. By contrast, a non-guaranteed contract (sometimes called an "overflow" arrangement) does not receive or make any such commitments. The costs of any jobs assigned to such a contractor are usually higher than costs of assignments to a guaranteed contractor.

Challenges of contracting

As Harry's story illustrates, there are quite a few challenges involved in contracting. Let's review the issues Harry needs to overcome, including some that we didn't mention in the story out of fairness to Harry – after all, he had a tough weekend…

• **Long-range forecasting and planning:** The organization needs to establish just the right amount of guaranteed contracts to ensure sufficient work capacity for all types of outsourced work and at all locations, either under a full outsourcing model, or as fully-badged and managed resources. Errors in forecasting the work capacity that would be "sufficient" – either too much or too little – may be costly.

• **Visibility into contractor status:** It's hard for the organization to know how much work the contractor can really perform, where and when. Even when the guaranteed commitment for this month has not been fully consumed, the contractor may be available in one week but not in another. Assigning another job to the same contractor may or may not be possible, depending on whether the same contractor employee (or a single of equipment) is required for both jobs – information that is not always visible to the organization. The same applies for shifting the job's date by one week – it's hard to tell which contractor will be able to meet the new date, and to assess the impact on other jobs already committed to that contractor. Finally, the organization does not have any visibility into the job's progress. What sub-tasks need to be completed today? Will they indeed be completed? Does this affect estimated time of completion for the whole job? All of these require substantial voice and written communication, without automated support. This communication is error-prone, hard to track and record, and quite costly.

• **Short-range planning in reaction to unforeseen events:** Harry's story is mainly about this set of challenges. As a result of the lack of visibility into contractor status, Harry does not know which changes will be feasible. If he delays the job by one week, will this contractor still be available? How about another contractor? How will the change affect other jobs? Will the effect be limited for only a short time period, or will it have repercussions extending months ahead and interfering with the long-range planning?

• **Sharing information with contractors:** As the contractor does not have access into the organization's information systems, the required information needs to be manually extracted and sent to the contractor. Any changes and updates then need to be manually sent by the contractor and manually entered into the information systems. If the contractor needs more information, in the best case this causes delays and more work as the contractor requests the information. In worst cases, the contractor does not know that crucial information is missing, and this may lead to costly or even dangerous results.

• **Maintaining consistency, quality and safety standards:** The contracting organization needs to maintain standards for all work, whether performed by contractors or in-house employees. There are usually strong practices in place to do this for in-house employees – e.g., periodic reviews and assessments, employee and job records, audit processes – but these are hard to apply for contractors. Thus, the organization finds it hard to assess the contracted work quality and even harder to make sure that the work follows consistent processes no matter which contractor is assigned to do the work.

• **Customer-facing issues:** While all of the above apply to asset work as well as to customer-facing work, customer-facing work exacerbates some of these issues and introduces new issues. For example, the lack of up-to-the-minute job status updates may not be critical when assigning a multi-day digging job, but it is far more critical when setting a customer visit to install a new smart meter. Furthermore, once the contractor arrives at the customer's premise, the customer may discover that the contractor has not been provided with the required information, leading to postponing the installation, resulting in an unhappy customer and often, bad press. The customer may also have questions about other tasks, including those performed during the previous month. In those cases, customers do not appreciate hearing, "'Sorry, sir, but I'm just a contractor; please take it up with our call center."

Tips and best practices

Possibly the most important common theme to all of these challenges is information sharing. That is, how much demand is expected and with what confidence? What is the progress on currently contracted work? How much additional capacity is available, and for what crew types?

If Harry and his contractors had a way to pool their information about jobs, projects, customers, capacity and availability, they could reach much better decisions – and do it more quickly. However, there are substantial difficulties involved in sharing information. The organization needs to protect commercial information and to avoid exposing customers' private records. The contractors also have their own commercial information, including their employee records and the work they do for other contracting organizations.

In some cases, a good approach is to provide the contractors with some limited access, via a "contractor portal", to the organization's planning and scheduling software. That way, that they can record and update more details of their day-to-day availability (in terms of work hours, skills, equipment, etc.); have access to the most up-to-date information they need to perform their job; and collaborate with the internal workforce on coordinating and updating progress for ongoing and planned projects.

The above practice enables the contracting organization to have one shared work management solution and expose just the information that can, and should, be exposed. Subcontractors gain from process improvements, opportunities to bid for more business, and access to

CIGRE - IEEE PES Symposium

Calgary, Canada

July 29-31, 2009

Integration of wide-scale renewable resources into the power delivery system

An International Symposium

Organized by CIGRE and IEEE-PES, in cooperation with Canada and US National Committees of CIGRE and Study Committee C6 of CIGRE – Distribution Systems and Dispersed Generation.

The main topics

1. Characteristics of wind/Renewable Generation
2. Renewable in Transmission Systems
3. Renewable in Distribution Systems
4. Field Experience, Laboratory and Test Results
5. Wider Renewable Integration issues

Technical Programme, Registration and Accommodation Forms

See www.cigre.org/gb/events/symposium.asp
www.ieee.org/power

Contacts

tkey@epri.com - sylvie.bourneuf@cigre.org

highly sophisticated planning and scheduling. However, contractors also see some downside by exposing their internal information and possibly the headaches of having to work with the information systems of several different organizations for with which they contract.

Alternatively, contractors may elect to use their own work management solution and arrange for frequent exchanges of information. This way, they can store all of their information in their own system, while choosing which information to share with others. This may not be as difficult as one may think, as it is possible to start with simple and basic integration.

Since many small contractors don't invest in their own information technology infrastructure, they may wish to investigate work and project management solutions that are available under the Software as a Service (SaaS) model. Such solutions are often industry-specific and provide a wealth of capabilities. Some of these services allow simple integration, which may be used to share information with the contracting organizations.

Both of these models – "Portal" and "Integrated Work Management" – enable timely communication of critical information that enables both the utility and its contractor to work in a more predictable, efficient, and effective complement to each other. The result of flushing out and facing these challenges holds huge potential for utilities as contractor usage increases. For example:

- Long-range planning becomes possible as visibility to the future workload, and all resource availability increases for the utility and the contractor.
- Current job status from the contractor enables more effective usage of internal employees that must be coordinated, including proactive intervention, when needed.
- Short-term planning becomes easier for the utility with visibility into contractor availability. In turn, contractors with greater visibility into potential demand can be more flexible to meet short-term needs.
- Work between contractors and utilities' internal workforce becomes safer and more efficient based upon the sharing of safety procedures, job information, and schedules.
- Greater communication and information sharing enables a more aligned and informed face to the customer, regardless of the resource's direct employer.

Over time, we'll see a tendency by organizations to prefer selecting contractors who facilitate information sharing and planning collaboration. This may trigger the next phase, where the sharing and collaboration will occur within an electronic "marketplace" where many utilities and utility contractors interact on contracts, bids and agreements. Until that day, their critical need for information will be served by a utility-centric solution (where each contractor is given limited access via the portal), or by integration of the utility's and contractor's work management solutions.

The shared information will be used for long-range planning, setting times and plans for lengthy projects; short-range planning, updating plans and fleshing them out with more detail; execution monitoring and collaboration guiding the cooperation of all involved parties; and business analytics to assess the quality of each contractor, refine the estimates of job durations and costs, and enable feedback into long-range planning for improving operational aspects such as the mix of in-house employees and contractors.

For customer-facing tasks, these mechanisms will work side-by-side with periodic assessments of customer satisfaction, generating valuable feedback on the consistency and quality of work provided by internal and external employees.

Do you still remember where we left Harry? Being the capable and experienced professional that he is, he is surely able to bring the story to a happy ending, but it may take him substantial effort, inhibit his ability to react to changes in a timely manner, and cause undue stress on work and life to get the job done.

He would certainly prefer to see the software automatically notice the non-availability of the linemen who should have worked with the contractor and find the most efficient solution – delay the dig by two weeks, assigning it to another contractor (the software knows that contractor has the required availability, skills and equipment); and assign another job to the first contractor – a job that wasn't as urgent, but that still needs doing.

After a weekend that was stormy in more ways than one, Harry deserves such ease and convenience, and so does his employer, his contractors and – most of all – his customers. ■

About the Author

Dr. Moshe BenBassat *is Chairman and CEO of ClickSoftware. Following a long and successful academic career with positions at USC, Tel Aviv University and UCLA, Dr. BenBassat established himself as one of the world's leaders in the area of optimization and decision support software for a wide variety of applications. His research work was supported by DARPA, NIH, Ballistic Missile Defense Agency (via TRW), ARI (U.S. Army Research Institute), NASA and NSF. Dr. BenBassat has been published in leading professional journals, led many executive training workshops and has lectured in numerous industry events worldwide.*

CSWEEK™

Expanding Excellence in **Customer Service**

Washington, DC | May 18-22, 2009

CSWEEK COLLEGE

CSWEEK synergy GROUPS

CSWEEK EXECUTIVE SUMMIT

CSWEEK CONFERENCE 33

Honored Keynote Speaker

Spencer Abraham

Former US Secretary of Energy

May 20, 2009

Register to Win a

2009 Ford Fusion

Keynote Speaker

Rick Sergel

President & CEO, NERC

May 22, 2009

Utility industry leaders will address strategic developments and technologies that are changing the landscape of customer service, interaction and satisfaction across the meter-to-cash footprint. Explore utility case studies, best practices and rapidly changing trends.

- More than 60 workshops will speak to the broad spectrum of utility customer service challenges.
- Sessions covering all business processes from meter to cash.
- Over 100 companies in the largest exhibit hall in the utility customer service arena.

Who should attend:

- Customer Service Managers, Directors and Supervisors
- Call/Contact Center Managers
- IT Managers and Personnel
- Field Service Managers
- City Managers and Finance Directors
- AMI/MDM managers

Complete details and registration at **www.csweek.org**

PRODUCT Showcases

ADVERTISERS Index

RSC #	COMPANY	WEB SITE	PAGE #
1	Aclara	www.aclara.com	Outside Back Cover
2	Areva T&D Inc.	www.areva-td.com	9
3	BCS SwitchGear, Inc.	www.bcsswitchgear.com	27
4	Cigré Canada	www.cigre-canada.org	41
5	Comverge Inc.	www.comverge.com	1
6	CS Week	www.csweek.org	43
7	Elster	www.elster.com	Inside Front Cover
8	GarrettCom Inc	www.garrettcom.com	36
9	Hastings Fiberglass Products Inc.	www.hfgp.com	19, 21, 23
10	High Voltage Inc.	www.hvinc.com	13
11	Neoptix Fiber Optic Sensors	www.neoptix.com	Strip Front Cover
12	Oracle USA Inc	www.oracle.com/industries/utilities	5
13	RTDS Technologies Inc.	www.rtds.com	30
14	Rugged Com Inc.	www.ruggedcom.com	7
15	Schweitzer Engineering Laboratories, Inc.	www.selinc.com	11
16	Sensus	www.sensus.com	3
17	Smart Grid RoadShow	www.smartgridroadshow.com	Inside Back Cover
18	Utilimetrics	www.utilimetrics.org	17
19	W.I.R.E. Services, a division of Manitoba Hydro	www.wireservices.ca	39
20	Westex Inc.	www.westexinc.com	15

Smart Grid RoadShow

Denver Marriott City Center
DENVER, COLORADO
APRIL 6-7 2009

Bringing the Smart Grid Marketplace to Your Door!

Smart Grid Vision – Smart Grid Focus

Smart Grid RoadShow Conferences are a new concept in energy industry events. Positioned at the forefront of grid transformation, SGRS events are uniquely focused on creation of the smart, self-healing, two-way power and communications superhighway that our future energy outlook demands.

Both 2009 SGRS events — Spring in Denver and Fall in Baltimore — concentrate on bringing together highly motivated people, fresh ideas and progressive organizations from major metropolitan user, supplier and consulting communities in an intimate environment that is conducive to knowledge expansion and professional growth.

The main focus of each Smart Grid RoadShow is to create a timely and economical series of 'Smart Grid-centric' events in geographically significant venues across North America. And, SGRS events are also smart business, leaving behind the skyrocketing costs and logistical overhead of much larger conferences while allowing participants to focus on communicating and sharing vital information.

ATTEND – PRESENT – EXHIBIT

Start Participating in Tomorrow's Smart Grid Marketplace Today!

Host Utility:

Xcel Energy · SMART GRID CITY™

Corporate Sponsors:

accenture · current · GRIDPOINT · OSIsoft. · SEL · SmartSynch · Ventyx · OSI · enspiria SOLUTIONS · AREVA · InfoNetrix

Presented by: Electric Energy T&D MAGAZINE

Produced & Managed by: JAGUAR EXPO

Supported by: Conference Second Annual European Executive Summit

Media Sponsors: UTILITY T&D · UtiliPoint International Inc.

Register today! **www.smartgridroadshow.com**

No *over-hyped* vendor promises – just results. Aclara's scalable AMI solutions prove themselves everyday by handling millions of meter reads for over 500 utility customers. Whether your utility needs a complete AMI turnkey solution, or answers to specific challenges, Aclara delivers.

Capturing data. Liberating knowledge.™

Find out more at Aclara.com/delivers
1.800.297.2728 | info@aclara.com

ACLARA™
Aclara Technologies of ESCO

Circle **1** on Reader Service Card